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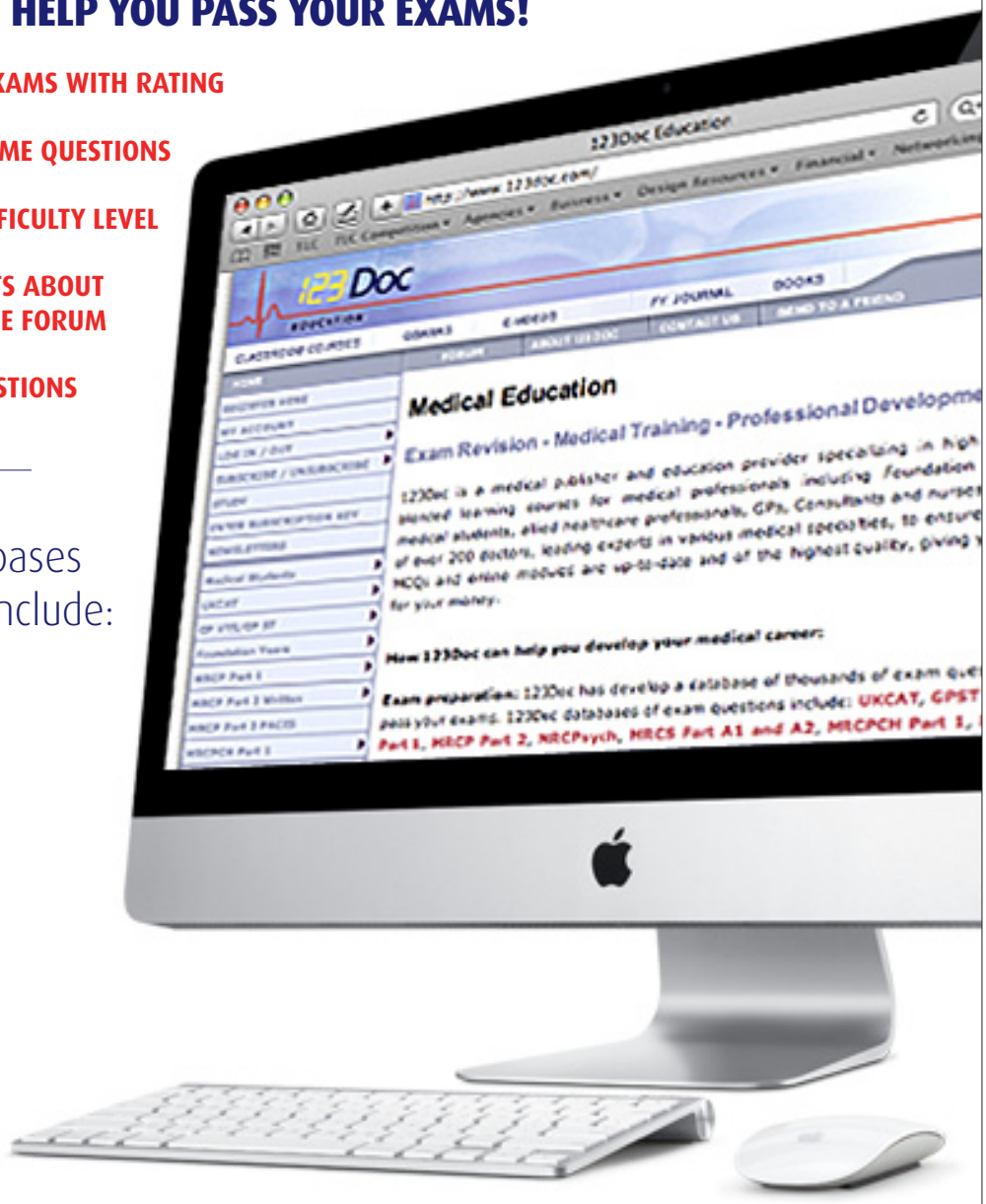

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FOUNDATION YEARS JOURNAL 2017

Volume 11

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Notice

BRIEF OVERVIEW OF PROSTATE CANCER: DIAGNOSIS & MANAGEMENT

C Brunning, A Reekhaye, S Madaan

Abstract

Prostate cancer is the most common cancer in men in the United Kingdom (UK). The disease is becoming increasingly common with rising age. An increasing awareness of the disease as well as improved diagnostic modalities such as multi-parametric magnetic resonance imaging (MRI) have also contributed to the increase in the prostate cancer detection rates. The increased incidence has led to numerous changes in diagnosis and treatment over the past few years.

As there are a variety of modalities for diagnosing and managing the disease, it can be poorly understood because some prostate cancers are slow-growing and may not require treatment, while other cancers can be aggressive and metastasise. Foundation year doctors will come across many patients with prostate cancer and its complications during their training as the diagnosis is on the increase. This article focuses on providing junior doctors with the basic knowledge about prostate cancer, its diagnosis and the multi-disciplinary approach to its management.

What is the prostate?

The prostate gland is a walnut-shaped structure that is located just anterior to the rectum and inferior to the bladder. The urethra runs through the centre of the prostate. Its main function is to secrete a slightly alkaline fluid that forms part of the seminal fluid. This is the fluid that nourishes and carries sperm. During orgasm, the muscular glands of the prostate help to propel the prostatic fluid, in addition to sperm that was made in the testicles, into the urethra. The semen then leaves the body out through the tip of the penis during ejaculation. (1).

Prostate Cancer

Prostate cancer is the most commonly diagnosed male cancer in the United Kingdom (UK). Its diagnosis is on the increase, probably as a result of increasing use of serum prostate-specific antigen (PSA) for both symptomatic and asymptomatic men. Almost all prostate cancers are adenocarcinomas and arise within the gland in a multifocal distribution. While it is the most common male cancer, it is not responsible for the most deaths as the majority are slow-growing and present later in life. There were 47,300 new cases of prostate cancer diagnosed in 2013 which equates to 130 cases per day. It accounted for 11,287 deaths in 2014, making it second behind lung cancer as a cause of male cancer mortality (2).

Risk Factors

There are many risk factors for prostate cancer. Age is an important risk factor for the development of prostate cancer, the disease being rare below the age of 40 and becoming increasingly common with rising age. The disease is also more common in Western nations, making an environmental aetiology important. Ethnicity is also a risk factor and black men are at greatest risk. Family history can play an important role with 5% of prostate cancers believed to be inherited. Genetic abnormalities and mutations of the BRCA2 gene have also been reported. The risk is doubled if there is one affected first-degree relative. A healthy diet and regular exercise may help to lower the risk of developing prostate cancer (3).

Role of Androgen Receptor

The androgen receptor is an important target in oncological therapy because it plays a role in cell-to-cell signalling, cell growth and even in the ability of cancer cells to invade and subsequently spread to distant sites.

As the cancer progresses, the cells bear less of a resemblance to their tissue of origin and eventually can divide and grow in the absence of androgen, which then leads to the so-called 'androgen escape' seen in the later stages of the disease (4). The utilisation of exogenous androgen as a therapy for prostate cancer will be discussed in more detail later in this review.

Prostate Cancer Presentation

Since the introduction of serum PSA testing in the late 1980s, the majority of new patients have non-metastatic disease at presentation. In cases of localised prostate cancer, patients can be asymptomatic and the disease is only detected with an elevated or rising serum PSA or incidental abnormal digital rectal examination (DRE). There may also be symptoms of bladder outflow obstruction, haematospermia, haematuria or perineal discomfort, probably due to coexisting prostatitis.

Locally advanced non-metastatic prostate cancers can present with similar symptoms as well as symptoms of renal failure due to ureteric obstruction. Malignant priapism and rectal obstruction are rare presentations. Metastatic disease can be asymptomatic or it can present with anorexia, weight loss, bone pain, pathological fractures, lower limb swelling due to lymphatic obstruction as well as neurological signs and symptoms in the lower limbs. Spinal cord compression can also be an important presentation. It is an oncological emergency which needs prompt diagnosis and treatment.

Prostate Cancer Diagnosis

The early detection of prostate cancer in asymptomatic men can be very challenging. A thorough history and examination to elicit the above-mentioned signs and symptoms are important. Diagnosis is usually first made by a raised suspicion of the disease and an elevated serum PSA or abnormal DRE. Since most prostate cancers arise peripherally in the peripheral, posterior part of the prostate, they should be palpable on DRE. An abnormal DRE is defined by asymmetry, a nodule or a fixed craggy mass.

Prostate Specific Antigen

Prostate specific antigen (PSA) was first measured quantitatively in 1980 (5). Since then it has become instrumental in the screening and monitoring of prostate cancer. It is a protein secreted by all prostate glands and is thought, physiologically, to provide some of the liquid quality to semen, thereby increasing sperm motility (6). It is raised in cases of benign prostatic hyperplasia as well as in cases of prostate cancer. Its levels increase physiologically with age as the prostate gland becomes larger and therefore has a greater capacity to secrete PSA. It is for this reason that PSA results must be interpreted in the context of a patient's age and digital rectal examination findings. It can also be raised in cases of urinary tract infections (UTI), vigorous exercise, ejaculation and even a DRE having been performed in the preceding week (7). These features make PSA a sensitive, but not particularly specific, screening test.

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Table 1 shows the age-specific ranges for serum PSA levels (8).

Age Range (Years)	Asians	Africans	Caucasians
40 to 49	0 to 2.0 ng/mL	0 to 2.0 ng/mL	0 to 2.5 ng/mL
50 to 59	0 to 3.0 ng/mL	0 to 4.0 ng/mL	0 to 3.5 ng/mL
60 to 69	0 to 4.0 ng/mL	0 to 4.5 ng/mL	0 to 4.5 ng/mL
70 to 79	0 to 5.0 ng/mL	0 to 5.5 ng/mL	0 to 6.5 ng/mL

Table 1. Age-specific PSA ranges.

Prostate Cancer Investigation

A raised serum PSA or an abnormal DRE will lead to further investigations to confirm or exclude the diagnosis of prostate cancer. This will include prostate biopsy and imaging in the form of magnetic resonance imaging (MRI). Traditionally, biopsies were obtained prior to imaging. However, post-biopsy bleeding causes artefact on scans and makes interpretation difficult. This means MRI scans have to be delayed for around 6 weeks which then slows down the pathway to diagnosis and treatment.

This is the reason why pre-biopsy imaging is being further evaluated. There is ongoing research into the use of MRI scans before biopsy, in order to more accurately target suspicious regions of the gland. Multi-parametric MRI techniques are being increasingly used for diagnosis and image-guided targeted biopsy. Other imaging modalities such as computed tomography (CT) and bone scanning are also used to establish whether the disease is metastatic once the diagnosis of prostate cancer has been made.

The prostate imaging reporting and data system (PI-RADS) refers to a structured reporting scheme for evaluating the prostate for cancer. The PI-RADS score is assessed on prostate MRI. The scale is based on a score from 1 to 5 given to each lesion on the scan, with one being most probably benign and 5 being highly suspicious of malignancy.

Prostate biopsy is usually achieved, at least in the initial instance, under trans-rectal ultrasound guidance (TRUS-guided prostate biopsy). An ultrasound probe is placed inside the rectum at the level of the prostate gland and is used to identify the structures of the prostate to enable systematic targeting of different anatomical areas of the gland.

This approach is essential to the diagnosis of prostate cancer as the disease develops in a multifocal distribution, arising in potentially many areas of the gland. It is hoped that by taking ten to twelve cores of prostatic tissue, one will target any suspicious areas. It is said that as many as 20% of small cancers will be missed by this method (9). If a patient has a raised PSA and TRUS-guided biopsies are negative, then a transperineal template biopsy can be performed using the information from the MRI scan which can then accurately target the suspicious areas.

It has the advantage of not going through the rectum and therefore has lower rates of post-biopsy sepsis. The transperineal method can also target anterior lesions. One disadvantage is that it should be performed under general anaesthesia and there is a higher risk of urinary retention as more biopsies are taken compared to the TRUS-guided prostate biopsy. The procedure however has a lower infection rate as the needles are going through the skin rather than the rectum.

Prostate Cancer Grading

Prostate cancers are graded by pathologists using the Gleason scoring system of 1-5 based on the differentiation of cells under the microscope and therefore their similarity to the tissue of origin. If the sample has features of malignancy but the cells still resemble prostatic cells, then they are assigned grade 1 and if there is extremely poor differentiation, they receive a grade of 5, with differing levels available in between.

Since multiple cores are obtained and prostate cancer often has differing grades in different samples, the pathologist will consider the two areas that comprise the greatest amount of disease. The score is given as two numbers, for instance Gleason 3 + 4 = 7. The first number refers to the fact that the majority of disease is cells of grade 3 severity and the second number refers to disease that is grade 4 but makes up a lower proportion than grade 3 disease. Therefore, Gleason 4 + 3 = 7 confers a more aggressive disease than 3 + 4.

Gleason scores of 6 are said to be well differentiated cancers. Scores of 7 are said to be moderately differentiated and scores between 8 and 10 are said to be poorly differentiated. The Gleason score is extremely important in predicting the likely behaviour of the cancer. It is used in assigning patients to different prognostic risk groups but is not used alone. It must be interpreted in conjunction with patient factors and DRE findings when informing management decisions.

It may be that a patient has had a biopsy, the indication for which was a rise in PSA, which shows only inflammation. This is commonly seen at multi-disciplinary team (MDT) meetings and is a good example of how PSA can be non-specific. Patients with prostatitis commonly have a raised PSA and are subsequently found to have no malignancy at biopsy. Careful counselling of patients at the time of PSA testing and in subsequent interpretation is important to minimise anxiety.

Risk Stratification and the Multi-Disciplinary Team

The management of prostate cancer relies on careful risk stratification in order to identify patients with cancers at risk of progression. Categorising patients into different groups remains very challenging. Various clinical parameters such as the Gleason score, clinical stage and pre-treatment PSA are used to stratify patients in the different groups and estimate the long-term disease progression.

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Table 2 below shows some of the different criteria used by the National Institute for Health and Care Excellence (NICE) to stratify prostate cancer (10).

Level of risk	PSA		Gleason score		Clinical stage
Low risk	<10 ng/ml	and	≤6	and	T1–T2a
Intermediate risk	10–20 ng/ml	or	7	or	T2b
High risk	>20 ng/ml	or	8–10	or	≥T2c

Table 2. NICE prostate cancer risk stratification.

Prostate Cancer Treatment

Treatment is usually started in the secondary care setting. It is based upon the decisions of the multi-disciplinary team. At the MDT meeting, the patient's presenting complaint, DRE findings, blood test results including PSA, family history and medical co-morbidities including WHO performance status score, are presented to the team.

A pathologist will then present the histopathological findings from the core biopsies sent and will assign a Gleason score to the disease. A radiologist with specialist knowledge in urological cancer will then present the findings from the MRI and other imaging modalities before assigning a TNM score to the disease. It is then for the consultant urological surgeon and oncologist to decide on the management pathway best suited to the patient in question.

Management of Prostate Cancer

NICE guidelines outline the range of treatment options available for men who are diagnosed with prostatic cancer. Options for men diagnosed with localised disease include active surveillance, external beam radiotherapy, brachytherapy and the gold standard radical prostatectomy. Other management options, which are not available in all centres throughout the UK include high-intensity focused ultrasound and cryotherapy. The mainstay of advanced disease remains hormone therapy (HIFU).

1. Active Surveillance and Watchful Waiting

Active surveillance (AS) involves serial PSA measurements at frequent intervals and regular outpatient appointments where DRE will be performed to identify any change. Patients will also have repeat prostate biopsies. The key difference between watchful waiting and active surveillance is that performing repeat biopsies and correlating the PSA with the histopathology from the biopsies, allows the patient's prognostic risk to be closely monitored to detect any disease progression.

It aims to reduce the number of patients being subjected to the morbidity of treatment, whilst also identifying those at risk of progression, requiring active intervention. If a man's risk increases, he should be offered radical therapy. The modality of treatment is dependent on the co-morbidities and patient's preferences. Active surveillance is only reserved for men who are fit for radical treatment, but prefer to defer treatment until it is necessary. It is also an option for intermediate-risk groups, but is not appropriate for those in the high-risk category as outlined in Table 2.

Watchful waiting on the other hand is an option in any prognostic risk group but is more likely to be employed in those with very low risk disease or in elderly people with multiple co-morbidities in whom it is unlikely that treatment will improve their overall outcome or survival. It involves PSA testing at pre-determined intervals and regular clinical assessments.

It does not include repeated DRE or serial prostate biopsies. If the clinical picture changes, for instance if the PSA starts to rise rapidly, or patients become symptomatic with bony pain or bladder outflow obstruction, then their case will be re-assessed and may be re-referred to the MDT for further decision making. They might be started on hormonal treatment at that point.

2. Radical Prostatectomy

This involves the surgical removal of the entire prostate gland and seminal vesicles. It has traditionally been performed via the open perineal or retropubic approach. However, minimally-invasive techniques are becoming increasingly popular. These include laparoscopic and robot-assisted prostatectomy. Radical prostatectomy is an option in those with localised disease who are fit for surgery and is generally reserved for younger patients. It is rare that it is offered to those over the age of 70. It remains an option for patients in all prognostic risk groups including low-risk patients and is offered to those with a chance of cure or long-term disease control.

Salvage radical prostatectomy is also an option in those who have had a so-called biochemical relapse following radical radiotherapy. A man is said to have had a biochemical relapse when he has undergone radical radiotherapy to his prostate gland and on subsequent follow-up, is found to have a rising PSA. When radical prostatectomy is performed in this setting, the co-morbidities of surgery are higher when compared to primary radical surgery. There is also a significantly increased risk of damage to the rectum due to ongoing radiation proctitis.

Radical prostatectomy can be performed in those with locally-advanced high-risk disease. However, the presence of T3 disease or higher is usually a contraindication to radical surgical approach.

Specific side-effects of radical prostatectomy include erectile dysfunction, affecting 60-90% of patients. Spontaneous erections can return up to 3-year post-operatively. The use of nerve-sparing techniques has however improved outcomes. Urinary incontinence (stress type) is another complication of radical surgery. Most patients do recover their continence after pelvic floor exercises. Implantation of an artificial urinary sphincter is rarely necessary.

3. External beam radiotherapy

This technique involves irradiating the prostate gland from a source outside the body. The source of radiation is often x-rays and can lead to similar side-effects to surgery. Erectile dysfunction and urinary problems are also an issue. It carries with it the additional risk of bowel dysfunction, such as bleeding and diarrhoea, due to inflammation of the mucosa caused by radiation.

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It is delivered over 4-8 weeks of daily therapy. Attempts are made to accurately direct the radiation to the prostate gland to minimise collateral damage to surrounding structures. Due to the significant potential for morbidity with this treatment, it is not offered to those in the low prognostic risk group. It is instead reserved for the intermediate and high-risk populations. If a man is receiving radical external beam radiotherapy and has a Gleason score of 8 or more, he will be offered at least 2 years of hormone therapy as an adjuvant to the radiation.

External beam radiotherapy is also used in those with biochemical relapse after radical prostatectomy, with radiation being delivered to the prostatic bed following surgery. This is only offered if the man is radiologically demonstrated to have no metastases.

In locally-advanced disease, external beam radiotherapy can be combined with brachytherapy.

4. Brachytherapy

This is where the source of radiation is actually implanted within the prostate gland itself. It shares the complications of its external beam cousin, but these are often markedly reduced due to the more locally directed nature of the therapy. It can be used for localised disease in men who are in the low or intermediate-risk group, but is not used alone in those in the high-risk group.

For those with locally advanced disease, it can be combined with external beam therapy to increase the dose of radiation given to the prostate.

5. High intensity focused ultrasound (HIFU):

This causes destruction of prostatic tissue by heating. It is currently only offered as part of clinical trials, where it is compared to the standard treatments already described above. It may be appropriate for all three categories: localised disease, locally-advanced disease and relapse of cancer following radiotherapy.

6. Cryotherapy

This causes tissue destruction by freezing, as the name suggests. Like HIFU, it is only offered as part of clinical trials.

Non-Curative and Adjuvant Treatments

Metastatic disease is the cause of nearly all prostate cancer-related deaths. Currently incurable, the 5-year survival is about 35%. The gold standard treatment is hormone therapy, with chemotherapy reserved for progressive disease.

1. Hormone Therapy

Prostatic cells grow in response to androgens, so manipulation of the androgen receptor on prostatic cells is a useful tool in disease management.

Androgen withdrawal (castration): This can be achieved via chemical means with gonadotrophin-releasing hormone agonists (Goserelin, Leuprorelin and Triptorelin) or antagonists (Degarelix). It can also be achieved surgically with bilateral orchidectomy. In practice, this latter option is rarely offered due to the associated psychological side effects.

Androgen blockade: This is achieved with drugs that bind to the hormone receptors of prostatic cancer cells and therefore block them from the action of endogenous androgens, thereby removing the growth stimulus. Examples include bicalutamide, flutamide and cyproterone acetate. These drugs can be used prior to the initiation of androgen withdrawal drugs as the latter can cause a temporary surge in testosterone as the testes respond paradoxically to the withdrawal of stimulus. This flare of androgen causes a temporary worsening of symptoms and is to be avoided.

Hormonal therapy is useful in an array of situations in prostate cancer. It can be used in the neo-adjuvant setting for some months before the initiation of radical therapy, or can be given concurrently alongside radiotherapy. It can also be given as adjuvant therapy in the aftermath of external beam radiotherapy and is sometimes offered after radical prostatectomy but only in the case of biochemical relapse and metastasis.

The side effects of hormone therapy depend on the mechanism. Androgen withdrawal commonly results in symptoms similar to those experienced by women during the menopause. They include hot flushes and loss of libido, osteoporosis and increase in cardiovascular risk. Androgen blockade has fewer of these side-effects, with the main problems being gynaecomastia and mastalgia.

2. Chemotherapy

This can be given to men with advanced disease who become castrate-resistant. Castrate-resistance is defined by two consecutive PSA rises from its nadir or symptomatic progression despite a favourable biochemical response following hormone therapy. Its use is weighed against the patient's preferences, symptoms and quality of life. Common chemotherapy agents include docetaxel and cabazitaxel. Novel therapies include Abiraterone which is administered orally with prednisolone and Enzalutamide which is an orally bioavailable androgen receptor antagonist more potent than Bicalutamide.

3. Palliative Care

Multidisciplinary involvement of the oncologist, urologist and palliative care team is often necessary for patients in the terminal phase of the disease, where the aim is to optimise their comfort and quality of life. Adequate pain management is needed to treat bone pain. Bladder outflow surgery may be required to treat persistent voiding symptoms. A long-term urethral or suprapubic catheter is an alternative for patients not fit for major surgery. Ureteric obstruction causing renal failure may require percutaneous nephrostomies or ureteric stents.

Summary

Prostate cancer is extremely common in the United Kingdom today. It is a field of significant ongoing research and we are now seeing it being managed as a chronic disease for many people in whom it will, in all likelihood, not be the process that kills them. It is increasing in incidence largely due to increased life expectancy, better awareness and the success of PSA screening. A multidisciplinary team approach involving general practitioners, urologists, oncologists, radiologists, cancer nurse specialists and palliative care is essential in managing this complex disease.

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SBA Questions

Q1. You are a GP working in a busy East London practice. A 65-year-old man presents complaining of nocturia of up to 4 times a night. His urine dipstick test is positive for nitrites and leukocytes. What is the most appropriate management?

1. Perform a random PSA test to exclude prostate cancer

2. Perform a DRE and ask him to see the practice nurse afterwards for a PSA

3. Perform a bladder scan and administer antibiotics for his UTI

4. Perform a bladder scan and DRE, administer antibiotics and ask him to attend for a PSA check in 2 weeks, meanwhile refer to a urologist for further evaluation

5. Send a urine culture, administer empirical antibiotics, perform a bladder scan and DRE and ask him to return for a PSA in 6 weeks

Q2. A 60-year-old man is shown to have Gleason 4 + 3 =7 disease. His MRI shows anterior gland disease that is confined to the prostate. CT shows some reactive lymph nodes and no metastases. This man is suffering from frequency and nocturia with poor flow. What is the most appropriate management?

1. Watchful waiting

2. Brachytherapy

3. Transurethral resection of prostate

4. Radical prostatectomy

5. Active surveillance

Q3. An 80-year-old man with recurrent UTIs and intermittent haematuria presents to clinic. His CT urogram is normal but flexible cystoscopy reveals a significantly inflamed bladder with friable mucosa and contact bleeding. His past medical history includes radical external beam radiotherapy to his prostate when he was in his sixties. His PSA is within range. What is the most likely cause for his symptoms?

1. Transitional cell carcinoma of the bladder.

2. Radiation cystitis.

3. Post-BCG instillation to the bladder.

4. Infection with coliform bacteria.

5. Recurrence of his prostate cancer.

Q4. A 50-year-old man is noted by his GP to have a PSA of 5. DRE reveals a firm, normal sized prostate. He is referred for TRUS-guided prostate biopsy and is not found to have any areas of disease. His MRI shows an area of suspicion anteriorly. What is the most appropriate management?

1. Discharge back to the GP for watchful waiting

2. Active surveillance

3. Transperineal template biopsy of the prostate

4. Hormone therapy as his PSA is high

5. TURP

Q5. A 79-year-old man with hormone refractory prostate cancer attends A&E complaining of pins and needles and numbness in both feet. What is the single most important clinical examination you must perform in this patient?

1. Neurological assessment of lower limbs

2. Cranial nerve examination

3. Plantar reflex assessment

4. DRE

5. Cardiovascular examination

Answers

1. Answer: 5

The most likely cause for UTI is incomplete bladder emptying, which in this age group is most likely due to prostatic enlargement. It is essential to exclude malignancy as a cause for this enlargement which the DRE and PSA will help to do.

If the PSA is raised or the DRE suspicious, he will need referral. It is essential to send a urine culture prior to antibiotic therapy in order to prevent resistance and the overuse of broad spectrum antibiotics. The bladder scan will give you an idea of whether this man is retaining urine or not. DRE or UTI can falsely raise PSA so the blood test should not be performed within 6 weeks of a urinary tract infection or physical gland examination.

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2. Answer: 4

Young, fit patients with localised disease should be treated with curative intent if they opt for radical treatment. Radical prostatectomy is the most appropriate option. Brachytherapy would have been an option were it not for the bladder outflow obstruction. Brachytherapy can make this problem worse. This makes option 4 the most appropriate.

3. Answer: 2

The damaging effects of ionising radiation on tissues surrounding the malignant target are often debilitating and hard to treat. BCG would be an option but there is nothing in his history to suggest he has had BCG immunotherapy.

4. Answer: 3

The MRI has demonstrated an area of interest which the TRUS biopsy may have missed. Transperineal template biopsies allow more focused targeting of suspicious areas anteriorly. Transperineal template biopsy is therefore the best way of making a definitive diagnosis.

5. Answer: 4

All other examinations listed are important in assessing someone with these symptoms but the DRE will allow assessment of anal sphincter tone and perineal sensation. These findings will inform how urgently this man requires MRI of his spine to exclude cauda equina syndrome.

Prostate cancer is one of the malignancies that classically spread to bones and therefore can compromise the spinal canal. Other symptoms include retention of urine and faecal incontinence. Other cancers that commonly spread to bone are breast, lung, thyroid and kidney.

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Financial statement
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CIRCUMCISION & THE FORESKIN

M Dinneen, E Dinneen

Introduction

Male circumcision may be considered one of the first elective surgical procedures reported in any literature in human history. Drawings with hieroglyphics found in the Ancient Egyptian temple at Saqqara depicting the earliest techniques of male circumcision are thought to date back to roughly 2600-2400 BC. (1) Male circumcision has also become increasingly 'medicalised' since the 19th Century and is the most frequently performed surgical procedure in the world today.(2) This article will consider the normal anatomy and function of the male foreskin, the common presentations of problems with the foreskin and circumcision.

The foreskin: Anatomy and Function

The male foreskin, also known as the penile prepuce, is the double-layered fold of smooth muscle tissue, blood vessels, nerve endings, skin and mucous membranes that covers and protects the glans of penis and the urinary meatus. The foreskin affords protection to the glans from irritants and friction. In this capacity, and because the foreskin is comprised of specialized, junctional mucocutaneous epithelium, the foreskin is often structurally compared to the eyelids, the lips, the anus and the labia minora.

During development, the epithelium lining the prepuce and the glans are contiguous, such that preputial adhesions represent a normal feature of foreskin development during childhood. At the age of 5 years, almost 75% of boys still have preputial adhesions and this figure drops steadily until puberty.(3) Preputial adhesions during childhood and up until puberty are not, therefore an indication for circumcision. Furthermore, it is recognized that physiological phimosis is very common in young boys and that this too resolves spontaneously in the vast majority of cases.(4)

The space between the inner surface of the prepuce and the glans of the penis (the preputial sac) is maintained by secretions from the prostate, the seminal vesicles, the urethral glands of Littre and the complex vasculature of the penile mucosa. Commensal organisms abound in the preputial sac. These include enterococci, Corynebacterium, Gram-negative anaerobes and Mycobacterium smegma.(5) These physical and immunological conditions provide protection for the glans of the penis and the urethral orifice. The male prepuce also has a role in sexual intercourse, providing adequate mucosa to cover the entire penis during erection and serving as an erogenous sensory tissue.(6)

Disorders of the Foreskin

Men with genital skin disease may present to clinicians in primary care, dermatology, genitourinary medicine, urology clinics and infrequently to the emergency department. Most diagnoses of the foreskin can be made by thorough history and examination. Biopsy is rarely indicated as diagnosis can be made by careful history, genital examination and extra-genital examination of other skin lesions. Particularly important features of history taking pertaining to the foreskin are listed in the Table below. The term balinitis describes inflammation of the glans of the penis, whereas posthitis is inflammation which affects the foreskin only.(7)

Sexual Dysfunction	Dyspaerunia, discomfort, soreness, pain, splitting, bleeding, during or after sex may indicate an inflammatory dermatosis.
	Erectile dysfunction and changes in sex drive may point to underlying conditions or psychological causes.
Urinary Dysfunction	Dribbling or incontinence can cause skin irritation or dermatitis.
	Frequency or pain may be indicative of an inflammatory dermatosis such as lichen sclerosus.
Drug History	Inflammation or lesions associated with certain medication points to drug eruption.
Circumcision	Previous circumcision can sometimes leave an excess of foreskin which may continue to cause problems.
	Circumcision should protect most men from many of the causes of balanoposithtitis.
Contraception	Allergy to latex or lubricants in condoms may indicate contact dermatitis.
Personal and family history	Atopy, psoriasis, other systemic dermatoses
Sexual history	Sexually Transmitted Diseases such as syphilis chancre, condyloma lata (secondary syphilis), genital herpes, condylomata accuminata (genital warts, candida.

Phimosis

Phimosis is defined as the inability to retract the foreskin because of a narrowed preptuial opening. The chief symptom of adult phimosis is dyspareunia. In more severe cases there can be difficulty passing urine and in very rare cases there can develop the inability to pass urine.(8) Acute urinary retention as a result of very tight phimosis is an emergency which necessitates emergency circumcision or dorsal slit to enable micturition again.

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Phimosis in the adult male is often a result of inflammatory or traumatic injury to the prepuce resulting in an acquired, tight, inelastic scar or fibrous ring around the preputial orifice. Predisposition to inflammarory genital dermatoses may be related to the entrapment of urine and desquamated tissue within the preputial sac leading to inflammatory changes the most common of which is lichen sclerosis. The typical picture of inflammatory skin thickening and subsequent phimosis secondary to lichen sclerosis can be seen in Figure 1 below.

Topical steroids can be used in pathologic phimosis with some success (particular when lichen sclerosis is the cause), though most trials have been conducted in paediatric populations, many of whose foreskins would have become retractile spontaineously in any case. When phimosis is refractory to topical steroids, or if there are significant concerns about the extent of irritative or inflammatory change in the foreskin, then circumcision is indicated. Treatment of the non-retractile foreskin is the most common indication for an adult circumcision.

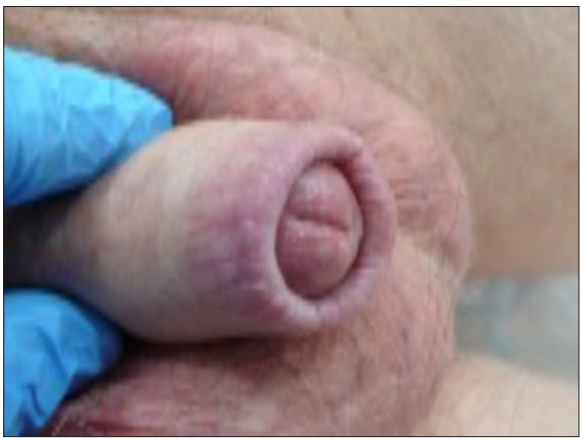

Figure 1. Phimosis and inflammatory thickening of the foreskin secondary to lichen sclerosis.

Paraphimosis

Paraphimosis is a condition when the foreskin of the uncircumcised male becomes trapped in retraction proximal to the coronal sulcus. Again this entrapment is usually consequent to a phimotic preputial ring. Although the changes may take some time to become pronounced and hazardous, with the passage of time with the foreskin in retraction the glans engorges and the prepuce becomes oedematous as a result of lymphatic and venous congesition.

The most common cause in the hospital setting of paraphimosis is iatrogenic after the foreskin has been retracted in order to allow catheterization and not replaced by the clinician. Paraphimosis can, albeit infrequently, progress to an urological emergency if preputial tightness, or subsequent swelling prevents blood flow distally to the glans of the penis. Ischaemia of the glans can progress to necrosis if not remediated. Reduction of the swollen foreskin can be difficult.

This can be achieved by patient compression and elevation of the swollen tissue until the foreskin can be gradually replaced over the glans. If this practive is too painful for the patient to allow meaningful improvement in the oedema in the glans and the foreskin, a dorsal penile nerve regional local anaesthetic block can be of considerable assistance.

Lastly, if reduction cannot be achieved in this manner, again operative intervention such as the dorsal slit of the foreskin will be required to allow the ring of constriction to be released and for normal blood and lymph flow to the glans of the penis to be restored. An emergency dorsal slit in this instance should again always be succeeded by an elective completion circumcision.(9)

Penile malignancy or premalignant changes

Diagnosis of penile carcinoma in situ (CIS) requires a high index of suspicion. Bowenoid papulosis, Bowen's disease and erythroplasia of Queyrat refer to different clinical presentations that are grouped together as premalignant conditions (CIS). Such conditions can present with a dysfunctional foreskin, typically local pain or itch, or they may be asymptomatic and found incidentally following histopathologic examination of the prepuce after circumcision for other reasons.

Severe dysplasia/penile CIS of unkeratinised penile epithelium of the glans is called erythroplasia of Queyrat. Lesions on the keratinised skin of the shaft or the prepuce of the penis are referred to as Bowen's disease. Circumcision plays a central role in management as it combines the benefits of excising a preputial lesion, eliminating a suitable environment for human papillomavirus infection, and facilitates surveillance and self-examination in the future.

Psoriasis and Eczema

Psoriasis and eczema are common dermatoses that may present on almost any area of the body. If genital psoriasis is syspected a detailed inspection of the rest of the body is indicated with particular attention to the scal[, the nails and the perineal regions. The clinician should also seek whether the lesion on the foreskin correlates with any recent systemic flare of the psoriasis.

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Both the prpuce and the glans can be affected by psoriasis. Eczema (dermatitis) may be endogenous (eg. atopic or seborrhoeic) or exogenous, commonly irritant or allergic dermatitis. Symptoms of psoriasis and eczema include itch, rash, soreness and male dyspareunia. Again, topical treatments are recommended primarily and circumcision is only indicated in more severe cases when treatment is refractory to first line agents.

Counseling a patient for Circumcision

Given that circumcision is such a common urological procedure it is helpful for all doctors including juniors to have an understanding what is entailed. Circumcision is performed under general anaesthetic in the majority of cases. Regional local anaesthetic penile block can also performed to minimize the experience of pain in the immediate surgical aftermath. Circumcision can also be performed under regional block alone if general anaesthetic is considered unpreferable due to patient co-morbidities.

Usually closure of the skin layer in circumcision is performed using interrupted absorbable sutures. Figure 2 is a picture of the steps of the procedure. As such, patients are advised that they should try to keep the wound relatively dry for 10-14 days after the operation. Bathing or excessive wetting of the wound can cause premature disintegration of the sutures which can lead to wound breakdown and/or infection.

It is normal to experience marked swelling after circumcision, particularly in the distal penis around the healing wound. However, the swelling should begin to subside approximately 4-7 days after surgery. If, on the other hand, there is a temperature, ascending redness or any purulent, offensive discharge from the wound this should prompt the patient to seek advice from a healthcare professional.

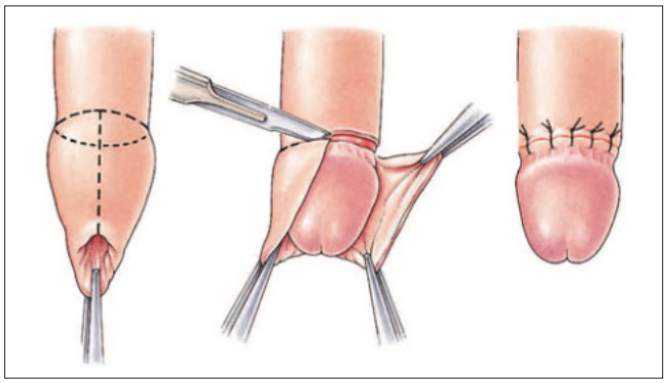

Figure 2. Pictorial representation of the steps of a circumcision. (10)

Multiple Choice Questions

1. Following are risk factors for penile squamous cell carcinoma;

a) HIV

b) Schistosomiasis

c) Circumcision in childhood

d) Smoking

e) Lichen sclerosus

2. Following are indications for circumcision;

a) HIV

b) Non-retractile foreskin in 8 year old boy

c) Phimosis in adult

d) Mild Lichen sclerosus

e) Severe lichen sclerosus

3. Paraphimosis;

a) Is an indication for circumcision

b) Can lead to skin and tissue necrosis

c) Always requires general anaesthetic for reduction

d) Always requires dorsal slit for reduction

e) Is a common complication of male catheterization

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4. Common complications of circumcision include;

a) Bleeding

b) Reduction in penile sensation

c) Marked penile oedema,

d) Paraphimosis

e) All of the above

5. Penile Lichen Sclerosis;

a) When severe is synonymous with Balinitis Xerotica Obliterans (BXO)

b) Is more common in women than men

c) Is likely to be a systemic disorder

d) Causes male dyspareunia

e) Warrants histological examination of the excised prepuce.

Answers

1. Following are risk factors for penile squamous cell carcinoma;

a) True b) False c) False d) True e) True

2. Following are indications for circumcision;

a) False b) False c) True d) False e) True

3. Paraphimosis;

a) True b) True c) False d) False e) True

4. Common complications of circumcision include;

a) True b) True c) True d) False e) False

5. Penile Lichen Sclerosis;

a) True b) True c) False d) True e) True

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DIAGNOSIS & MANAGEMENT OF URETERIC COLIC

C Kenny, M Eragat, S Salahia, W Mulhem, MY Hammadeh

Abstract

This article explores a common urological problem of ureteric colic, discusses its incidence, presentation, symptoms and signs. We try to give the reader some insight into the various ways to investigate ureteric colic, highlighting the best practice to follow in different patient scenarios. Importantly, we discuss the need to have an open mind in light of the large list of potential differentials that make early identification vital in preventing further risk to the patient. We summarise the management strategies including conservative, medical and surgical treatment of ureteric colic. At the end of the article we include five multiple choice questions to highlight some other relevant key educational points.

Definition

Ureteric colic, also known as renal colic, is a term generally used to describe 'an acute and severe loin pain caused by a urinary stone obstructing the ureter and kidney'. (1)

Introduction

With annual incidence at 1-2 cases per 1,000 people, Ureteric colic is a common hospital presentation, causing an estimated 12,000 UK hospital admissions per year. (2)

With incidence increasing annually it is important that clinicians can recognise, diagnose and initiate the management of this common Urological problem.

This article aims to give a step by step guide to help clinicians to:

1. *Recognise the symptoms and signs of ureteric colic*
2. *Be confident in differential diagnosis of flank pain*
3. *Arrange appropriate investigations for ureteric colic*
4. *Knowledge of effective preliminary clinical management*

- Male
- Adults
- Caucasian
- Higher Body Mass Index (BMI)
- Reduced fluid intake
- Family history stone disease
- Hot or arid climates
- Occupations exposed to high temperatures
- Anatomical malformations of the urinary tract

Table 1: Risk factors for developing stones (4)

Signs and symptoms

Ureteric colic should be suspected in any individuals presenting with rapid onset, severe unilateral abdominal or flank pain. This pain can radiate differently depending on the stone's location. (see table 2).

Stone location	Pain distribution	Possible differential diagnoses
Renal pelvis or Upper ureter stones	Pain radiates to the flank and lumbar areas Costo-vertebral angle tenderness	Pleuritis, pneumonia, cholecystitis, cholelithiasis, pancreatitis, perforated peptic ulcer disease, gastritis, pyelonephritis
Mid-ureteral stones	Pain radiates anteriorly and caudally	Gastritis, appendicitis (left), diverticulitis (right), abdominal aortic aneurysm
Distal ureteric stones	Pain radiates to groin Labia majora / vulva in females Penis / testicles in males	Ectopic or tubal pregnancy, ovarian cyst rupture or torsion, pelvic inflammatory disease, female menstrual pain, epididymitis, prostatitis, cystitis

Table 2. Pain distribution associated with location of stone with consideration of differential diagnosis (4)

Obstruction to flow within the ureter leads to the release of prostaglandins, which cause vasodilatation of surrounding vessels and stimulates ureteric smooth muscle spasm (5). This colicky pain is caused by distension of the renal capsule along with contraction of the ureteric smooth muscle, which can last minutes or hours. (4) The common Parasympathetic innervation of the renal capsule with the lower gastrointestinal system means that, if the renal capsule becomes distended secondary to hydronephrosis, the patient may have associated nausea and vomiting. (6, 7)

Ureteric colic is associated with costo-vertebral angle tenderness and this pain is not typically alleviated or exacerbated by a change in position, though patients can be free from pain between attacks. (8) Gross or microscopic haematuria is present in up to 90% of patients (7), and some may have increased urinary frequency and dysuria. (4)

Most calculi originate within the kidney and proceed distally, creating various degrees of urinary obstruction as they become lodged in three main physiological ureteric strictures: the ureterovesical junction (UVJ) (61%), pelvic brim (where the ureters cross the iliac vessels at the level of the anterior superior iliac spine) (23%) and ureteropelvic junction (UPJ) (11%) (9). (Figure 1)

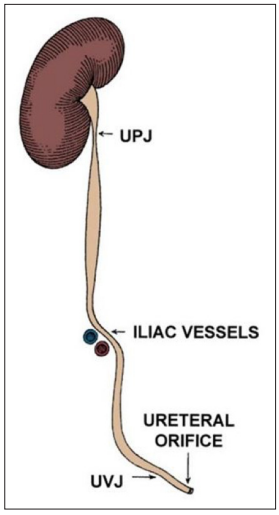

Figure 1: Ureteric physiological narrowing
(http://images.slideplayer.com/13/3898167/slides/slide_17.jpg)

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Diagnosis and differentials

In a patient presenting with flank pain it is imperative to exclude other causes of acute abdomen before formally diagnosing ureteric colic (10) (table 3 and figure 2).

Abdominal aortic aneurysm	Vascular risk factors, older age. Sudden intense persistent abdominal pain radiating to back or legs. Can mimic left and right sided ureteric colic.
Pyelonephritis	Fever, flank pain on palpation. If suspected immediate imaging to rule out obstructed kidney.
Cholecystitis	Risk factors include: overweight, female, fertile, 30-40 years of age. Pain typically worsens when eating fatty foods. Tender right upper quadrant. Positive Murphy's sign.
Acute pancreatitis	History of alcohol consumption. Severe epigastric pain radiating to back. Alleviated on leaning forward.
Appendicitis	Tenderness in right iliac fossa (may be peritonitic). Positive McBurney's sign.
Ectopic pregnancy	Female of child bearing age with pelvic pain. Possible vaginal bleeding.
Ovarian torsion, ovarian cyst rupture	Pelvic pain, nausea and vomiting, low grade fever. Possible adnexal mass. Cervical tenderness may feature on examination
Shingles	Pre-rash, may have extreme pain and tenderness to touch. Past medical history of varicella zoster (chickenpox)
Opiate dependence	Abusers of opiates may have repeated episodes of admission for pain relief, with discrepancies in history and physical examination.

Table 3: Differential diagnosis of ureteric colic (10)

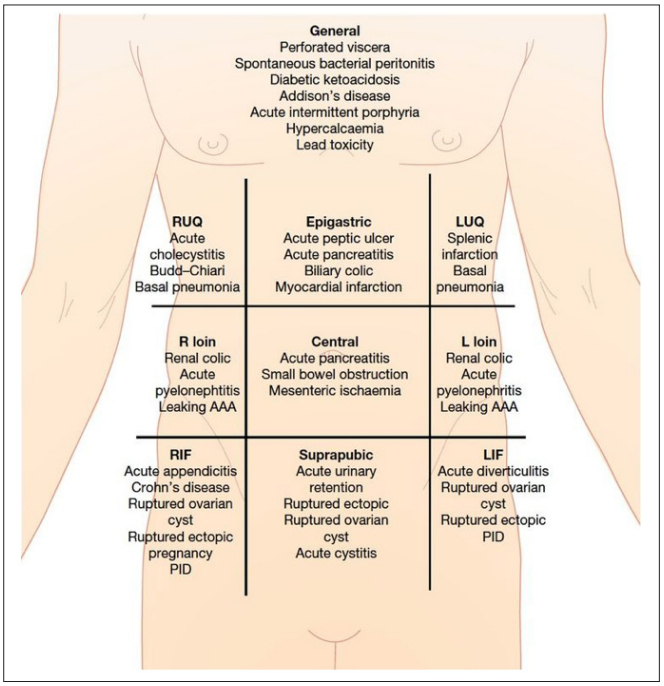

Figure 2: Differential diagnoses of renal colic by anatomical site

(adapted from http://humananatomylibrary.com/wp-content/uploads/2016/07/anatomy-lower-left-abdomen-female-lower-left-abdomen-wwwoustormcrowd.jpg)

Investigations

1. Laboratory:

The European Association of Urology recommends that all patients being investigated for ureteric colic require urine dipstick testing: (2)

- *Haematuria, positive blood: can help to support diagnosis of renal colic. Note that in up to 20% of cases no haematuria is present. (11)*

- *Positive nitrite and leucocyte esterase: suggestive of infection, therefore urine culture is required. Commence antibiotics according to trust guidelines should a urinary tract infection (UTI) be suspected.*

Blood investigations may be required depending on the clinical presentation, according to table 4.

Urine
Urine dipstick test
Urine culture
Blood
Serum blood sample (U&E's) – creatinine / uric acid /
ionized calcium*PTH / sodium/ potassium
Blood Cell Count (FBC)
C-reactive protein (CRP)
Clotting screen including INR
(If intervention is planned)
*Calcium and PTH levels - Helps to exclude medical complications i.e.
hyperparathyroidism

Table 4: Ureteric colic laboratory Investigations checklist (6, 10)

It is important to identify severe complications in the diagnosis of ureteric colic, namely infection and obstruction. Infection in the presence of stone obstruction is a life-threatening urological emergency as obstruction of urinary flow can lead to irreversible renal damage and cause septic shock. (6)

2. Imaging (figures 3, 4, 5)

Non-contrast computer tomography (CT) has replaced intravenous urography (IVU) as the gold standard investigation because of its high sensitivity for urinary stones (approximately 99%) and rapid interpretation of results. (12) Furthermore, it avoids exposing the patient to nephrotoxic intravenous contrast which is contraindicated in patients who are allergic to contrast or have acute kidney injury. Ultrasonography should be reserved for patients where there is a risk of using ionising radiation, such paediatric patients, pregnant women or those undergoing multiple examinations. (13) Plain radiography of kidneys, ureter and bladder can be used as it provides quick and cheap images with which to assess JJ stent placement position and can sometimes visualise the stones (approximately 60% of renal stones are radiopaque), however, it does not assess the degree of hydronephrosis. (2, 14)

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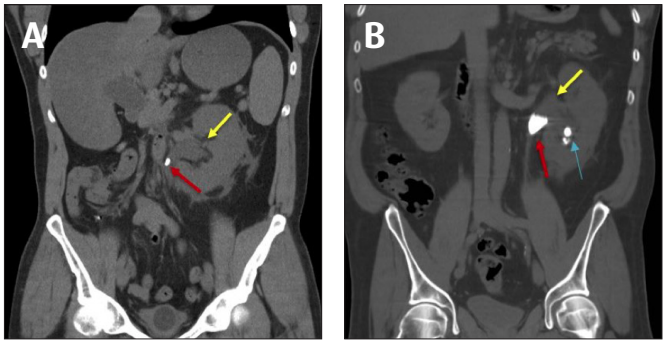

Figure 3. CT KUB (non-contrast): A- 6 mm stone at the left upper ureter (red arrow) causing obstruction (dilatation in the left renal pelvis, yellow arrow). B-1.2 cm stone at the left upper ureter (red arrow) causing obstruction (dilatation in the left renal pelvis, yellow arrow) and small stone lower pole left (blue arrow)

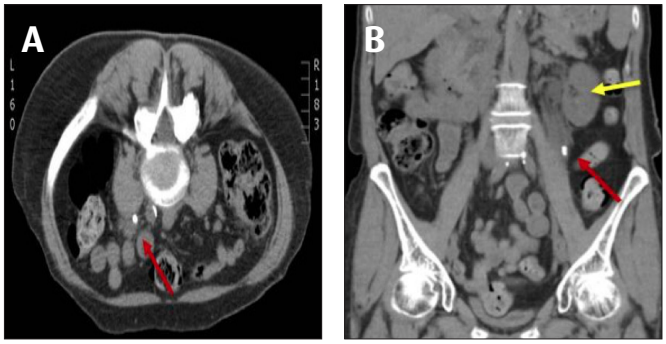

Figure 4. CT KUB (non-contrast): A-(coronal section) 5mm stone in the (red arrow) left mid ureter B - (sagittal section) 6mm stone at the left midureter (red arrow) with no obstruction (no dilatation in the left renal pelvis, yellow arrow).

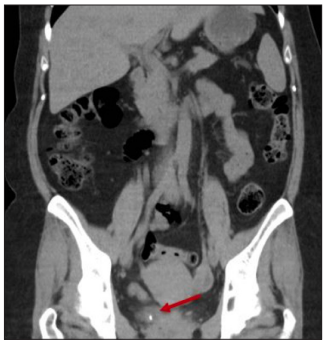

Figure 5. CT KUB (non-contrast): 4mm stone at the right vesico-ureteric junction with no obstruction.

Management

Conservative treatment in the form of observation is the preferred approach considering the majority of ureteric stones less than 5mm will pass spontaneously without intervention. (7) A meta-analysis report of 656 patients conservatively managed showed an overall passage rate of 86% (15). However, Urologists suggest time taken for stone passage should not exceed 4-6 weeks due to the risk of renal damage. (16) On the basis of these recommendations a large proportion of patients with stones are managed conservatively in the community using symptom relief, with only 20% of patients requiring hospital admission. (17)

Evidence suggests initial analgaesia should be with non-steroidal anti-inflammatory drugs (NSAIDs) which can be as effective as one another (18), although NICE guidance recommends Diclofenac for effective rapid pain relief (oral, rectal or intramuscular preparations). (1, 19) If NSAIDs are contraindicated then intravenous paracetamol is a safer and as effective alternative, with fewer side effects than opiate analgesics. (20)

Following the WHO analgaesic ladder (21), if patients are not suitable for an NSAID then they can be managed with opiates (eg. Dihydrocodeine, tramadol or morphine), although avoiding pethidine as it has been associated with exacerbation of nausea and vomiting. (18) Relieving such symptoms with antiemetic's (eg. Cyclizine metoclopramide, prochlorperazine and domperidone) is common practice and doses and preparations can be found in the British National Formulary (BNF). (26)

NICE guidelines suggest diagnostic investigations and urology follow up of discharged patients within seven days if possible (2), and safety netting ensures that patients will seek medical attention if their pain is refractory to treatment or they show signs of infection (such as fever) (table 5). (7, 8)

1. Infected obstructed kidney
2. Uncontrolled pain
3. Singular kidney
4. High temperature and abnormal renal function

This list can be expanded to include patients who are pregnant or those with an increased risk of developing acute kidney injury, for example chronic kidney disease sufferers or kidney transplant recipients. (1)

Table 5: The British Association of Urological surgeons (BAUS) state three indications for hospital admission in the management of ureteric stone: (2)

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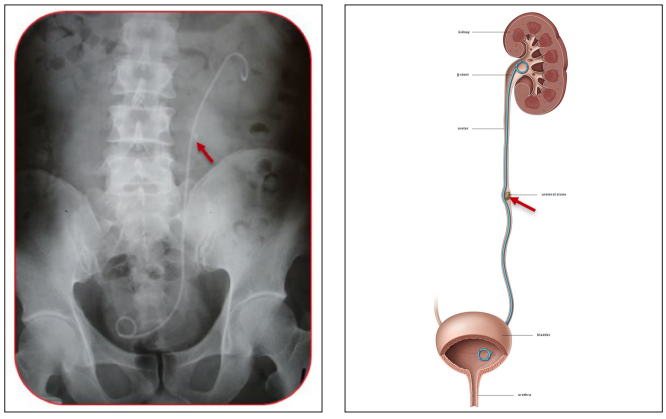
Medical expulsive therapy involves the use of drugs to facilitate the spontaneous passage of stone. Calcium antagonists (eg. Nifedipine) block calcium channels, which relax ureteric smooth muscle contraction and enhance stone passage. (23) Alpha adrenoreceptors are found in the lower portions of both ureters, so using alpha 1-adrenergic antagonists (eg. Tamsulosin) to inhibit smooth muscle tone reduces ureteric peristaltic frequency which lowers the intraureteric pressure below the calculus and aids stone exit. (24, 25) However, a recent Prospective Randomised Trial (SUSPEND study) , which gave three groups of patients either tamsulosin, nifedipine or placebo, showed that those drugs were not effective at decreasing the need for further treatment. (26)

Ureteric obstruction with associated renal tract infection is a urological emergency. (2) If patients display any signs of deterioration due to sepsis, then they may require emergency decompressive surgery. Management should involve aggressive fluid resuscitation with broad-spectrum antibiotics according to hospital guidelines, and the patient can go for one of two procedures outlined in the table below (table 6). (6, 12)

Insertion of JJ stent (GA)	A thin tube made of flexible plastic material that is placed in the ureter. Urologists insert retrograde stents in theatre under general anaesthetic using cystoscope via the urethra and bladder. J shaped curls are present at both ends to prevent migration, hence the name "double J stent". (see figures 6 and 7 below)
Nephrostomy (LA)	Percutaneous insertion of a larger diameter hollow tube into the renal pelvis to drain the urine via the flank. Performed under mild sedation by interventional radiologists.

Table 6: Management of obstructed kidney



Figures 6 and 7:

KUB X-ray (left) and anatomical diagram (right): Left JJ stent in the left kidney, ureter, and bladder to bypass the obstructing stone (red arrows). (adapted from http://patients.uroweb.org/fileadmin/eau_images/images_full/JJ-stent.jpg). If conservative and medical expulsion therapies fail, further options depending on the stone size, location and anatomy of the renal pelvis and ureter include: (1)

1. Extracorporeal shockwave lithotripsy (ESWL)

A non-invasive outpatient treatment that focuses shock waves to break down the stone.

2. Ureteroscopic (rigid or flexible) lithotripsy

Laser, ballistic, electrohydraulic or ultrasound; performed under general anaesthesia with a rigid, semi rigid or flexible ureteroscope. (Figure 8)

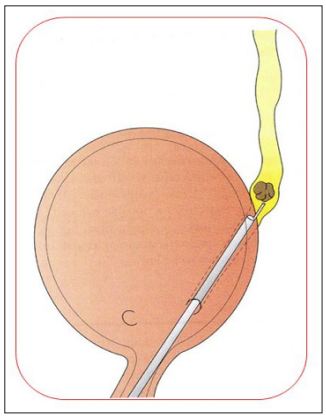


Figure 8: Left ureteroscopy and stone fragmentation

Test yourself

1. A 21-year-old student presents with right-sided flank pain. The symptoms began 3-4 hours previously. Examination showed right flank tenderness and he is apyrexial. A urine dipstick demonstrates blood +++ and negative for WBC & Nitrite. His CT KUB showed 4 mm stone in mid left lower ureter. What is the most appropriate initial management strategy?

a. Hospital admission and Kidney, Ureter and bladder Ultrasound Scan (KUB USS)
b. Right Ureteroscopy and stone extraction
c. Extra-corporal shockwave lithotripsy
d. Hydration, regular analgaesia and follow-up appointment
e. Hospital admission for abdominal X-ray

2. Which of the following has become the gold standard imaging of choice to aid in the diagnosis of urolithiasis?

a. Abdominal radiography (X-Ray)
b. Intravenous pyelography (IVU)
c. Non contrast Computed tomography of Kidney, ureter and Bladder (CT KUB)
d. Abdomen and Pelvis Magnetic resonance imaging (MRI)
e. Kidney, Ureter and bladder Ultrasound Scan (KUB USS)

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3. Which size renal stones have the highest chance of passing with conservative management?

a. 8 mm
b. 7 mm
c. 6 mm
d. 4-5 mm
e. 9 mm

4. Which of the following urinary stones is classically associated with the medical condition gout?

a. Uric acid
b. Calcium oxalate
c. Calcium phosphate
d. Struvite
e. Cystine

5. Review this non-contrast CT scan below (Figure 9), can you describe location and approximate size of the stone?

a) A 6mm size stone in the right PUJ
b) A 1.5cm stone in the right proximal ureter
c) A 6mm stone in the right mid ureter
d) A 5mm stone in the right distal ureter
e) A 6mm stone in the right UVJ

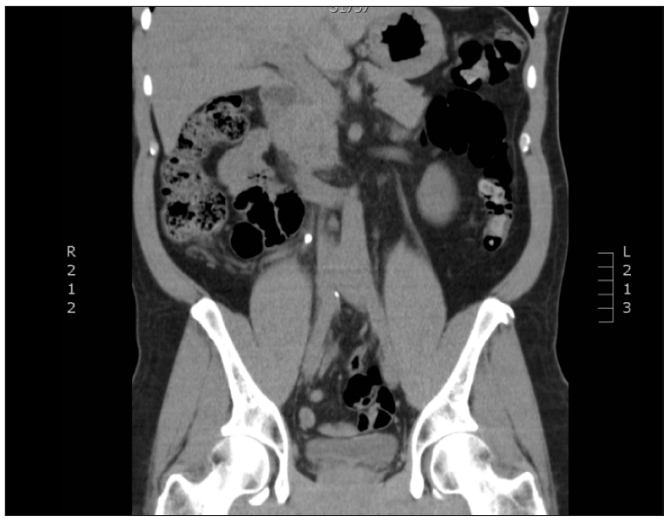

Figure 9

Answers

1. (D)

For the majority of patients, renal colic can be managed conservatively and medically with analgaesia and adequate hydration. In general the management of renal colic is dependent on the size and location of the stone.

Indications for urgent hospital admission include:

- Evidence of systemic infection (e.g. fever, rigors, tachycardia, hypotension).
- Increased risk of AKI (e.g solitary kidney, renal transplant, CKD, bilateral stones).
- Pregnancy
- Symptoms non-responsive to treatment or rapid recurrence of severe pain.
- Dehydration and unable to tolerate oral fluids.
- Uncertainty over the diagnosis.

2. (C)

Non-contrast KUB CT scan has become the gold standard for the diagnosis of renal stones. CT has a high sensitivity (>95%), can evaluate renal parenchyma and rapidly assess for urinary obstruction and hydronephrosis.

3. (D)

Ureteric stones less than 4-5 mm may pass spontaneously without intervention. Stone diameter between 5 and 7 mm can pass spontaneously in about 50% of people. More than 7 mm have a very low chance of spontaneous passage and unlikely to pass unassisted. While greater than 1 cm requires intervention and will require urgent intervention especially if there is an underlying infection or complete obstruction.

4. (A)

Gout is a crystal arthropathy secondary to the deposition of monosodium urate crystals within joint spaces. It typically presents with an acutely inflamed first metatarsal joint, but can affect a wide number of other joints and cutaneous tissue. Gout is associated with hyperuricaemia (high uric acid levels in the blood). The high level of uric acid increases the risk of developing uric acid urinary stones.

5. (C)

This CT Urinary Tract clearly depicts a 6mm sized stone in the mid-ureter on the right side. Note there is also evidence of hydronephrosis on the right side. It is difficult to ascertain hydronephrosis grading in this view, however dilatation of the renal pelvis and calyces is noted.

Conclusion

With prevalence of Ureteric Colic on the rise it is becoming increasingly important for clinicians to have a well-founded understanding of this common Urological condition. The formulation of differential diagnoses and knowledge surrounding 'best practice' is a critical topic. This article has provided clinicians with a systematic overview into the presentation, diagnosis and management of ureteric colic. Finally, through the use of questions and case studies, clinical knowledge has been condensed into an easy digestible framework.

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ERECTILE DYSFUNCTION - IT'S NOT HARD

A Adimonye, T Birks, A Okeke

Abstract

We present a case of erectile dysfunction (ED) in a fifty-seven year old man and using this example we aim to provide non-specialist clinicians with an awareness of its multifactorial aetiology and a confident strategy to effectively investigate and treat. Good clinical care and case based discussion parts of the Foundation programme curriculum are covered in this article.

Case History

A 57-year-old man attends his GP clinic complaining of being 'impotent', which he says he has not experienced before and his sex life is suffering.

Definition

ED (also called impotence) is defined as the persistent or recurrent inability to attain and/or maintain a penile erection sufficient to permit satisfactory sexual performance (1).

Physiology of Erections

An understanding of the interplay of psychological, neurological, vascular and hormonal roles' in attaining an erection will guide your history and examination. Erection occurs when arteriolar and cavernosal smooth muscle relax to allow greater inflow of blood primarily to the copora cavernosa.

This blood expands the sinusoidal spaces, in turn compressing the draining subtunical venous plexus. Thus, the intracavenorsal pressure rises producing an erection (Figure 1). The regulation of this mechanism relies on adequate blood supply and the release of nitric oxide (NO) from the cavernosal nerves. These nerves carry the parasympathetic fibres for erection from S2-S4 and sympathetics for ejaculation from T11-L2. Importantly, they receive neurological input from the brain where psychological, tactile and audio-visual signals may be interpreted as sexual. Hormones, particularly testosterone, act more diffusely such as by stimulating cavernosal NO production and increasing libido.

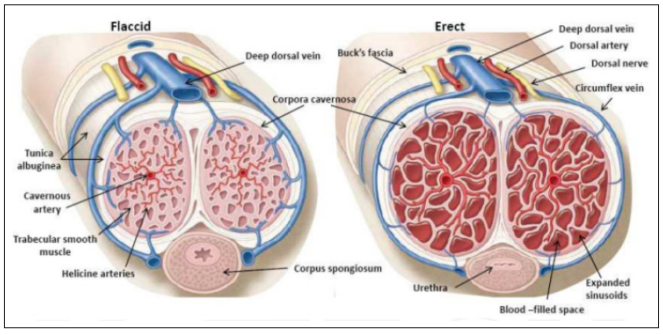

Figure 1. Mechanism of Erection

What aspects are important in this gentleman's history?

Presenting Complaint (including a detailed sexual history)

- *Was the onset of ED sudden or gradual? And what is the duration of the problem?*
- *What was his previous erection quality and if he still gets some erections, how are they currently? (i.e. - his ability to maintain erections - early collapse, not fully rigid and any presence of erections - nocturnal, early morning, spontaneous)*
- *Does he have any problems with sexual desire, arousal, ejaculation and orgasm?*
- *What is his sexual orientation and relationship status (past and current)?*
- *Does he have sexual aversion or pain issues - (i.e. micropenis, penile curvature - Peyronie's disease)?*

Medical and Surgical History

- *Does he have a history of diabetes or a neurological disorder such as stroke or Parkinson's disease?*
- *Any history of cardiovascular disease such as hypertension, peripheral vascular disease etc?*
- *Does he have symptoms of an endocrine disorder such as hyper- or hypothyroidism and hypogonadism - loss of libido, reduced energy levels and loss of hair?*
- *Does he have any symptoms of prostatic disease? – storage and voiding lower urinary tract symptoms (LUTS)*
- *Any previous pelvic or penile surgery, radiotherapy or trauma?*

Psychosocial History

- *Is he depressed or anxious?*
- *Does he have any underlying family or social pressures?*
- *Any relationship issues or performance anxiety?*
- *Does he smoke and/or drink alcohol? If yes, how much and how often?*

Drugs History

- *Is he on any anti-hypertensives, anti-depressants, anti-psychotics, anti-androgens, steroids or recreational drugs such as cannabis etc?*

ED is a symptom and not a disease, therefore it is important to identify the underlying disease or condition causing it which maybe physical, psychological, drug-related or multifactorial. It is commonly classified into three categories, which are organic, psychogenic, and mixed ED.

An organic cause of ED is more likely in older men, in those with a gradual onset of symptoms (unless there is any obvious cause such as surgery which may present more acutely), loss of spontaneous erections, an intact libido and ejaculatory function and in those with existing medical risk factors (1, 2).

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Features of psychogenic ED may include personal factors such as performance anxiety that may manifest as the ability to attain erections for masturbation but not with a partner. Adverse recent life events may cause abrupt onset ED (Table 1)

Vasculogenic	Smoking, Hypertension Hyperlipidaemia, Peripheral Vascular Disease
Neurogenic	Diabetes Mellitus, Stroke, Multiple Sclerosis, Polyneuropathy
Hormonal	Hypogonadism, Hypo-and Hyperthyroidism, Hyperprolactinaemia
Anatomical	Peyronie's Disease, Micropenis, Hypospadias
Trauma	Penile Fracture, Pelvic Fracture, Pelvic Surgery, Prostatectomy
Psychological	Depression, Anxiety, Stress, Relationship Difficulties
Drugs	Alcohol, Anti-hypertensives, Anti-depressants, Anti-androgens

Table 1. Pathophysiology of ED

It becomes clear that this happily married gentleman has a history of insulin dependent diabetes mellitus, smokes 3-5 cigarettes per day and drinks moderately. He explains his penile erections have been getting softer over the last 9 months, though his sex drive remains high and he has recently noticed an absence of his usual 'morning glory erections'. He describes minimal LUTS.

What would you look for on examination?

After eliciting a comprehensive history a basic assessment of the patient is warranted which should include body weight measurement, blood pressure and heart rate. A full physical examination should be carried out including evaluation of the genitourinary, cardiovascular, endocrine , peripheral vascular and neurological systems. In addition, a digital rectal examination to assess the prostate is needed if the patient has obstructive urinary symptoms. Importantly, but often missed, an external genitalia assessment is needed to diagnose any penile deformities, lesions and the presence, size and location of the testicles.

On examination you find this gentleman has a body mass index of 23 with a normal heart rate and blood pressure. However, a postural drop in blood pressure was noted. The only other significant finding is a slight reduction in sensation in both feet, which is new.

What investigation would you perform?

- *Fasting glucose or HbA1c*
- *Fasting Lipid profile*
- *Early morning serum (free) testosterone*

Depending on the patient's history and risk factor profile additional blood tests may include urea and electrolytes, prolactin, luteinising hormone/follicle-stimulating hormone, thyroid function tests or prostate specific antigen (if the patient is over 50 and has an abnormal DRE) (3).

Your investigations reveal a high HbA1c and fasting glucose level that indicates his diabetes is currently being poorly controlled and is a likely cause for his ED, Diabetic autonomic neuropathy can cause ED, postural hypotension and gastroparesis.

How would you treat his ED?

- *Lifestyle advice such as losing weight, reducing alcohol consumption, stop smoking and increase exercise*
- *Assess his regular medications and adjust if necessary*
- *Establish good diabetic control - consider referral to a diabetes clinic.*
- *Phosphodiesterase type 5 inhibitors (PDE-5I) e.g. sildenafil (Viagra), Tadalafil (Cialis)*

All patient's presenting with ED should be counselled on lifestyle changes and advised on stopping smoking and reducing alcohol consumption. Psychosexual counselling may help in psychogenic ED and should be offered if warranted (4).

PDE-5Is are the first line therapies in the treatment of ED. They are effective, safe and well tolerated with up to 75% of ED responding to these drugs (1,4,5). They act by inhibiting the breakdown of cGMP by phosphodiesterase, therefore allowing continued stimulation of smooth muscle relaxation and greater blood flow into the corpora cavernosa (Figure 2). PDE-5Is are contraindicated in patients taking nitrates and in those with recent stroke and myocardial infarction.

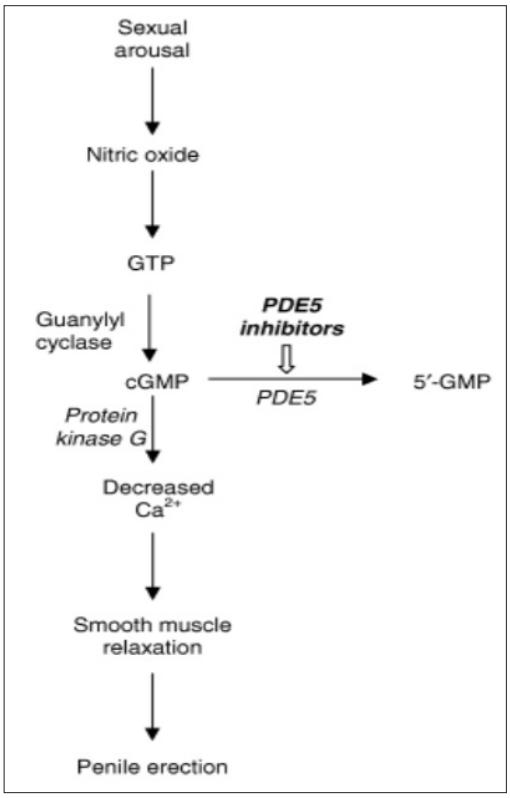

Figure 2. Mechanism of Action of PDE-5I. (6)

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This patient's ED does not respond to PDE-5I and risk factor modifications. So what is your next step?

A PDE-5I non-responder is classified 'as a man with ED with no response following eight maximal doses of PDE-5I with adequate sexual stimulation' (1,4). There are two common reasons why patients fail to respond to PDE-5I. These are incorrect drug use or lack of drug efficacy. Therefore you need to ensure that:

1. The patient has been using a licensed medication. There is a large black market in PDE-5Is with huge variations in amount of the active drug, so it is important to check which source he is obtaining his medication from.

2. The patient has been using his medication properly and an adequate dose (maximum if needed) has been prescribed. Adequate counselling is necessary before commencing a patient on PDE-5I. You should ensure they are aware that adequate sexual stimulation is still needed for the medication to take effect and about the side effects such as headaches, flushing and nasal congestion. In addition, adequate time between taking the medication and attempting sexual intercourse (30 - 60 minutes before required).

3. Consider an alternative PDE-5I.

Despite undertaking all these steps in your general practice this gentleman remains impotent and is still keen for a solution. The next step would be to refer him to urology for further assessment.

Which patients with ED should you be referring to urology from primary care?

According to NICE guidelines Urology referrals should include (4):

1. Young men who have always had problems with ED

2. Men with a history of trauma

3. Those with an abnormal penis or testicles on examination

4. Men who do not respond to the maximum dose of at least two PDE-5Is

ED is not solely urological; men with hypogonadism will need referral to endocrinology, those with severe cardiovascular disease for example contraindicating the use of PDE-5I will need referral to cardiology. Patients with psychogenic ED will benefit from psychological assessment (1, 4).

Following failure of medical therapy with PDE-5I. What other possible treatment options are available for this patient?

Patients not responding to oral pharmacotherapies may be offered a synthetic prostaglandin E1 such as alprostadil. This increases cAMP within the corporal smooth muscle resulting in muscle relaxation, increased arterial blood flow and thus an erection. It is administered as an intraurethral medicated pellet or an intracavernosal injection.

Another option is vacuum erection devices (VEDs) that cause engorgement. Using a constriction band at the base of the penis the blood can be retained in the corpora to produce an erection. Although cumbersome it is a non-invasive option. A final option exists which are penile prostheses, for those who have found other treatments ineffective or prefer a more permanent solution to their problem. Two parallel reservoirs are surgically implanted into the corpora to provide penile rigidity. Although highly invasive and expensive, patients report high satisfaction rates. (Figure 3)

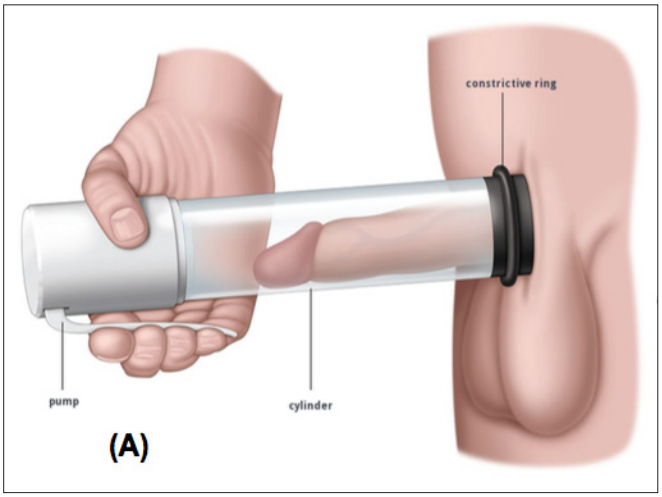
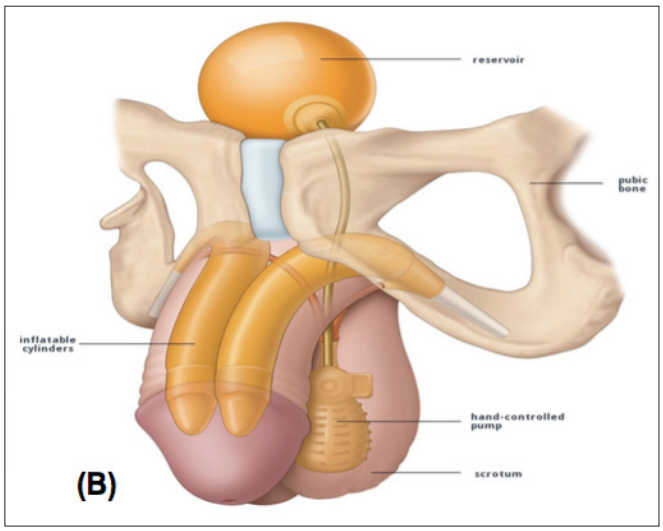


Figure 3. (A) Vaccum Erection Device

ERECTILE DYSFUNCTION - IT'S NOT HARD

A Adimonye, T Birks, A Okeke



(B) Inflatable Penile Prosthesis (Flaccid State with a Full Abdominal Reservoir). (7)

Conclusion

Erectile dysfunction is a symptom of many diseases. Although PDE-5Is frequently provide effective symptomatic relief for ED of multiple aetiologies, the effective consultation should strive to elucidate the underlying cause. The patient's long-term erectile function and general wellbeing will benefit from treating the underlying cause. Referral patterns should reflect the likely underlying aetiology.

Self-Assessment Section (5 MCQs - Single Best Answer)

1) Which of these drugs is not known to cause erectile dysfunction (ED)?

a) Bendroflumethiazide

b) Finasteride

c) Phenytoin

d) Bisoprolol

e) None of the above

2) Which of these is a contraindication for the use of phosphodiesterase type 5 inhibitors (PDE-5I)?

a) Hypertension

b) Decompensated heart failure

c) Myocardial infarction

d) Angina

e) All of the above

3) What is the most common cause of ED in young men?

a) Diabetes mellitus

b) Alcohol

c) Cannabis

d) Psychogenic

e) Peyronie's disease

4) When should you consider referring a patient to urology?

a) Those not responding to at least two different PDE-5I

b) Men with a history of trauma

c) Young men with lifelong ED

d) Abnormal genitalia examination

e) All of the above

5) A 35-year-old man presents to your out of hours GP clinic complaining of recurrent inability to maintain an erection. What investigation would you perform at this early stage?

a) Fasting glucose

b) MRI

c) Bone profile

d) Penile arteriography

e) LH/FSH

ERECTILE DYSFUNCTION - IT'S NOT HARD

A Adimonye, T Birks, A Okeke

Answers

Question 1

e) Multiple drugs are known to cause ED and this is why a prudent drug history is needed when taking a history from each patient. Common groups of drugs which you need to be aware of that cause ED are the Eight As which include: 1) Antihypertensives (ACE inhibitors, thiazides and B-blockers), 2) Antidepressants (SSRIs and tricyclics), 3) Antiandrogens (finasteride), 4) Anticonvulsants (phenytoin), 5) Anti-parkinson drugs (levodopa), 6) Alcohol, 7) Antiarrhythmics (amiodarone) and 8) Anxiolytics (benzodiazepine).

Question 2

b) Decompensated heart failure is a contraindication to the use of PDE-5I. Other contraindications include hypotension (systolic <90mmHg), a recent myocardial infarction (within 6 months), a recent stroke or unstable angina/dysrhythmia.

Question 3

d) The most common cause of ED in young men is psychological and they normally have no identifiable risk factors and some may even recall the exact time when their problems began (such as a new relationship, social pressures, depression etc). Other features suggesting a psychogenic cause include maintained erections during masturbation and preserved early morning erections.

Question 4

e) All of the above are indications to refer to urology. As these patients will need further specialist investigation and management.

Question 5

a) One of the first blood test, which should be done in primary care for all patients presenting with ED, is fasting glucose along with a fasting lipid profile and serum (free) testosterone. LH/FSH can be done according to the patient's history. MRI is used for assessing penile fibrosis and severe cases of Peyronie's disease and penile arteriography is reserved for trauma-related ED.

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MANAGEMENT (MEDICAL & SURGICAL) OF BENIGN PROSTATIC HYPERPLASIA

T Suntharasivam, DJ Thomas

Abstract

Benign prostatic hyperplasia (BPH) is the most common condition affecting the prostate, accounting for over 80% of clinical presentations for prostate disease. It is currently estimated that more than 2 million men in the UK are affected by this clinical condition.

The clinical manifestations of BPH include lower urinary tract symptoms (LUTS), poor bladder emptying, urinary retention, an overactive bladder (OAB), Urinary tract infection (UTI) , haematuria, and renal insufficiency. LUTS have storage symptoms (frequency, urgency and nocuria) which are largely due to bladder over activity and voiding symptoms (hesitancy, weak stream, straining and intermittency) are commonly related to bladder outlet obstruction (BOO), which is often caused by benign prostatic enlargement (BPE) resulting from the histologic condition of BPH (1, 2).

Patients may also experience post micturition symptoms which includes post micturition dribble and sense of incomplete emptying. This article should help foundation doctors to understand the assessment and management of BPH.

Discussion

BPH is a histological diagnosis which describes a proliferative process of the stromal and epithelial elements of the prostate. The proliferative process originates in the transition zone and the periurethral glands Which is in contrast to malignant transformation which commonly occurs in the peripheral zone.

Assessment

The clinical assessment of patients with LUTS has two main objectives:

- *To consider the differential diagnoses*

- *To ascertain treatment options and identify men at risk of disease progression*

1. Medical History

A focused urological history including Urinary Tract Infection(UTI), haematuria and previous treatment should be taken along with relevant co-morbidities, medical and neurological diseases. In addition, medication, lifestyle habits, emotional and psychological history should be elicited. The urological history is usually complemented with a self-completed validated symptom questionnaire in the form of The International Prostate Symptom Score (IPSS) (3), Frequency Volume Chart (FVC) and if indicated an International Index for Erectile Function (IIEF).

	Not at all	Less than 1 time in 5	Less than half the time	About half the time	More than half the time	Almost always	Your score
Incomplete emptying Over the past month, how often have you had a sensation of not emptying your bladder completely after you finish urinating?	0	1	2	3	4	5	
Frequency Over the past month, how often have you had to urinate again less than two hours after you finished urinating?	0	1	2	3	4	5	
Intermittency Over the past month, how often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5	
Urgency Over the last month, how difficult have you found it to postpone urination?	0	1	2	3	4	5	
Weak stream Over the past month, how often have you had a weak urinary stream?	0	1	2	3	4	5	
Straining Over the past month, how often have you had to push or strain to begin urination?	0	1	2	3	4	5	

	None	1 time	2 times	3 times	4 times	5 times or more	Your score
Nocturia Over the past month, many times did you most typically get up to urinate from the time you went to bed until the time you got up in the morning?	0	1	2	3	4	5	
Add Your scores and write total in the box to the right							

Figure 1 - International Prostate Symptom Score (IPSS)

2. Physical Examination

A general examination is required to evaluate any systemic signs of renal failure and neurological disorder. The urological examination should focus mainly on Digital Rectal Examination (DRE), palpable bladder and external genitalia. DRE is vital to exclude prostate cancer, assess the approximate size of the prostate and to evaluate anal tone.

3 Primary Care Assessment

3.1 Urinalysis

This should be either dipstick or microscopic assessment, which will help to determine UTI, non-visible haematuria and diabetes mellitus (4).

3.2 Serum Creatinine Measurement

Measurement of serum creatinine is carried out in all men with LUTS. Patients with renal insufficiency are at an increased risk of developing postoperative complications (5).

3.3 Prostate-specific antigen (PSA)

The measurement of the serum PSA value should be performed in patients with more than 10-year life expectancy in whom the identification of cancer would clearly alter BPH management. In the absence of prostate cancer, the PSA value provides both a guide to prostate volume (6) and also prognosis (7).

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Indications for referral to a urologist

- *A markedly elevated symptom score,*
- *Not responding to medical therapy.*
- *A history of haematuria, urinary retention or recurrent UTIs.*
- *Abnormal DRE or a palpable bladder.*
- *PSA above age-adjusted values.*

4. Specialist assessment

4.1 Flow rate (FR) Study

Uroflowmetry involves the electronic recording of the urinary flow rate throughout the course of micturition. The results of uroflowmetry are nonspecific for causes of the symptoms, but it can be used for monitoring treatment outcomes (8)

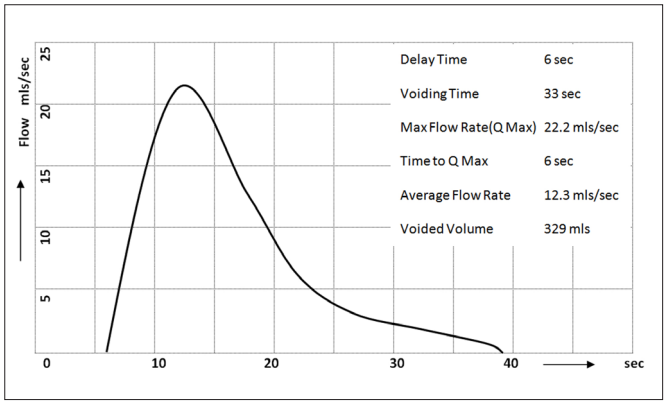

Figure 2: Trace of Flow rate studies showing voided volume and Q-Max

4.2 Post-void residual urine (PVR)

Post-void residual urine volume is the amount of fluid remaining in the bladder immediately after the completion of micturition. Large PVR may indicate a poor response to treatment and increased risk of symptom deterioration (9,10)

4.3 Upper tract Imaging (Renal tract Ultrasound)

Upper urinary tract imaging is recommended in evaluation of men with LUTS associated with haematuria, UTI, renal insufficiency, urolithiasis, urinary tract surgery or chronic retention (11)

4.4 Flexible cystoscopy

The flexible urethrocystosocpy could be offered only when history is suggestive of following: recurrent infection, sterile pyuria, haematuria, profound symptoms or pain.

4.5 Cystometrogram (Urodynamic)

This could be offered to selected group of men with LUTS if they are considering surgery which helps to explore the functional mechanisms of LUTS and to identify risk factors for adverse outcomes. Due to invasive nature of the test, Urodynamics is usually done in patients <50 years, >80 years, previous BOO surgery, large PVR and dominant storage symptoms.

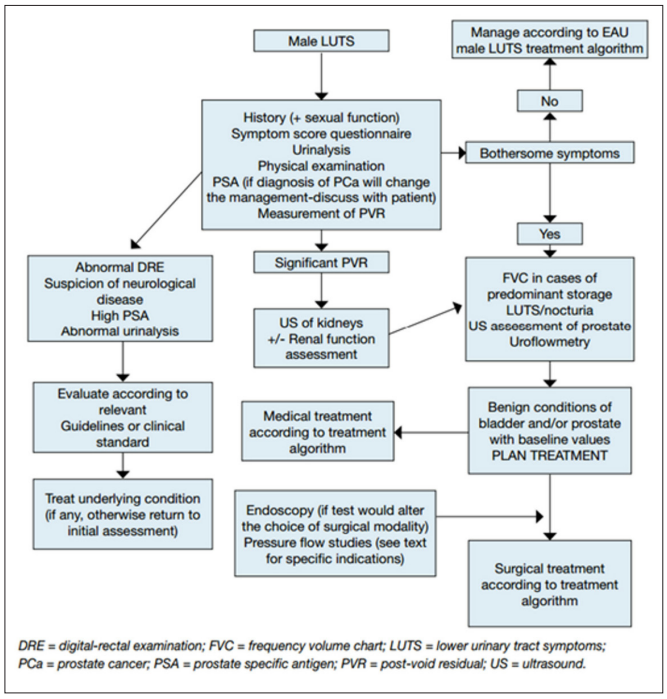

Figure 3: Assessment algorithm for men with LUTS

Management of BPH

1. Conservative Management

Conservative management should be offered to patients with BPH causing non-bothersome LUTS. However, it should be emphasised that all men should be formally assessed prior to this decision and should not have any contraindications (i.e. renal insufficiency, retention episode, UTI or stones) (12, 13). This includes patient education, periodic monitoring, review of patient current medications, treatment of constipation, behavioural and dietary modification, bladder retraining, double voiding, urethral milking and distraction techniques.

2. Pharmacological management

This is considered for patients with bothersome LUTS when conservative management options have been unsuccessful or are not appropriate.

2.1 α-adrenergic blockers

The rationale for the α1-adrenergic blockers is based on the fact smooth muscle accounts for 40% of the area density of the hyperplastic prostate and bladder neck. The α1-adrenergic receptors mediated smooth muscle contraction causes dynamic BOO. The α1-adrenergic blockers are effective within hours of commencing treatment and take a few weeks to develop full effect (14). Commonly used α-adrenergic blockers are alfuzosin, doxazosin and tamsulosin

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α1-adrenergic typically reduce IPSS by approximately 30-40% and increase Q-max by approximately 20-25%. Side effects Includes asthenia (5%), dizziness (6%), headache (2%) postural hypotension (1%), and retrograde ejaculation (8%).

2.2 5α-Reductase inhibitors

The development of BPH is an androgen-dependent process and dihydrotestosterone (DHT), the most potent androgen shown to increase prostate volume(16). This results in the static component of BOO. Testosterone is converted to DHT by the enzyme 5α-reductase.

Currently, available 5α-Reductase inhibitors are Finasteride and dutasteride. Both drugs reduce prostate size by 18-28% and circulating PSA levels of about 50% after 6-12 months of treatment (17).

Finasteride decreased the occurrence of urinary retention by 57%, and surgical intervention by 34%, in moderately symptomatic LUTS(18). 5α-Reductase inhibitors also shrink large vascular prostates and probably helps reduce the frequency of haematuria. Side effects include loss of libido 5%, impotence 5%, reduced volume of ejaculate and gynaecomstia.

2.3 Muscarinic receptor antagonists

The detrusor muscle is innervated by parasympathetic nerves whose main neurotransmitter is acetylcholine, which stimulates muscarinic receptors (M-cholinoreceptors) on the smooth muscle cells. Hence BPH patient with storage LUTS and low PVR could benefit from antimuscarinics, however, regular re-evaluation of IPSS and PVR is advised. Side effects includes dry mouth (up to 16%), constipation (up to 4%), micturition difficulties (up to 2%), nasopharyngitis (up to 3%), and dizziness (up to 5%).

2.4 Phosphodiesterase 5 inhibitors

PDE 5 inhibitors (PDE5i) improve BPH symptoms by reducing smooth muscle tone of the prostate and urethra, altering reflex pathways in the spinal cord(19), increasing blood perfusion and oxygenation in the LUT (20). The long-term data about efficacy and tolerability is limited and only tadalafil 5 mg once daily has been licensed for the treatment of male LUTS.

2.5 Combination therapies

More widely used combination therapy consists of α1-blockers + 5 α reductase inhibitors. Several studies with long term data showed combination therapy is superior to monotherapy(21, 22). Other combination therapy includes α1-blockers + muscarinic receptor antagonist.

2.6 Plant extracts - phytotherapy

These are plant extract parts of single or more plant. Commonly used product includes saw palmetto, African plum and South African star grass. There is not enough evidence to make any recommendation.

3. Surgical treatment

Recently there has been less use of surgical treatment with the widespread use medical therapy for BPH. The indication includes:

- *Failed medical management*
- *Recurrent or refractory urinary retention*
- *Renal impairment or bladder stones due to BOO*
- *Recurrent haematuria due to BPH*
- *Recurrent UTI secondary to residual urine*

3.1 Transurethral resection of the prostate (TURP)

TURP is now considered the gold standard for surgical management of BPH (less than 60 - 80cc), this involves surgical removal of obstructive tissue from the transition zone of the gland leaving outer zone intact. This is performed under general or spinal anaesthesia. A resectoscope is used to access prostate and bladder through which an electrically heated wire loop is used to resect the adenoma. The electrical source could be monopolar or Bipolar (TURis - Trans Urethral Resection in saline, thus reducing TUR syndrome) which also helps in haemostasis. Resected prostate tissue is evacuated at the end of surgery and sent for histology. The patient is left with three-way irrigation catheter for initial 24 - 48 hours.

TURP delivers durable outcomes both in improving flow rate and symptoms score. The peri-operative morbidity and mortality remain in the order of 11.1 % and 0.1 % respectively (23).

The immediate complications include bleeding requiring transfusion 2%, TUR-syndrome 0.8%, UTI 4.1% (24). The late complications include urinary incontinence 2.2% bladder neck contracture 4.7%, urethral stricture 3.8%, retrograde ejaculation 65.4% and erectile dysfunction 6.5%

3.2 LASER treatments of the prostate

The **holmium:yttrium-aluminium garnet (Ho:YAG)** laser is used either to resect prostate (HoLRP) or enucleation of adenoma (HoLEP) which results in symptoms reduction in BPH. This technique is currently offered for the patient with a large prostate volume of more than 60cc, but can be used for the smaller prostate. The HoLRP/HoLEP results are comparable to TURP (25-28).

In **Green light laser vaporisation of the prostat**e, kalium-titanyl-phosphate (KTP) and the lithium triborate (LBO) lasers are used for thermal ablation of prostate tissue. This appears to be safe for the high-risk patient on anticoagulant therapy (29) and produces outcome similar to TURP. The main disadvantage includes lack of prostatic tissue for histopathological analysis.

The **Thulium:yttrium-aluminium-garnet laser (Tm:YAG)** is used in a range of application from vaporisation, vaporesction and enucleation. The current data is of limited follow up hence no final conclusions could be made regarding long-term efficacy.

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3.3 Open prostatectomy

This oldest technique of surgical treatment for moderate to severe LUTS secondary to BPH is largely reserved for glands more than 100cc. The obstructive adenomas are enucleated using index finger sweep under the prostatic capsule. The approach could be through bladder (Freyer procedure) or through the anterior prostatic capsule (Millin procedure). This is the most invasive but effective and durable procedure for BPH, which currently is being replaced by HoLEP.

3.4 Minimally Invasive Therapy.

Transurethral radiofrequency needle ablation **(TUNA),** Transurethral microwave therapy **(TUMT),** High-intensity focused ultrasound **(HIFU)** are used in a minimally invasive way to treat BPH. However, the outcome is not comparable to TURP. **Prostatic urethral lift** represents a novel approach where encroaching lateral lobes are compressed by small permanent suture base implants. There is short-term improvement in symptoms however more studies with long-term follow up are needed. Prostate artery embolisation is a newer technique in management of BPH. According to NICE guidelines, this should be only offer in context of research.

Follow up

Patients on conservative management should have an initial review in six months and subsequently annual review.

Patients commenced on medical therapy should ideally be reviewed at 4 - 6 weeks after treatment initiation and thereafter six monthly as long as the patient had symptomatic relieve and no significant side effects.

Post surgical patient should have 4 - 6 weeks follow up after trial without the catheter.

MCQ

1. Where does benign prostatic hyperplasia (BPH) originate? In the:

a. transition zone.
b. peripheral zone.
c. periurethral glands.
d. transition zone and periurethral zone.
e. peripheral and periurethral zones.

2. The tension of prostate smooth muscle is mediated by the:

a. ∂_1 receptor.
b. ∂_2 receptor.
c. ∂_1 receptor.
d. ∂_2 receptor.
e. muscarinic cholinergic receptor.

3. Finasteride significantly decreases the long-term risk of:

a. acute urinary retention.
b. surgical intervention.
c. symptom progression.
d. all of the above.
e. none of the above

4. Which of the following is FALSE regarding transurethral resection of the prostate (TURP)?

a. It can result in TUR syndrome.
b. It is generally only used in prostates larger than 80 - 100cc.
c. It causes retrograde ejaculation in 65% of cases.
d. It always needs irrigating catheter postoperatively
e. It is the gold standard surgical procedure for BPE

5. Which of the following surgical techniques provide comparable outcome as TURP?

a. HoLEP/HoLRP
b. TUNA
c. HIFU
d. TUMT
e. Prostatic urethral lift

Answers

1. d.

Transition zone and periurethral zone. The BPH process originates in the transition zone and the periurethral glands.

2. a.

∂_1 receptor. The tension of prostate smooth muscle is mediated by the ∂1 adrenergic receptors.

3. d.

All of the above. The unique findings of PLESS (Proscar Long-Term Efficacy and Safety Study) were related to incidences of both acute urinary retention and surgical intervention for BPH.

4. b.

It is generally only used in prostates larger than 80 - 100cc.

5. a.

HoLEP/HoLRP

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Financial statement
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MANAGEMENT OF ACUTE URINARY RETENTION AFTER CATHETERIZATION

W Akhter, S Jallad, V Izegbu, R Kavia

Abstract

Acute urinary retention is a common urological emergency. It is painful inability to void and requires immediate catheterization to relieve the symptoms. AUR is more common in men and most of the times due to large benign prostate. Measurement of residual urine is mainstay in terms of further management as it would help to differentiate between acute and chronic retention. If patient is fit and well and there is no acute kidney injury; trial without catheter is attempted after prescribing alpha blocker. History, clinical examination and specialized investigations are important to evaluate the precipitating or progressive factors of retention for ultimate treatment.

Introduction

Urinary retention is a common medical emergency worldwide. Urinary retention (UR) is characterized by the rapid onset desire to micturate coupled with inability to pass urine. Historically acute urinary retention (AUR) prevalence have varied greatly with calculated 10-year cumulative incidence ranging from 4% to 73% in early studies (1).

AUR is considered as a common emergency with an incidence of primary AUR in England of approximately 3/1000 men per annum(2). It is rare in younger men and the risk increases with age. As per evidence, 60 years old men would have 23% probability to develop AUR by the age of 80 years.(3). It is also estimated that AUR is ten times more common in men than in women and highest in men aged over 70.(4)

Pathophysiology of retention

Micturition is a complex process involving the integration of high cortical centers, sympathetic, parasympathetic, and somatic neuronal circuits. An afferent input sent to the brainstem and cerebral cortex which in response lowers resistance at the level of external sphincter smooth muscle and striated muscle that lead to coordinated contraction of bladder smooth muscle (detrusor muscle).

Thus any factor that interfere the above system may lead to urinary retention or dysfunctional voiding. It could be due to an increased uretheral resistance to flow via mechanical or dynamic means or due to diminished neurogenic control of detrusor muscle contractility.As bladder outlet obstruction progressively increases, the urineflow become weak and with time detrusor contractility diminishes with a larger amount of residua l urine volume ultimately resulting in retention(5).

Risk factors for acute urinary retention

Acute urinary retention is sudden and painful inability to void. Usually it is presented as severe lower abdominal pain however it is vital to exclude other causes of acute abdomen. History, clinical examination and bladder scan is an important tool to make a correct diagnosis. The volume of residual urine varies in published data ranges from 50mls- 400mls.

The common risk factors for AUR are advancing age, high IPSS (international prostate symptoms score), large prostate, large residual and poor urinary stream.PSA is also considered as an independent factor for progression. Increasing age is a strong predictor of the risk of urinary retention in men with lower urinary tract symptoms (LUTS) as well as with a previous episode of AUR. Urinary retention may also occur due to instrumentation of lower urinary tract such as post bladder hydrodistention, surgery for stress incontinence, surgery to perineum, rectum and any gynaecological surgery.

Causes of AUR

Acute Urinary retention can be spontaneous or precipitated.The term precipitated AUR refers to a condition which may be triggered by surgical procedures with general or locoregional anaesthesia, mechanical obstruction (urethral stricture, clot retention), urinary tract infections (UTIs), prostatic inflammation, excessive alcohol intake, use of drugs with sympathomimetic or anticholinergic drugs, neuropathic causes (diabetic cystopathy),excessive fluid intake and bladder over- distension.

Spontaneous AUR is most commonly associated with benign prostatic hyperplasia (BPH) and is regarded as a sign of progression. The difference between precipitated and spontaneous retention has clinical relevance because BPH surgery is less common in cases of precipitated AUR.(3) The importance of differentiating the two types of AUR becomes clear when evaluating the ultimate outcomes of patients.

Following spontaneous AUR, 15% of patients had another episode of spontaneous AUR, and a total of 75% underwent surgery, whereas after precipitated AUR, only 9% had an episode of spontaneous AUR, and 26% underwent surgery.(6)

Causes in men and women are given in Table - 1

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Pharmacologic causes: These medications include anticholinergics that inhibit detrusor muscle activity, sympathomimetic drugs that increase alpha-adrenergic tone in the prostate, and NSAIDS that inhibit prostaglandin-mediated detrusor muscle contraction.

Opioid for quite a long time are also at an increased risk for AUR by reduced bladder-fullness sensation.

Neurologic causes: The diabetic cystopathy also causes AUR. Up to 45% of patients with diabetes mellitus and 75% to 100% of patients with diabetic peripheral neuropathy will complain at some point.

Upper and lower motor neuron lesions, multiple sclerosis, trauma, Parkinson disease, stroke, and neoplasms.

Infectious Or Inflammatory Causes: The urethritis, prostatitis, vulvo-vaginitis and viral causes which includes genital herpes involving sacral nerves.

Obstructive Causes: The Obstructive causes are divided into intrinsic causes for example prostatic enlargement, bladder stones and extrinsic causes uterine or gastrointestinal masses.Obstructive causes in women often involve pelvic organ prolapse (e.g. cystocele or rectocele) or malignant pelvic masses and post surgery for stress continence and fowlers syndrome.

Women	Men
1.Obstructive Causes	**1.Obstructive Causes**
Organ prolapse(cystocele,rectocele,uterine prolapse) Pelvic mass(fibroid,ovarian cyst,malignancy)	Benign prostratic hyperplasia Meatal stenosis Phimosis/Paraphimosis Prostrate cancer Penile constricting bands
2.Infectious Causes	**2.Infectious Causes**
Acute vulvovaginitis vaginal lichen planus vaginal lichen sclerosis vaginal pemphigus	Balanitis Prostatic abscess Prostatitis
3.Neurologic Causes	**3.Neurologic Causes**
Diabetic cystopathy Stroke Trauma Multiple sclerosis Parkinsons Upper motor neuron lesion Lower motor neuron lesion Neoplasms	Diabetic cystopathy Stroke Trauma Multiple sclerosis Parkinsons Upper motor neuron lesion Lower motor neuron lesion Neoplasms
Other Causes Postpartum complication urethral sphincter dysfunction	**Other Causes** Penile trauma fracture laceration

Table 1: Gender-Specific Causes Of Acute Urinary Retention.

Investigations

History and examination are sufficient to diagnose AUR but bladder scan is important to confirm the diagnosis. Once patient is catheterized , ultrasound can be arranged if there is evidence of high pressure retention or if U&E are abnormal.(4) Renal ultrasound may show signs of hydronephrosis or structural abnormalities of the renal tract. In women, pelvic ultrasound may show ovarian or uterine mass responsible for acute retention. Ultrasound can be of help in trauma cases t rule out free fluid along with any bladder pathology. (8,9)

After catheterisation, urinalysis can reveal infection as a cause of retention. In Urinalysis we will check forinfection, haematuria, proteinuria, glucosuria followed by MSU. Blood tests such as FBC,U&E, creatinine and glomerular filtration rate (eGFR) should be checked to rule out upper tract involvement. Blood glucose, and Prostate-specific antigen (PSA) are frequently elevated in the setting of AUR;however, PSA is not a routine test but can be helpful if there is any worry that retention is due to prostate cancer. PSA should be checked after counselling and explanation.

Further complex investigations such as CT/MRI depends on history and examination are rarely required. CT scan can be performed to look for pelvic, abdominal or retroperitoneal mass causing bladder outlet obstruction. MRI/ CT brain scan is optional to look for intracranial lesions (eg. tumour, stroke, MS) followed by MRI scan of the spine to look for disc prolapse, spinal tumours, Multiple scelrosis, disc herniation, cord compression, and cauda equina syndrome.(10)

Investigations such as cystoscopy, retrograde cystourethrography or urodynamics studies must also be taken depending upon the suspected cases of retention.

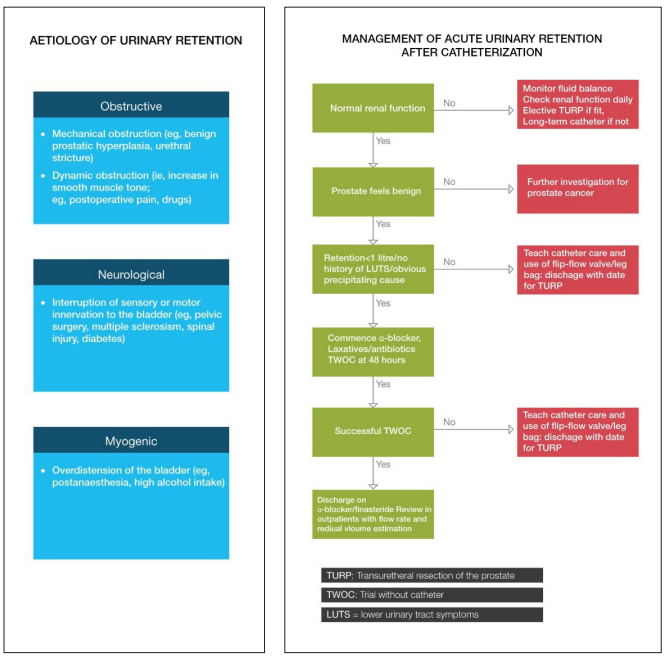

Figure 1: Management of acute urinary retention after catheterization.

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Management

The immediate management is to place urethral or suprapubic catheter (SPC set picture) if unable to insert urethra catheter due to urethral stricture or false passage in urethra. Measurement of residual urine is important for further management and if residual urine less than 300 mls it is not urinary retention. If patient well and fit with normal kidney functions TWOC should be arranged after starting an alpha blocker before removal of the catheter(11).

But if a patient present with urinary retention, high residual volume and acute kidney injury will require hospital admission after catheter insertion to monitor renal functions and to observe for post obstructive diuresis and fluid replacement.

These patients should be offered bladder outet surgery such as TURP, green light laser prostatectomy or holmium laser enucleation of prostate depending on their fitness.

The trial without catheter (TWOC) has become a standard practice worldwide for men with BPH and AUR. Alpha-blocker should be prescribed before commencing TWOC and significantly increases the chance of success. (8) The patients with initially successful TWOC were more likely to have recurrent AUR if their post TWOC urine residual volume was high. It has been proposed that thesepatients should be offered elective TURP. (See figure 1)

If patient has predisposing moderate to severe LUTS with prostate size more than 30cc, combination therapy can be started i.e starting alpha blocker with 5 reductase inhibitor. As per evidence, combination treatment reduces the risk of AUR as well as risk of BPH related surgery. If patient is unwell and unfit, long term catheter is the preferred option and should be explained to the patient and relatives.

Figure 2: Suprapubic catheter set.

For neurological patients presenting with retention, long term option is intermittent self catheterisationeither by patient or by relative to reduce the risk and complications associated with long term catheter.

If male patient is suffering from recurrent retention, surgical optionsshould be discussed. Acute surgery can be associated with morbidity. There is greater morbidity and mortality associated with emergency surgery and that morbidity increases with prolonged catheterization. (12)

Complications

Due to retention of urine patient can suffer from pain, infections and upper tract damage such as hydronephrosis and acute kidney injury (obstructive uropathy). {It can also cause post retention hematuria, post-obstructive diuresis (marked natriuresis and diuresis with electrolyte disturbance, including hypokalemia, hyponatremia, hypernatremia and hypomagnesaemia).(13)}.

With urinary retention, the abnormal urine flow gives bacteria at the opening of the urethra a chance to infect the urinary tract leading to urinary tract infection (UTI) or urosepsis. Similarly if the bladder becomes stretched too far or for long periods, the muscles may be permanently damaged and lose their ability to contract (hypo contractile bladder).

Transurethral surgery to treat benign prostatic hyperplasia may lead to urinary incontinence in men. However this condition is temporary and most of the time the patient recover their bladder control in a few weeks or months after surgery.

Prognosis

The mortality rate associated with AUR increases strongly with age and co-morbidity. In one study of 100,067 men with spontaneous AUR, the one-year mortality was 4.1% in men aged 45-54 years and 32.8% inthose aged 85 years and over. In men aged 75-84 years with spontaneous AUR - the most prevalent age group - the one-year mortality was 12.5% in men without co-morbidity and 28.8% in men with co-morbidity.

There is a high prevalence of co-morbidities, such as CVD, diabetes and chronic pulmonary disease, in those with urinary retention Postoperative urinary retention is usually transitory but can be prolonged in some cases. It may lead to UTI, long-term bladder dysfunction and chronic kidney disease.(14)

Prevention

Considering the distress involved in an episode of AUR, the health care cost associated with treatment, and the potential risks of surgical treatment, primary prevention of AUR is a highly desirable goal. RCTs have assessed the ability of therapies to prevent progression to AUR by prescribing long term medical treatment 5 alpha reductase inhibitors alone or in combination with alpha blockers).(15) As per Medical Treatment of Prostate Symptoms (MTOPS) and Combat trial; combination treatment with alpha blockers and 5 reductase inhibitors prevent the LUTS progression as well reduce the risk of retention up to 54%.

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Conclusion

Acute retention is a common medical emergency and prompt catheterization is important to relieve the discomfort. Residual amount is important to measure for further management. Patients who are fit and well without acute kidney injury should be given a trail without a catheter after an alpha blocker medication. (5) alpha reductase as well as combination therapy also reduces the chances of surgery and retention. Ultimately bladder outflow surgery is warranted if medical therapy fails in the absence of precipitating factors.

Questions

Q1: Micturition is a complex neurological process, which one of them are linked for co-ordinated micturition?

a) Sympathetic and Parasympathetic nerves

b) Sympathetic ,parasympathetic and somatic nerves

c) Sympathetic, parasympathetic and spinal cord

d) Sympathetic, parasympathetic, somatic and higher cortical centers

e) Pontine micturition reflex

Q2: What are the common causes of retention in men?

a) BPH, malignant enlargement of prostate, Stricture

b) Post-operative retention

c) Drugs such as anticholinergics, sympathomimetic and antidepressants

d) Neurological causes such as MS, spinal cord injury

e) Diabetic neuropathy

Q3: In a fit and well patient after catheterization what is the next appropriate step of management is?

a) Continue alpha blocker and arrange TWOC and follow up in clinic

b) Leave him with long term catheter

c) Teach intermittent self-catheterization

d) Discharge patient to GP for further community management

e) Start 5 alpha reductase inhibitor and arrange TWOC

Q4: What are the features of supra-sacral cord injury?

a) Detrusor hyperreflexia and coordinated sphincter

b) Detrusor Hyperreflexia and Detrusor sphincter dyssynergia

c) Areflexic bladder and overflow

d) Areflexic bladder and reflex bowel emptying

e) None of the above

Q5: Patient presenting with urinary retention, de-ranged renal functions and obstructed upper renal tracts, the most appropriate next step is?

a) After catheterization patient can be safely discharged home with GP follow up

b) Alpha blockers should be started immediately and wait for patient can void spontaneously

c) After catheterization patient should be admitted to hospital to observe for diuresis, urine output monitoring and ultimately surgery or LTC

d) Patient can have only suprapubic catheter insertion

e) All of the above

Answers

Q1: d

Micturition is a complex neurological process which involves higher cortical, pontine micturition centre, parasympathetic, sympathetic, somatic and spinal cord micturition centre

Q2: a

Acute urinary retention is more common in men with increasing age and common causa are enlarged prostate, stricture as well as prostatic obstruction due to prostate cancer.

Q3: a

In majority of fit and patients acute urinary retention is secondary to a predisposing cause. As per evidence chance of a successful to TWOC increases after taking alpha blocker

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Q4: b

Spinal cord injury exhibits variety of features depending upon the level of injury

Q5: c

Acute on chronic urinary retention patient after catheterization can develop diuresis, postural hypotension which need urine output monitoring and fluid replacement, in long term management patient need bladder outflow surgery/ long term catheter depending on their fitness.

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MANAGEMENT OF HYDRONEPHROSIS AFTER CAESAREAN SECTION

C Neophytou, S Graham, J Green

Abstract

This case based discussion presents the case of maternal hydronephrosis after caesarean section. Clinical history, presentation, investigations, differentials and corresponding management options are discussed. The article also discusses the choice of imaging modality for the detection of hydronephrosis and its cause, as well as surgical options for reconstruction of iatrogenic ureteric injuries. The article covers parts of the foundation program curriculum including good medical practice and patient management.

Case History

A 23-year old primigravida woman underwent emergency caesarean section for fetal distress and bradycardia, as demonstrated by a pathological cardiotocograph at 38 weeks gestation. Immediately after delivery, she developed persisting tachycardia which was initially attributed to pre-existing gestational anaemia. However two days later, she developed a pyrexia, with temperatures above 38.0°C.

Management was initiated based on the local sepsis protocol. Blood and urine cultures were taken prior to initiating empiric antibiotics, with ceftriaxone and metronidazole, and a CT IVU was organized.

The CT showed no pelvic abscesses or subcutaneous wall collections, but revealed a left-sided hydronephrosis and hydroureter, that could be traced down to the level of the sacroiliac joint behind the uterus, but no further (Figures 1, 2). There was no evidence of contrast extravasation. In the presence of an unidentified source of infection, the patient was urgently referred to urology for the exclusion of a potential infected obstructed urinary system that would warrant immediate intervention. The obstetricians were also concerned that there might have been an iatrogenic ureteric injury with the ureter accidentally caught in suture with left uterine angle extension.

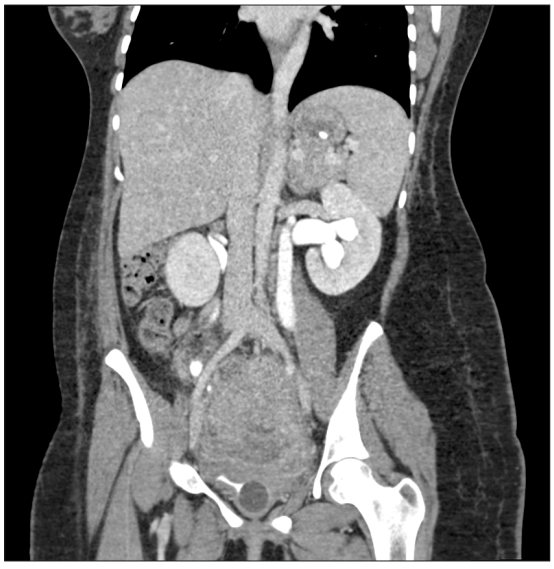

Figure 1: Coronal view of CT IVU demonstrating left hydronephrosis and hydroureter tracing down to the level of the sacroiliac joint but no further. No pelvic abscesses or subcutaneous wall collections are seen. There was no evidence of contrast extravasation.

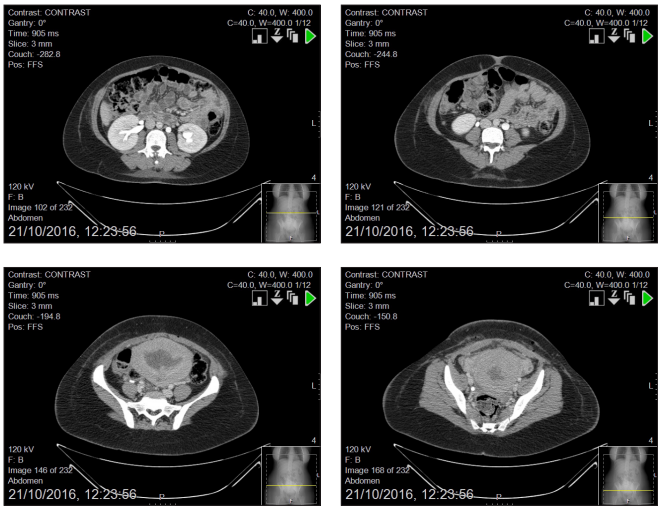

Figure 2: Transverse views of CT IVU demonstrating left hydronephrosis and hydroureter tracing down to the level of the sacroiliac joint but no further. No pelvic abscesses or subcutaneous wall collections are seen. There was no evidence of contrast extravasation.

There is also an 80 x 75mm low attenuation region expanding the uterine cavity with some peripheral enhancement that may represent an intrauterine haematoma consistent with recent delivery.

Discussion

As is often the case, investigation and management of the patient is guided by the suspected aetiology of the presentation. The possible clinical explanations febrile hydronephrosis after C-section in this case are:

a) Asymptomatic resolving physiological hydronephrosis of pregnancy in the presence of a separate source of infection.

Hydronephrosis and hydroureter refer to the abnormal dilatation of the renal pelvis and ureter respectively, due to the accumulation of urine secondary to outflow obstruction. More than 80% of women have some degree of hydronephrosis during the second half of pregnancy (1).

Its pathophysiology is attributed to the mechanical compression of the ureter between the gravid uterus and the linea terminalis. It is possible that the hydronephrosis was present prior to delivery, hence it is important to look for and identify it in pre-natal ultrasound scans. Since the sensitivity of detecting hydronephrosis on ultrasound is high, the absence of hydronephrosis on prenatal ultrasound is highly indicative of a new cause of obstruction.

MANAGEMENT OF HYDRONEPHROSIS AFTER CAESAREAN SECTION

C Neophytou, S Graham, J Green

However ultrasound sensitivity is still less than 100%, hence there is a small chance that this was present, but missed on prenatal scans. Management would be expectant until the uterus contracts fully and the hydronephrosis resolves with time. The first management steps should therefore be to look for and identify an obvious source of infection via an extensive clinical examination, along with basic investigations such as urinalysis, performing a chest radiograph and sending off blood and urine cultures.

b) Symptomatic hydronephrosis of pregnancy secondary to the presence of a urinary tract infection.

In the majority of cases, hydronephrosis in the gravid period is asymptomatic, with the incidence of symptomatic hydronephrosis in pregnancy being as low as 0.2%-3%(2)(3). Hydronephrosis is considered symptomatic when there is flank or loin pain, fever or symptoms indicative of a urinary tract infection. Conservative approaches can be sufficient in successfully managing symptomatic hydronephrosis in more than 90% of women, resulting in resolution of symptoms within 48h of onset(2). The remaining patients commonly require urgent intervention.

Investigation of the patient must include laboratory tests including C-reactive protein (CRP) and white blood cells to assess for the presence of infection or sepsis, with CRP being the most sensitive test. Measurement of serum urea and creatinine assist in the assessment of renal function, the derangement of which may be indicative of acute obstruction. In the presence of a functioning contralateral kidney, the initially deranged renal function normalises when the obstructed kidney 'switches off'. Hence this would be of particular concern in the presence of a solitary kidney.

Deranged renal function and elevation of inflammatory markers in combination with a septic clinical presentation and evidence of obstruction on imaging would guide the decision towards prompt intervention for decompression and drainage of a potentially enclosed infected space. This is commonly achieved by the percutaneous insertion of a nephrostomy with or without antegrade stent placement, or by the cystoscopic retrograde stent insertion.

c) Iatrogenic injury to the ureter during Caesarean Section complicated by infection of the urinary system or in the presence of a co-existing separate source of infection.

Although a rare surgical complication (<1%), gynaecologic procedures account for 52-82% of all iatrogenic ureteric injuries (4). The commonest presenting signs of this complication are fever, leucocytosis, abdominal or flank pain or peritonitis.

Management depends on the exact type, location and timing of the ureteric injury. If suspected intra-operatively, attempts should be made to identify the injury and remove the suture. However, the majority of ureteric injuries are detected post-operatively, in which case the extent and location of the injury will determine management.

The choice of radiological imaging is critical in the detection of hydronephrosis, as well as the cause and location of obstruction. Ultrasonography is the least invasive modality for visualisation of the urinary tract and is very sensitive to the detection of hydronephrosis. Hence it is the preferred modality during pregnancy. Computerised tomography (CT) has the advantage of assessing the continuity of the ureter.

Since the patient has just delivered, radiation exposure would not be as limiting as it is during pregnancy. Hence the benefit of having information provided by more invasive modalities such as CT justifies the risk of radiation exposure. CT of the urinary tract (KUB) can accurately detect and exclude concomitant conditions at a lower radiation exposure that CT intravenous urogram (IVU). However, CT IVU is more sensitive in detecting ureteric integrity as it allows better visualisation of the relevant anatomy and may demonstrate potential contrast extravasation. Cystoscopic retrograde pyelography is as sensitive but has the additional advantage of enabling simultaneous treatment with a retrograde stent placement.

Besides achieving drainage, cystoscopic insertion of ureteric stents may be the only surgical intervention required in small ureteric injuries, as stents can provide structural support to allow healing of the injured ureter(5). Stents are removed at 8-12 weeks, after which complete ureteric healing is achieved(5). Stenting is an effective intervention achieving over 80% patency at a mean follow-up of 46 months(5). Alternatively, ureteric stenting can be safely and efficiently performed with minimally invasive percutaneous antegrade stent insertion(6).

Ureteric injuries located above the pelvic brim that are complicated by ischaemia or necrosis of ureteric segments shorter than 3cm, the ureter is resected and with the two ends anastomosed in what is known as a ureteroureterostomy(4).

For ischaemic injuries located in the distal ureter, ureteroneocystotomy is preferred with re-implantation of the ureters into the bladder(4). A vesico-psoas hitch is indicated when the defect is long, as this would result in tension over the anastomosis(7). This involves bridging of the distance between the bladder and the ureter by hitching the bladder detrusor onto the psoas muscle. It has a 97% success rate at a mean follow-up of 4.5 years(7).

In cases of extensive injury, the vesico-psoas hitch is unable to sufficiently warrant a tension–free anastomosis, hence a boari flap is indicated(4). The latter involves the tubularisation of a bladder flap prior to anastomosing it to the proximal ureter. Transureteroureterostomy involves anastomosing the proximal end of the injured ureter to the contralateral ureter(8).

MANAGEMENT OF HYDRONEPHROSIS AFTER CAESAREAN SECTION

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Its use is less favourable as it can potentially introduce pathology to the healthy contralateral ureter, hence its use is preserved for cases in which all other methods are not feasible, such as major vascular, rectal or bladder injuries, all of which are extremely rare after caesarean section. Although gastrointestinal segments can be used for ureteric substitution, it is unlikely that an iatrogenic ureteric injury after caesarean section will be extensive enough to warrant this.

Back To The Case

The patient continued to spike temperatures for up to a week after caesarean section. Laboratory tests showed a rise in inflammatory markers, but normal renal function. Although urinalysis was positive for blood and leucocytes, urine microscopy and cultures were negative. Her initial antibiotic therapy was switched to intravenous tazocin for her persisting pyrexia. She was offered urgent retrograde studies in theatre with the potential to simultaneously insert a retrograde ureteric stent, but refused these.

Three days after delivery, an erythematous macular rash consistent with cellulitis was noticed surrounding her wound site, which could potentially justify the origin of the infection. This was closely observed and was improving daily. The patient had a plain abdominal radiograph two days after the CT scan, which showed no evidence of contrast collecting in the urinary system, indicating that this had drained with time. A repeat ultrasound scan nine days after caesarean section showed resolving hydronephrosis.

The intrauterine haematoma identified on CT IVU (Figure 2) was consistent with a recent delivery and was managed conservatively. The patient showed a marked clinical improvement by day 10 post-delivery with normalisation of inflammatory markers. She was discharged on a 14-day course of oral co-amoxiclav. Despite evidence for relief of the ureteric obstruction, resolving hydronephrosis does not exclude injury to the ureter as the urinary system tends to adapt with time. Hence the patient was booked to come in for a ureteroscopy to assess the ureter which will guide the decision for further surgical intervention.

Question

1. Which nerve is at risk of injury during a vesico-psoas hitch for the reconstruction of a ureter?

a) Hypogastric nerve

b) Genitofemoral nerve

c) Ilioinguinal nerve

d) Iliohypogastric nerve

e) Obturator nerve

2. Which of the following is the most appropriate definitive surgical management for a 5mm ischaemic ureteric injury between the proximal and middle thirds of the ureter?

a) Retrograde ureteric stenting

b) Ureteroureterostomy

c) Psoas hitch

d) Boari flap

e) Tranureteroureterostomy

3: In the presence of hydronephrosis, which of the following investigations would be highly indicative for urgent percutaneous nephrostomy insertion?

a) Hb: 135 WBC: 28.6, Na: 138 K: 4.5 Cr: 92 U: 4.2, CRP: 220

b) Hb: 125 WBC: 7.2, Na:138 K:4.5 Cr: 270 U: 18.3, CRP: 4

c) Hb: 85 WBC: 18.6, Na:142 K:4.0 Cr: 92 U: 5.6, CRP: 68

d) Hb: 145 WBC: 25.6, Na:138 K:3.5 Cr:185 U: 14.3, CRP: 172

e) Hb: 138 WBC: 10.4, Na: 123 K: 6.0 Cr: 185 U: 4.8, CRP: 16

4: Which of the following is the most sensitive imaging modality for the detection of uterine iatrogenic injuries after caesarean section?

a) CT KUB

b) CT IVU

c) US KUB

d) Abdominal X-ray

e) None of the above

5: Which of the following is not a contraindication for a transureteroureterostomy?

a) retroperitoneal fibrosis

b) previous urinary tract infection

c) Urolithiasis of the recipient ureter

d) transitional cell carcinoma of the recipient ureter

e) pelvic tumours with ureteral involvement

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Answers

1. Answer: b)

The genitofemoral nerve lies on the anterior surface of the psoas muscle. When suturing the bladder to the psoas muscle, the stitch is placed vertically to avoid the nerve.

2. Answer: a)

Ureteroureterostomy is indicated for ischaemic injuries located above the pelvic brim that are shorter than 3cm. The principle is that the least invasive procedure that can achieve a tension free anastomosis is preferred.

3. Answer: d)

Elevated white blood cells and a rise in C-reactive protein indicate the presence of inflammation and potential infection. Elevated creatinine and urea demonstrate deranged renal function that may be secondary to post-renal obstruction. In the presence of an infected obstructed urinary system, urgent decompression of the enclosed obstructed space is indicated via the insertion of percutaneous nephrostomy.

4. Answer: b)

Despite high radiation exposure CT IVU is the most sensitive diagnostic investigation for the detection of ureteric integrity. CT KUB is more sensitive than CT IVU in the detection of concomitant conditions such as renal stones.

5. Answer: b)

All other options are contraindications for transureteroureterostomy. A previous urinary tract infection is not.

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Financial statement
The authors of this article have not been paid. The Foundation Years Journal is financed by subscriptions and advertising. The Journal does not receive money from any other sources. The decision to accept or refuse this article for publication was free from financial considerations and was solely the responsibility of the Editorial Panel and Editor-in-Chief.

Patient consent statement
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MAXIMIZING YOUR FOUNDATION YEARS FOR A UROLOGY APPLICATION

K Prakash, P Johnson

Abstract

This article will focus on the key skills necessary for the Foundation doctor interested in urology, including catheterization and flexible cystoscopy. By assessing the criteria necessary for a successful application, it aims to keep the Foundation doctor one step ahead with tips on completing your logbook, exams, courses, audits, presentations and teaching.

Introduction

Urology is a specialty which students often have little exposure to in medical school, but one which is fast becoming one of the most popular surgical specialties for trainees. The common misconception that the majority of problems are catheter related may be partly to blame. In reality it is a specialty which encapsulates a diverse set of disciplines from benign disease to oncology to laparoscopy, and is pioneering in its technological advances such as the use of the da Vinci robot. In this article I will discuss the best ways for the Foundation doctor to experience urology with a view to applying for Core Surgical Training (1) and ultimately for a urology ST3 registrar number (2). A word of advice - always look two stages of training ahead of you and plan early how to get there.

Clinical skills

Catheterisation

A skill all should possess, and all will need, but few can apply with confidence. Catheterisation involves inserting a foreign body into the urethra and thus must be a sterile procedure undertaken with aseptic non-touch technique throughout. As with all procedural skills, the only way to improve is with practice. If your hospital has a urology specialist nurse, he or she will be a fountain of knowledge, with small tips and tricks gained from years of experience. Follow them and learn from them, getting your hands dirty at every opportunity. Remember that just as you will have experienced being bleeped for difficult cannulas, it will be the difficult catheters you get called to as well, and it is here that your confidence must be built.

The art of catheterisation is two-fold: first in the preparation of the field, which should take longer than the procedure itself; and second in your manner with the patient. The patient feeds off your body language and within seconds makes a judgement regarding your confidence, manner and technique. Become familiar with the types of catheter (Foley catheter, Tiemann or Coudé-tipped catheter, 3-way catheter, open-ended catheter, ISC catheter, suprapubic catheter, convene/sheath catheter), their specific indications and how to perform a good bladder washout for haematuria. A patient who sees his doctor as an expert is a patient who is already at ease.

Insertion of a female catheter (which is proportionally shorter to accommodate the shorter female urethra) into a male patient should be a never event. Inflation of the balloon can occur in the urethra leading to urethral rupture, florid sepsis and death. Inflation within the prostate in a man, comparatively, more often causes significant haematuria, infection, creation of false passages or urethral stricture.

For this reason many trusts do not stock female catheters. If yours does, be hyper-vigilant to avoid this potentially fatal error. Your Foundation years are also an ideal time to get to grips with female catheterisation, as although the majority of urological referrals for catheterisation are regarding male catheterisation, you will also be expected to be able to catheterise difficult female patients. This group includes obese and elderly women who may have urethral meatuses on their anterior vaginal walls. Here, finger-guided insertion may be the best option. One of the best places to learn is in theatre, or shadowing the on-call urology registrar.

Flexible cystoscopy

We do flexible cystoscopies (inserting a camera into the bladder) for many reasons, and typically for the investigation of haematuria. Referral to one-stop 'haematuria clinic' for visible or persistent non-visible haematuria is common. 1 in 4 patients with visible haematuria will have a malignancy. 1 in 10 with non-visible haematuria will have cancer (3). As a result urology registrars need to be competent in flexible cystoscopy from the outset and the sooner you start to practice, the better.

Attending flexible cystoscopy lists in your foundation years is recommended (with registrars, nurse practitioners or consultants). All will be happy to teach you. Practice with the scope outside the patient first. Kindly ask the scrub nurse if you can learn the controls while in the endoscope wash room. Understand what your wrist movements do to the scope before you attempt to do this with the scope inside the patient. It's all in the wrist.

Application criteria

Theatre logbook

Surgery is a numbers game. With this in mind, start your logbook now by registering at elogbook.org, the most widely used tool (4). Most of your consultants will already be registered on the site. Remember that if you have scrubbed for an operation you will no doubt have assisted in some way. However don't fail to record operations even if you have only observed – it all counts. Updating daily is by far the most efficient way. Every surgeon at one time or another has had a backlog of entries to upload, and all will testify to the pain involved.

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Urological operations where you may have a chance to assist include day case operations such as vasectomies, circumcisions, hydrocele repairs and excisions of epididymal cysts. Do you know the difference between the Jaboulay and Lord's procedures? Every surgeon will have a slightly different technique - learn one and stick with it and you will pick it up much faster. Any trans-urethral procedure such as TURP (Trans-Urethral bipolar Resection of the Prostate), TURBT (Trans-Urethral Resection of Bladder Tumour), bladder neck incision, botox injections and bladder biopsies will require rigid cystoscopy at the beginning. Ask if you are able to do the initial cystoscopy, and become familiar with the instruments of your trade.

Finally, if shadowing the on-call registrar, you will no doubt have the opportunity to perform or assist in emergency scrotal explorations (for suspected testicular torsions) and ureteric stent insertions (for obstructing stones). Remember that these will be the operations you want to be comfortable performing alone overnight when on-call as a registrar - keep looking two steps ahead.

Exams

The Foundation years are the perfect opportunity to complete MRCS Part A (5) during a quieter rotation. Online question banks (PasTest, emrcs, onexamination) are the preferred method of revision. Part B requires more practice for the viva component and candidates may want further experience in surgical rotations prior to applying. If sitting Part B (5), gain as much experience as possible in the language of surgery - discussing patients and pathologies with peers and having senior colleagues ask you questions.

Examiners say they know within the first minute whether a candidate will pass, as those who have spent sufficient time in the surgical environment are plainly evident. It is advisable to revise with a friend or attend PACES-specific courses (or indeed both) in order to practice exam technique and appear confident verbalising answers in a systematic way.

Courses

The Basic Surgical Skills (5) course is an essential requirement for Core Surgical Training (1). Places get booked up months in advance, therefore do not delay and ensure you get this organised for your FY2 year. Once complete, practice knot tying and suturing at home so that these are slicker on the operating table. The ATLS (Advanced Trauma Life Support) course is another essential. Beyond these, any course is a bonus – consider CCrISP (Care of the Critically Ill Surgical Patient, essential for Specialist Training) (5), and urological conferences such as BAUS (6), EAU or AUA.

Quality Improvement

When the time comes for applications, the requirements are always the same. There will be a section for audits so get these done early. Remember that the most points always come for completing an audit cycle. Be tactical in how you expend your time. Rather than multiple small audits, try to re-audit the same thing and show an improvement since employing a change in policy you suggested.

Utilise the teams at your disposal. Most hospitals will have a quality improvement team who will be more than willing to assist you in data collection and often analysis too. Remember that the managing board, all the way up to the chief executive, will have their own goals and targets for improving patient care and making the trust a success. If your audit targets one of these goals, a whole host of people will be on board to assist you.

Presentations & Publications

Submit all research and quality improvement projects to as many journals and conferences as possible, for example the Royal Society of Medicine (RSM), British Association of Urological Surgeons (BAUS) (6) or various annual nationwide patient safety conferences.

Presenting posters or research at regional meetings is a great way to network with others interested in your field; these will be your colleagues in the years to come, and some may even be on your interview panels. If struggling for publications remember that some journals take case studies. All of your consultants will be able to think of rare and interesting cases they have recently encountered.

Teaching

There are ample opportunities for teaching medical students. For those who wish to excel in this part of the application, the highest points are awarded to those who organise regional teaching for a wider group of students and engage with this regularly. Make sure you get feedback forms filled out as evidence for your portfolio.

Teaching may be better attended if tailored to medical school exams, for example in the form of OSCE teaching. There are single day courses such as 'Teach the Teachers' or 'Tomorrow's Teachers' which provide evidence that you have attended formal teaching on teaching theory. You may also consider applying for a Postgraduate Certificate in Medical Education which many universities offer. The downside is that these are often in the region of £2000.

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Learning urology

Remember that surgery is an apprenticeship and in general, you will improve the more that you do it. Although this involves hands-on experience in theatre, it is also important to engage with the ward rounds, being on-call and attending clinic, because the majority of experience in treating the surgically unwell patient comes from these areas.

The principles of good urological practice all arise from first principles, and as such it is a specialty which is easy to learn if your basic understanding is sound. Treat your Foundation years as an opportunity to consolidate what you have learned in medical school, seeing every day as a learning opportunity. The more you see the more you may find urology is the specialty for you.

MCQs

1. A 77 year old man with advanced vascular dementia and multiple co-morbidities has severe incontinence managed with a long term urinary catheter.

He is referred to you for significant traumatic hypospadias with erosion of the catheter through the entire glans. Bladder scans demonstrate he is emptying his bladder. What would be the best way to manage this man?

A. Suprapubic catheter
B. Long term urinary catheter
C. 3-way catheter
D. Sheath catheter
E. Incontinence pads

2. Which of these is a risk factor for Fournier's gangrene?

A. Klinefelter Syndrome
B. Intravenous drug abuse
C. Recent antibiotic use
D. Hirsutism
E. Schizophrenia

3. What percentage of patients presenting with visible haematuria will have an underlying malignancy?

A. 5%
B. 10%
C. 25%
D. 40%
E. 50%

4. A 9 year old boy presents with a 2 week history of intermittent right testicular pain. Episodes usually last between half an hour and an hour. On examination he has a palpable nodule at the superio-anterior aspect of his left testicle which looks like a blue spot. What is the most likely diagnosis?

A. Testicular torsion
B. Mumps orchitis
C. Mesenteric adenitis
D. Torsion of the hydatid of Morgagni
E. Mongolian blue spot

5. Which of these is a recognised cause of retroperitoneal fibrosis?

A. Abdominal Aortic Aneurysm
B. Systemic Sclerosis
C. Lichen planus
D. Instrumentation of the renal tract
E. Trauma

Answers

1. D

A sheath (or convene) catheter is essentially a condom catheter and is designed for patients with incontinence. It causes less trauma and reduces the nursing burden. A suprapubic catheter would be an alternative – if this man was not so co-morbid. It should be inserted under GA which this man is unlikely to tolerate.

Incontinence pads would also be an acceptable option however in severe incontinence with even the most attentive nursing, the skin around the buttocks and perineum will soon begin to break down. A long term catheter would continue to erode the urethra and there is no indication for irrigation (requiring a 3-way catheter) here.

2. B

The classic Fournier's patient is the elderly alcoholic with poor self-care or incontinence, increasing the likelihood of perineal colonization with aerobic and anaerobic microbial flora, both of which are required for the dramatic necrotising fasciitis of Fournier's gangrene (7).

Diabetes, immunocompromise and intravenous drug abuse are significant risk factors as they increase the risk of any severe infection. Prompt and radical debridement is the only treatment option, and patients will often require a significant post-operative stay.

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3. C

1 in 4 patients presenting with visible haematuria will have an underlying malignancy. This drops to 1 in 10 in those with non-visible haematuria picked up incidentally on dipstick or urinalysis (3). The most pertinent risk factor is smoking. Exposure to ananine dyes in the textile industry is often quoted in textbooks but rarely seen.

Schistosomiasis is rare in the Western world but the most important risk factor for bladder cancer worldwide, with a proclivity for causing squamous cell carcinoma (SCC) over the more commonly seen transitional cell carcinoma (TCC) in the West (7).

4. D

Torsion of the testicular appendage (otherwise known as the hydatid of Morgagni) occurs classically in the pre-pubertal age group (3). The history and examination is not classical for testicular torsion where pain usually comes on much more rapidly and can involve the abdomen and vomiting.

The hydatid of Morgagni or testicular appendage may also tort and be confused for true testicular torsion. A 'blue spot' may be visible on the scrotal skin overlying the hydatid; sometimes this is palpable (7). If there is any doubt over the diagnosis, scrotal exploration is necessary to exclude a testicular torsion.

5. A

Retroperitoneal fibrosis is a little understood condition which can cause ureteric obstruction. Although no cause is identified in many cases, malignancy, drugs, radiotherapy and AAA (abdominal aortic aneurysm) are recognised causes (7). Patients may present insidiously in frank renal failure with symptomatic uraemia secondary to bilateral obstruction at the ureters.

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Financial statement
The authors of this article have not been paid. The Foundation Years Journal is financed by subscriptions and advertising. The Journal does not receive money from any other sources. The decision to accept or refuse this article for publication was free from financial considerations and was solely the responsibility of the Editorial Panel and Editor-in-Chief.

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NON MUSCLE INVASIVE BLADDER CANCER

P Buakuma, G Dewar, S Pandian, S Madaan

Abstract

Non-muscle invasive bladder cancer (NMIBC) is the more common type of bladder cancer (75%). However, within this group of cancer, there is a spectrum of disease, with low grade, low risk tumours which rarely recur or progress at one end of the spectrum, to high grade, high risk tumours that have a significant risk of recurrence and progression to muscle invasive bladder cancer (MIBC).

Management involves risk-adapted strategies of Cystoscopy based surgery, including TURBT (Transurethral Resection of Bladder Tumour), Cystoscopy surveillance, including Check Flexible Cystoscopy (performed under local anaesthesia), and intra-vesical Chemo / Immunotherapy with the goal of preserving the bladder when it is safe to do so.

Rarely, high risk NMIBC may require more radical treatment including radical cystectomy and appropriate urinary diversion. However, the local recurrence and long-term survival rates are much better when compared to radical treatment for MIBC.

Introduction

Bladder cancer (BC) is the second most common malignancy of the urinary tract (1). It is the 11th most commonly diagnosed cancer in the world (2). In the UK, it is the seventh most common cancer. The Worldwide age standardised incidence rate (per 100,000 person-years) is 8.9 for men and 2.2 for women (2008 data) (2). Worldwide, BC is the 14th leading cause of cancer deaths, age-standardised mortality rate (per 100.000 person-years) was 3.3 for men versus 0.9 for women in 2008. BC causes 5,369 deaths per year in the UK and has a survival rate of 50% at 10 years (3).

BC incidence and mortality rates vary across different countries due to differences in risk factors, detection and diagnostic practices, and availability of treatments4. Smoking is the most established risk factor for BC, while other risk factors include occupational exposure to aromatic amines and hydrocarbons. Approximately 75% of patients with BC present with a disease confined to the mucosa (stage Ta, CIS) or submucosa (stage T1) and are classified as Non-muscle invasive bladder cancer (NMIBC). They have a high prevalence due to long-term survival in many cases and lower risk of cancer specific mortality compared to T2-4 tumours, which are classified as Muscle invasive bladder cancer (MIBC) (1, 5).

Pathophysiology and Types

The bladder is lined with transitional epithelium which is composed of layers of epithelia allowing the bladder to expand as it fills with urine. Most cancers of the bladder are epithelial-derived (2). Pathological subtypes of epithelial bladder cancers include:

- *Transitional Cell Carcinoma-this is the most common epithelial subtype (>90%)*
- *Squamous Cell Carcinoma (5%)*
- *Adenocarcinoma (<2%)*

Non-epithelial-derived cancers such as lymphomas and sarcomas also make up a small proportion of cancers.

Risk Factors

The incidence of bladder tumours increases with age, with the majority of cases being diagnosed in those over the age of 50. There are number of modifiable risk factors which should be identified in the patients social, occupational and travel history (6). In western countries, smoking is the single biggest modifiable risk factor for developing bladder cancer with smokers having a 2-6 times greater risk (7).

One meta-analysis of epidemiological studies demonstrated that 50% of male and 34.8% of female patients who developed bladder cancer had a smoking history (8). The risk increases with the number of pack years smoked; and although quitting smoking reduces the ongoing risk of developing bladder cancer, cessation does not reduce risk to the level of lifelong non-smokers (9).

Occupational exposure to carcinogenic chemicals such as aromatic amines, polycyclic aromatic hydrocarbons and chlorinated hydrocarbons found in paint, rubber and dye manufacturing have been proven to have a contributing factor in 10% of cases (10). Chronic irritation of the bladder leads to an increased risk of developing squamous cell carcinoma; this can be due to long-term catheterization or bladder stones. In regions of the world with endemic levels of Schistosomiasis, chronic infection from this parasite leads to chronic cystitis (11). Squamous Cell Carcinoma accounts for 75% of bladder cancers in these regions (12).

Clinical Presentation

Patients with NMIBC commonly present with gross, painless, visible haematuria (VH) (6). They may also present as non-visible haematuria (NVH), usually picked up on routine urinalysis using dipstix examination (Figure 3). Patients may also complain of Lower Urinary Tract Symptoms (LUTS) of storage, including frequency and urgency and sometimes dysuria, especially in the presence of carcinoma in situ (CIS) of the bladder.

NON MUSCLE INVASIVE BLADDER CANCER

P Buakuma, G Dewar, S Pandian, S Madaan

It is important to note that storage LUTS may also be the presenting symptoms in patients with urinary tract infections (UTIs). However, it is useful to remember that the diagnosis of UTI does not automatically exclude a bladder cancer, as both could be present in the same patient.

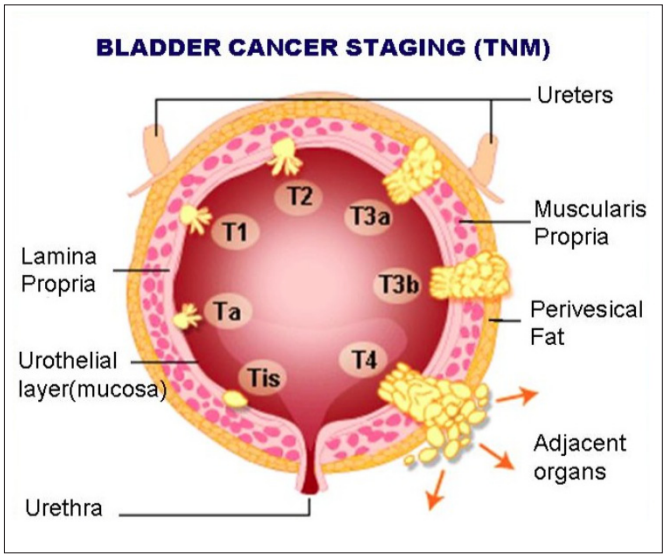

Figure 1: TNM staging of Bladder Cancer – also demonstrating the different layers of bladder histology and their relation to bladder cancer staging.

Haematuria Clinic and Investigations

Patients with both VH and NVH are referred by the GPs via the 2 week wait pathway to the Rapid Access Haematuria clinic. This is provided in the form of a "One-Stop" service during which clinicians take a detailed history, perform thorough clinical examination and carry out investigations, (summarized in figure 2). This allows the patient to be informed of their diagnosis on the same day of their initial out-patient appointment and reduces the anxiety and delay for both, the patients and clinicians who are planning their management.

In addition to the information given in Figure 2, a detailed history taking regarding VH should also include the timing of its occurrence in relation to the urinary stream, which may give clues to the possible site of the underlying pathology. Initial haematuria refers to patient seeing blood at the beginning of micturition. This may suggest a possible urethral pathology. Mixed haematuria implies the presence of blood mixed throughout the urinary stream, which may indicate that the pathology is possibly in the upper urinary tract (kidneys, ureters) or bladder. Terminal haematuria is seen at the end of voiding urine suggesting that the underlying pathology is possibly in the bladder neck or prostate.

Clinical examination of the patient may reveal useful information including other pathology. Supra-pubic tenderness may suggest cystitis related to UTI. A palpable bladder may be found, if the patient is in retention of urine. Renal angle fullness may suggest hydronephrosis or a renal mass, which will be typically bi-manually palpable and / or ballotable. Just tenderness in the renal angle may suggest pyelonephritis.

Genital examination may reveal phimosis and / or meatal stenosis. Digital Rectal Examination (DRE) is an integral part of the abdominal examination and may reveal nodule(s) or hardness in the prostate suggestive of malignancy or a smooth, firm enlargement of the prostate suggestive of BPE (Benign Prostatic Enlargement), which is the most common cause of visible haematuria in a man. Tenderness in the prostate may suggest prostatitis.

The mainstay of investigations is imagining and endoscopy. Flexible cystoscopy (Figure 4) allows direct visualization of bladder tumours. Small tumours and suspicious areas in the bladder mucosa may be biopsied and biopsy sites diathermied, under flexible cystoscopy guidance.

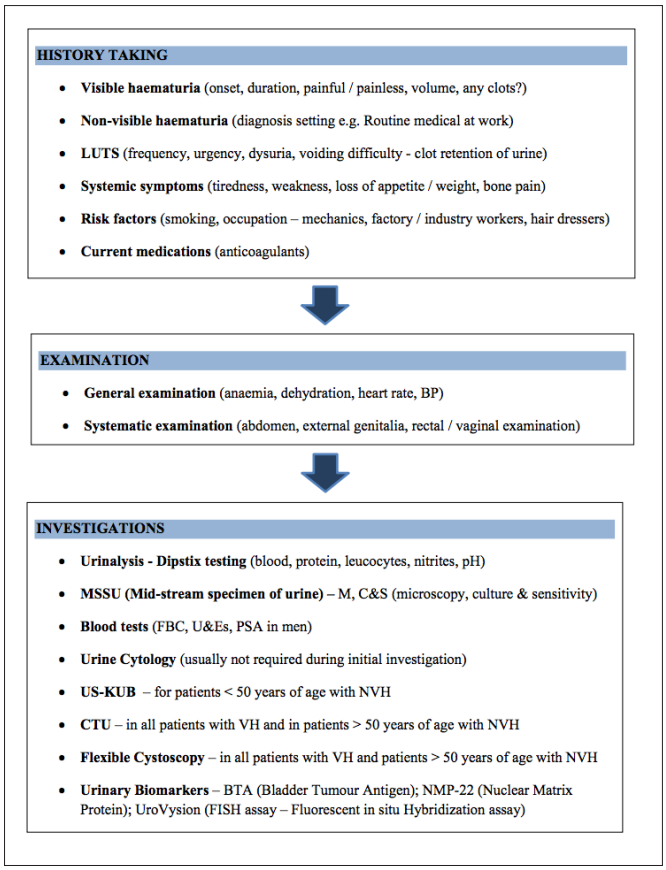

Figure 2: The progress of patient through the rapid access haematuria clinic

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Figure 3: Urine Dipstix for testing – reagents change colour with positive tests

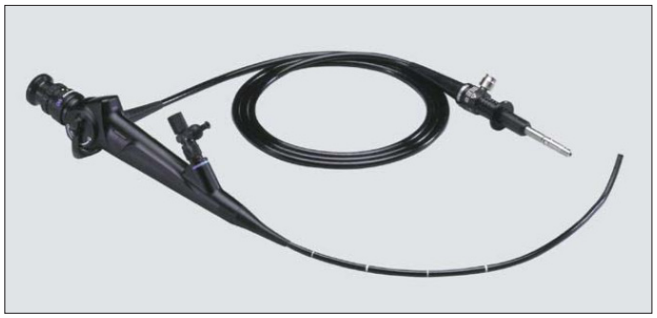

Figure 4: Flexible Cystoscope – commonly used in out-patient setting

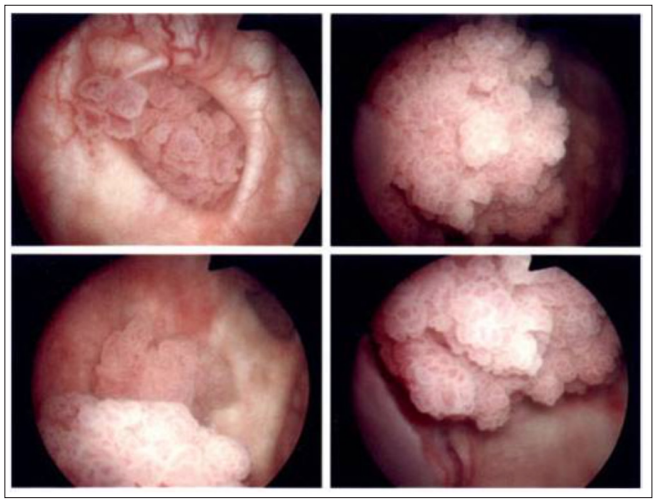

Figure 5: Different appearances of Non-muscle invasive bladder cancer at Cystoscopy

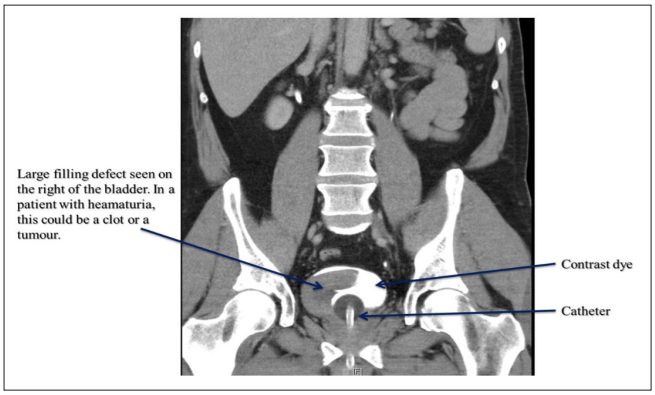

Figure 6: CTU (CT Urogram) appearance of a bladder cancer

Urine Cytology

Urine cytology forms part of routine initial evaluation of VH and NVH in some centres. However, in many centres, including ours, it is reserved as a second line investigation, if the initial investigations fail to demonstrate a cause for haematuria.

The criticism about urine cytology is due its low sensitivity to detect low risk NMIBC, especially. It has a relatively higher sensitivity for high risk NMIBC. However, the specificity to detect NMIBC is much higher for urine cytology i.e. there is not many false positive results.

So, if a patient has positive urine cytology, it is almost certain that there is Urothelial Carcinoma (UC) somewhere within the urinary tract, not necessarily bladder or urethra but may be in the ureters or kidneys. Thus, urine cytology can be judiciously used in the diagnosis and / or follow-up of patients with high risk NMIBC.

The Urinary Biomarkers, BTA, NMP-22 and UroVysion may be used instead of or along with urine cytology to aid the diagnosis of NMIBC (13).

Initial Management (TURBT + Intra-vesical Mitomycin C)

In the event a suspicious lesion identified during cystoscopy, the patient would need to be urgently scheduled to have a Trans-Urethral Resection of Bladder Tumour (TURBT). This procedure is both therapeutic and diagnostic. It is the best way to get the lesion pathologically assessed to confirm the extent of disease. The detrusor muscle should ideally be included in the specimen sent for Histopathological examination, especially, to ensure that the cancer isn't muscle invasive. Absence of detrusor muscle in a biopsy has been linked to a greater risk of the patient having residual disease (14).

The European Association of Urology (EUA) guidelines states that a bimanual examination should be carried out after a TURBT to assess for the presence of residual masses or thickening of the bladder which may indicate muscle invasive disease, while immobility of the bladder and pelvic organs may suggest T4 disease (14).

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Immediately after the TURBT a single dose of intra-vesical chemotherapy is ideally given to the patient. The chemotherapy drug commonly used is Mitomycin C (MMC). MMC is a drug which is isolated from the culture of Streptomyces caespitosus (6). It's mechanism of action is alkylation and cross-linking of DNA strands which results in cancer cell death. MMC is a large molecule and this prevents its systemic uptake thus limiting its effects to the local area of administration. The general complications that can arise from intra-vesical chemotherapy are LUTS of storage, skin desquamation and skin rash in the short term, but in the long term patients could potentially end up with bladder fibrosis and contracture (6, 14).

Staging

Bladder cancer is staged (Figure 1) using the Tumour, Node, Metastases system (2002). Union International Centre le Cancer, updated it in 2009 (14, 15). Non-muscle invasive cancer (NMIBC), sometimes referred to as "Superficial bladder cancer" are tumours of stages: Ta, T1 and Tis which are confined to the bladder mucosa, including the lamina propria (T1) (Table 1, Figures 1). Tumours which invade the bladder muscle, and deeper are staged T2 and greater (Figure 1).

T – Primary Tumour	
Ta	Papillary Tumours confined to Epithelial Mucosa
T1	Tumours Invading Sub epithelial Tissue (i.e. lamina propria)
Tis	Carcinoma in situ – flat high-grade tumours confined to the mucosa appear as inflammatory lesions.

Table 1: TNM staging of Non-muscle Invasive Bladder Cancer.

Papillary non-muscle invasive bladder tumours are graded based on the degree of differentiation. The older WHO classification (1973) used a numerical system for grading tumours:

- *Urothelial papilloma*
- *Grade 1: well differentiated (G1)*
- *Grade 2: moderate differentiated (G2)*
- *Grade 3: poorly differentiated (G3)*

More recently the World Health Organization (WHO) in 2004 reclassified these tumours as below:

- *Urothelial papilloma (completely benign lesion)*
- *Papillary urothelial neoplasm of low malignant potential (PUNLMP)*
- *Low-grade (LG) papillary urothelial carcinoma*
- *High-grade (HG) papillary urothelial carcinoma*

This older grading system is still frequently seen in clinical practice and some units use both systems in parallel. The two systems are not equivalent with Grade 1 tumours becoming Papillary urothelial neoplasm of low malignant potential (PUNLMP) or Low-grade (LG) papillary urothelial carcinoma, Grade 2 tumours assigned to Low-Grade or High-Grade and all previous Grade 3 tumours are now High-Grade (Table 2).

PUNLMP	Low Grade	High Grade
Grade 1	Grade 2	Grade 3

Table 2: Comparison of WHO grading 1973 and 2004 (10, 11)
Carcinoma in Situ is subdivided into three clinical types:

- *Primary: isolated CIS with no previous or concurrent papillary tumours and no previous CIS*
- *Secondary: CIS detected during follow-up of patients with a previous tumour that was not CIS*
- *Concurrent: CIS in the presence of any other urothelial tumour in the bladder*

Follow up & Further Management

Bladder cancer has a high recurrence rate (50–70%) therefore it is important to follow up patients regularly to identify patients who would require further therapy (6). This surveillance mainly involves a repeat cystoscopy every 3-6 months depending on risk stratification. Patients are divided into either the low, intermediate and high risk groups. Divisions are made using the pathological report of the specimens collected during TURBT and the number and size of tumours visualized (14). This division is used to aid disease management (Table 3) and determine length of follow-up.

The follow-up regime mentioned in Table 3 is based on the National Institute for Clinical Excellence (NICE) guidelines (16) for NMIBC (2015). Some Urologists are however uncomfortable to discharge patients in the low risk group after only 12 months follow-up. They prefer to continue cystoscopy surveillance on an annual basis for up to 5 years as was hitherto practiced in the UK.

Risk Group	Histology	Follow Up
Low	solitary pTaG1/ pTaG2 (low grade) - diameter of less than 3 cm Papillary urothelial neoplasm of low malignant potential	Cystoscopy surveillance for 12 months
Intermediate	solitary pTaG1/ pTaG2 (low grade) - diameter of more than 3 cm multifocal pTaG1/ pTaG2 (low grade) pTaG2 (high grade) low-risk non-muscle-invasive bladder cancer recurring within 12 months of last tumour occurrence	Intravesical MMC - weekly x 6 Cystoscopy surveillance for 5 years
High	pTaG3 pT1G2/pT1G3 pTis (Cis) aggressive variants e.g. micro papillary or nested variants	2nd TURBT to exclude muscle invasive disease Either: Intravescial maintenance BCG then Cystoscopy surveillance for 10 years or Radical Cystectomy

Table 3: Management and Follow up Plan for NMIBC (16)
P = Pathological - this information is obtained from histology rather than clinical examination or imaging

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The follow-up of NMIBC involves cystoscopy surveillance for a period of 5-10 years but patients with intermediate and high risk disease also receive adjuvant intra-vesical treatment once muscle invasive disease has been excluded. This can be in the form of chemotherapy (MMC), as mentioned earlier in this article or in the form of immunomodulators. The most commonly used immunomodulator is BCG - Bacillus Calmette-Guérin (17).

BCG is a vaccine that was initially developed to prevent tuberculosis but has been found to be useful in the treatment of bladder cancer. It's mechanism of action in the bladder is not completely understood. However, it is thought that the vaccine stimulates a local immune response 6 against the tumour cells via the promotion of pro-inflammatory cytokines (e.g. IL-1, IL-6, IL-8 and TNF - tumour necrosis factor).

Complications related to BCG use include, cystitis, granulomatous prostatitis, disseminated tuberculosis, BCG sepsis and death. BCG induction consists of 6 doses given weekly. Studies have shown that giving further maintenance BCG for up to 3 years improves the response (18).

NICE recommends that patients with High Risk NMIBC should be offered the choice of primary cystectomy or BCG and the benefits and risks of both options discussed (16). For patients who are refractory to BCG or not-tolerant, radical cystectomy is the treatment of choice. However those patients who are unfit or have decided against radical cystectomy may be offered alternative options depending on local policies. These can include further BCG induction therapy or device assisted intravesical chemotherapy in the form hyperthermia MMC or electromotive drug administration of MMC.

If cystectomy is performed, urinary diversion is done either through an ileal conduit (non-continent diversion) or the formation of a neobladder or abdominal pouch (continent diversion). Both forms of diversions require the use of a section of bowel which could lead to complications such as electrolyte disturbances, sepsis, and malabsorption of vitamins, bowel obstruction and the formation of renal calculi.

Recurrence & Progression

Recurrence involves the formation of a new lesion of the same histological grade, whereas progression means that the tumour has advanced in its pathological stage. Various factors are used when determining prognosis and the risk of recurrence or progression (Figure 5). The most important of these are histology and grade of the tumour. Carcinoma-in-situ is associated with a greater chance of progression to invasive disease.

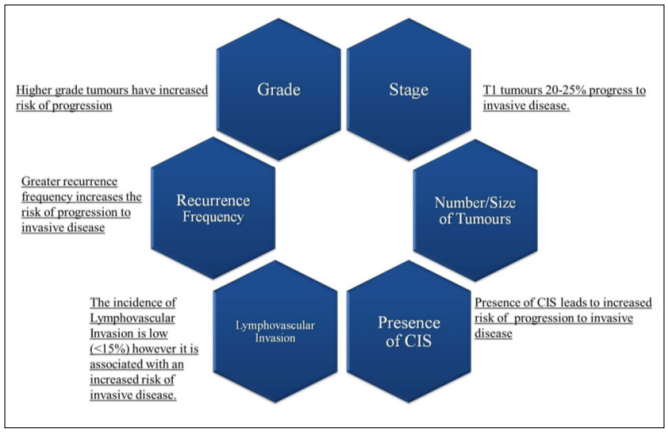

Figure 7: Factors used to assess prognosis (19, 20)

Risk progression scores have been developed in order to predict disease recurrence and progression however; these do not include patients with the presence of CIS alone (16). CIS is only included in patients with concurrent papillary disease. Recurrence and progression scores are given with regards to tumour grade/number, size, previous recurrence and presence of CIS (20). The scores are then added up (Tables 4 & 5).

Factor		Recurrence Score	Progression Score
Number of Tumours	2-7	3	3
	>7	6	3
Tumour diameter	>3 cm	3	3
Prior recurrence rate	< 1 recurrence/year	2	2
	> 1 recurrence/year	4	2
Category	T1	1	4
Concurrent CIS	Yes	1	6
Grade	G2	1	0
	G3	2	5
Total Score		0-17	0-23

Recurrence score	Probability of Recurrence at 5 years
0	15%
1-4	24%
5-9	38%
10-17	61%

Progression Score	Probability of Progression at 5 years
0	0.2%
2-6	1%
7-13	5%
14-23	17%

Table 4, 5: Probability of recurrence and progression (20)

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Conclusion

NMIBC should be considered in patients presenting with VH and / or NVH. Those at risk should be investigated quickly at the two week wait haematuria rapid-access clinic. Late detection and management could potentially lead to muscle-invasive disease with greater morbidity and mortality. Therefore it is imperative for patients to undergo imaging and cystoscopy as quickly as possible for a definitive diagnosis and to plan definitive treatment such as TURBT. Patients are risk stratified based on their histopathology results.

Further management including appropriate intra-vesical adjuvant MMC or BCG treatment and cystoscopy surveillance is based on the risk group that the patient belongs to. The aim of the treatment for NMIBC in general, is to preserve the bladder. However, some patients who have high risk or progressive disease may opt for or need radical cystectomy followed by an appropriate form of urinary diversion.

Multiple Choice Questions

1. A 67 year old British man presents with frank painless haematuria. Which of the follow risk factors is most important to establish whilst taking the history?

a) History of recurrent UTIs
b) Smoking
c) Hyperparathyroidism
d) Occupational exposure to aromatic amines
e) Schistosomiasis

2. The patient's GP decides to refer him for further investigation. What is the gold standard investigation for this patient?

a) CT Urogram
b) Urinary Biomarkers
c) USS KUB
d) Renal Function Tests
e) Cystoscopy

3. A 71 year old male patient is referred to Urology. Investigation demonstrates a papillary lesion visualized within the bladder. A biopsy is taken which is sent for histology. This shows that the tumour invades the lamina propria but does not invade the superficial muscle. Which of following tumour stages best describes these results?

a) Ta
b) Tis
c) T1
d) T2
e) T3

4. A 65 year old female patient undergoes TURBT and is given the diagnosis of a pTaG2 (high grade) bladder tumour. She is given an intravesical dose of Mitomycin C. Which of the following is the most appropriate regime of surveillance for reoccurrence?

a) No follow-up required
b) Cystoscopy surveillance for 12 months
c) Further maintenance MMC and Cystoscopy surveillance for 12 months
d) Further maintenance MMC and Cystoscopy surveillance for 5 years
e) 2nd TURBT, Intravescial BCG and Cystoscopy surveillance for 10 years

5. A 60 year old patient with high risk disease undergoes a second TURBT which shows disease progression. The histology report grades the lesions as muscle invasive. What would be the most appropriate management option for this patient?

a) No further management required
b) Repeat cystoscopy in 3 months
c) Verify eligibility for radical cystectomy.
d) Repeat course of intravesical BCG
e) Palliative radiotherapy

Multiple Choice Answers

1. Answer B

D is also important to ask about however it is not the most important risk factor associated with Non muscle invasive bladder cancer. E is relevant in patients who have migrated or travelled to countries where schistomiasis is prevalent.

2. Answer E

Cystoscopy allows direct visualization of the tumour and is also the only way to diagnose CIS.

3. Answer C

T1 disease is defined as tumours invading sub epithelial tissue but that does not invade the superficial muscle layer.

4. Answer D

The patient's disease would fall into the intermediate risk group. A is incorrect as every risk group is followed up, B is for the low Risk group, D is for the intermediate risk group, E is for the high risk group and C doesn't fit any of the risk groups

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5. Answer C

A and B are incorrect given the progression of high grade disease. E is incorrect as the question stem hasn't indicated that the patient is at the stage of palliative therapy yet.

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OVERACTIVE BLADDER - BE PROACTIVE, NOT REACTIVE

RS Radcliffe, K Anantharamakrishnan

Abstract

Introduction

Overactive bladder (OAB) is a common condition, which can have a profound impact on those who suffer with it. Foundation doctors working across adult hospital specialties, as well as in general practice will be confronted by it. We use a clinical case to motivate discussion of the epidemiology, diagnosis and treatment of OAB.

Methods

The current NICE and European Association of Urology guidelines were reviewed. These were used alongside up-to date treaties on the subject in preparing this summary.

Conclusion

Appropriate recognition and assessment of OAB will allow prompt treatment of this sometimes debilitating condition.

Overactive Bladder – Be Proactive not Reactive

Introduction

Overactive bladder is a condition commonly encountered and managed in urological practice and primary care, it is also frequently seen by other specialties including gynaecology and healthcare for the elderly. Here we present a case which highlights important points in its diagnosis and management. A number of sources have been used to inform the content of this article(1)(2)(3), where appropriate others have been cited directly.

Terminology

Nomenclature surrounding urinary symptoms can be confusing. To help remove ambiguity, the International Continence Society have produced standardised definitions (4). Before we introduce the case, we will review some of these.

Term	Definition
Increased daytime frequency (often referred to as just "Frequency")	The complaint by a patient who considers that he/she voids too often by day
Nocturia	The complaint that the individual has to wake at night one or more times to void.
Urgency	The complaint of a sudden compelling desire to void which is difficult to defer
Urinary incontinence	The complaint of any involuntary leakage of urine
Stress urinary incontinence	The complaint of urinary incontinence on effort or exertion or on sneezing or coughing
Urge urinary incontinence	Urinary incontinence which is accompanied by, or immediately preceeded by urgency
The Overactive Bladder Syndrome (often referred to as just Overactive Bladder)	Urgency, with or without urge incontinence, usually with frequency and nocturia
Detrusor Overactivity (DO)	A finding during urodynamic investigation characterised by involuntary detrusor contractions during bladder filling.

Overactive Bladder vs Detrusor Overactivity

These terms are easily confused. OAB is a syndrome of urinary symptoms, with urgency being the cardinal symptom. DO is a finding at Bladder Pressure Studies studies. It might be tempting to think of OAB and DO as the same thing. However, it is possible to have DO without symptoms (ie. without OAB).

Likewise, some patients complain of symptoms of OAB, without having DO. However, there is a degree of correlation between OAB and DO (5). OAB can be sub classified as "OAB dry" and "OAB wet" according to the presence of urge incontinence. Other terms have been used to describe the same syndrome, such terms as "Detrusor Hyperreflexia" and "Unstable bladder" are increasingly falling out of use.

Neurological disease including spinal cord injury, multiple sclerosis, spina bifida, cerebral palsy, Parkinson's disease, stroke or central nervous system tumours can all be associated with OAB, in this case it may be referred to as neurogenic OAB.

Epidemiology

The prevalence of OAB is about 12%. Whilst the prevalence of OAB is similar in men and women, men have been shown to have a higher prevalence of OAB dry and women to have a higher prevalence of OAB wet(3). Increasing age, neurologic disease, metabolic syndrome and bladder outlet obstruction (in men) have been linked to the aetiology of OAB.

Quality of Life

OAB can negatively impact on quality of life. It is associated with anxiety(6), sexual dysfunction(7), as well as poorer self-reported measures of physical function, general health and vitality(8). OAB wet has been associated with reclusive behaviour, recurrent urinary tract infections, hindered work place interactions, limited personal mobility, skin infections and may lead to falls and fractures.

Introduction to the case

Andrea is a 61 year old lady. She is generally fit and well, excepting diet controlled type 2 diabetes. Over the past year, she has become more troubled with her urinary symptoms, and has been referred to the urology clinic for further assessment. We'll first consider Andrea's initial clinical assessment.

We know that OAB is a clinical syndrome, so the diagnosis is made after taking a history, and carrying out some simple tests/assessments.

OVERACTIVE BLADDER - BE PROACTIVE, NOT REACTIVE

RS Radcliffe, K Anantharamakrishnan

History

Key aims in taking the history are to:

- *assess the severity and impact of each of their symptoms (a validated questionnaire such as ICIQ-OAB can be used)*
- *identify patients who may need investigation for other pathology (haematuria, pelvic pain, pelvic mass, previous pelvic cancer or suspected neurological disease)*
- *look for potential underlying causes of the symptoms (obstetric history in females, past medical and surgical history, medication history, caffeine intake, excessive fluid intake, and shift working etc.)*

Examination

A focussed examination, with a chaperone, should include:

- *Abdominal examination (including palpation for distended bladder / masses).*
- *Digital rectal examination in men.*
- *Perineal/vaginal examination in females to assess oestrogen status, pelvic floor tone and any pelvic organ prolapse.*
- *Neurological exam to look for underlying neurological disease.*

Bladder diaries

A bladder diary for at least 3 days should be obtained, detailing when and how much the patient drinks, when and what volume they void, and episodes of urgency or urinary incontinence.

Name ..... Date .....

	Day 1			Day 2			Day 3		
	In	Out	Wet	In	Out	Wet	In	Out	Wet
7 am				150ml					
8 am	200ml	100ml			150ml		200ml	200ml	
9 am									
10 am									
11 am				250ml	150ml		200ml		
12 pm	150ml	200ml	x					100ml	x
1 pm						x			
2 pm					200ml		300ml	200ml	
3 pm		150ml	x	300ml				100ml	
4 pm	200ml	100ml							
5 pm					100ml				
6 pm	300ml	200ml			100ml				
7 pm				300ml			300ml	100ml	x
8 pm					100ml	x			
9 pm	100ml							200ml	
10 pm	200ml	200ml	x	200ml					
11 pm					200ml	x	200ml	100ml	x
Midnight				200ml					
1 am								100ml	
2 am					100ml				
3 am	150ml								
4 am		200ml						100ml	x
5 am					100ml				
6 am									

Figure 1: An example of a bladder diary of someone with OAB wet.

Urinalysis

Important in looking for urinary tract infection, haematuria, glycosuria or proteinuria that may need further assessment.

Imaging

Apart from checking a post-void residual volume, there is typically no role for imaging in the initial assessment.

Andrea's most bothersome symptom is urgency. She works as a teacher and she struggles to manage her symptoms when she has to stay in a classroom for a whole hour.

She has had occasional urge incontinence, but denies any stress incontinence. She voids approximately two-hourly during the day, and typically gets up 2 or 3 times at night. She drinks 4-5 cups of tea during the working day. She is not taking any regular medications.

She does not have any relevant obstetric or gynaecological history. On examination, her abdomen is soft, with no palpable bladder. Perineal examination reveals normal oestogenisation and there is no evidence of prolapse or pelvic mass. Her gross neurological exam is normal. Urine dip is negative.

Management

Andrea has typical symptoms of OAB wet. Apart from her diabetes, there is no suggestion of other underlying cause for her symptoms which need investigation. As with many conditions, it is useful to think in terms of conservative, medical and invasive/surgical management.

Conservative

- **Caffeine intake:** *Caffeine is a diuretic, and can serve as a bladder irritant. In patients with a high caffeine intake, reduction can help with their symptoms.*

- **Fluid intake:** *modification of a high or low fluid intake may be beneficial.*

- **Bladder retraining:** *this a program which typically lasts at least 6 weeks and helps patients to delay voiding, and to increase the functional capacity of the bladder. It will typically be provided by a trained continence professional who will give other conservative advice concurrently.*

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Andrea is keen to avoid medications or more invasive treatments. She agrees to cut out caffeine from her diet. She is also advised to limit her fluid intake in the evening to help reduce her nocturia. She plans to see her General Practitioner to make sure that her diabetes is well controlled, and agrees to self-refer to the local continence service for bladder retraining.

She is seen again in clinic in 3 months' time. Whilst there has been some improvement in her symptoms, they are still a bother for her, especially at work. She is still wearing pads to help with her urge incontinence. After discussion about the benefits and potential side effects, she is prescribed Tolterodine, an anticholinergic.

Medical

Before starting medical management it is important to consider potential side-effects including impaired bladder emptying and increased anticholinergic load (many medications have a degree of anticholiergic action. Patients, in particular elderly patients, taking multiple medications with anticholinergic action have an increased risk of cognitive impairment).

- **Anticholinergics:** *these selectively block muscarinic receptors found in the detrusor muscle. The exact mechanism by which they treat OAB and DO is not clear. Potential side effects include constipation, blurred vision, dry mouth and urinary retention. NICE recommends that patients try two anticholinergics before they are considered for treatment with a Ð3-Adrenergic Agonist (2).*

- **∂ 3-Adrenergic Agonists:** *The only drug in this class available in the UK is Mirabegron. These medications are thought to cause detrusor relaxation through an increase in cAMP in detrusor muscle cells. Side effects include hypertension, constipation and headache. They are contraindicated in those with severe uncontrolled hypertension, and blood pressure monitoring should be offered whilst on treatment.*

The role of urodynamics

Whilst she discontinued the anticholinergics due to side effects, Andrea initially found that her symptoms were well controlled on Mirabegron and is discharged from follow-up. A year later, however, she is re-referred, as her symptoms have returned.

There are several more invasive therapies, which can be used in OAB refractory to medical management. Bladder Pressure Tests assessment is typically employed after failure of medical management, before consideration of surgical management, in those with neurological disease, and in extremes of ages.

Andrea goes on to have video urodynamic studies. This involves a catheter being placed into her rectum to measure intra-abdominal pressure. One or more catheters are sited into her bladder to measure intra-vesical pressure and to fill her bladder with radio-opaque contrast. During the investigation, various techniques may be used to try and reproduce her symptoms (coughing, sitting/standing, running taps). There is evidence of DO in Andrea's case after filling with 150ml of fluid, coughing also brings on DO. She voids well and empties her bladder to completion.

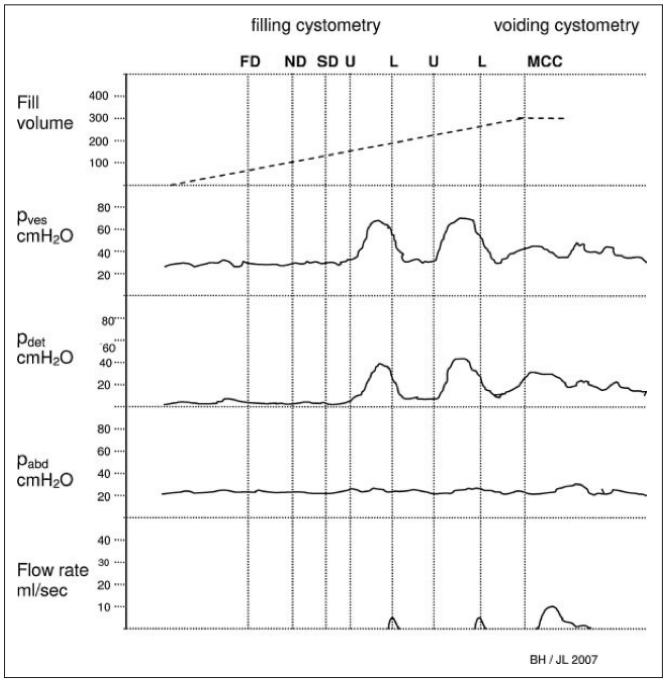

Figure 2: A urodynamic trace demonstrating DO and urge incontinence. FD – First Desire to void. ND – normal desire to void. SD – strong desire to void. U – Urgency. L – leak. MCC – maximum cystometric capacity. (9)

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Invasive/surgical management

Options for further management include

Intravesical Botulinum Toxin: *Botulinum toxin works by blocking nerve transmission to muscle cells and has been shown to be effective in DO. It is injected into the bladder wall though a cystoscope. This can be done under anaesthetic, or using a flexible cystoscope without anaesthetic. Side effects include pain, infection, and bleeding and urinary retention. It is important that patients are willing to accept the risk of impaired bladder emptying necessitating that the patient to carry out clean intermittent self-catheterisation.*

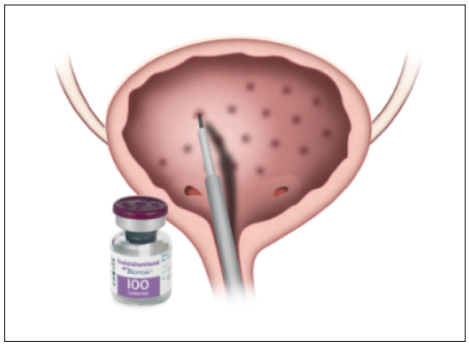

Figure 3: A schematic representation of intravesical botulinum toxin injection.

- Sacral Nerve Stimulation (SNS): *Whilst exact mechanism by which SNS works is unclear, it is thought to modify bladder sensation as well as bladder reflexes. SNS involves the insertion of an electrode through the sacrum to lie next to sacral nerves. This electrode is connected to a temporary neuromodulation device. If the patient's symptoms are well treated, then a second procedure sees a permanent device implanted with the implanted device lying beneath Scarpa's fascia.*

These procedures are carried out either under anaesthetic, or using deep sedation. The battery unit requires changing after several years. It is unsuitable for patients with spinal or sacral abnormalities, those who would not be able to manage their device, or those who would not be suitable for potential repeated procedures.

Figure 4: The Medtronic InterStim II neuromodulation device.

- Augmentation Cystoplasty: *with the success of intravesical botulinum toxin and SNS, the demand for augmentation cytoplasty and urinary diversion has fallen. Perhaps the most commonly performed type of augmentation cystoplasty in the UK is Clam illeo-cystoplasty.*

This involves dividing the bladder down to the trigone (so that it resembles a clam-shell), and then laying on a segment of detubularised ileum. This increases the capacity of the bladder, and may also interrupt the propagation of detrusor contractions. It is major pelvic surgery with all the attendant risks. Specific risks of bladder augmentation include metabolic acidosis, mucus in the urine, increased risk of bladder and kidney stones and incomplete bladder emptying requiring self-catheterisation.

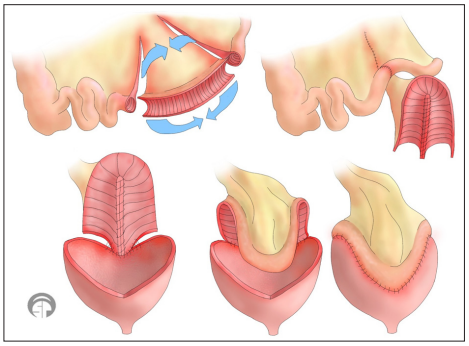

Figure 5: A schematic representation of some of the steps involved in clam ileocystoplasy (10)

- Urinary diversion: *this involves disconnecting the ureters from the bladder and anastomosing them to a length of ileum, which is in turn formed into a stoma on the anterior abdominal wall. The bladder may be left in situ, or removed. Once again, this constitutes major abdominal/pelvic surgery and carries similar complications to augmentation cystoplasty, alongside those associated with a stoma (retraction, stenosis, para-stomal hernia, and skin irritation)*

Containment

Some patients either do not want, or are not suitable for some or all of the treatments above. In these patients consideration may be given to managing their symptoms by urethral or suprapubic catheterisation, or with the use of urinary containment devices (pads, convene in men etc.)

Summary

Through Andrea's case we have introduced the diagnosis and management of OAB. We have discussed the management strategies in an order of increasing invasiveness, mirroring the way treatments are often introduced in clinical practice.

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Best of 5 Questions

1. Overactive bladder is characterised by:

1. Frequency with or without urgency, nocturia and urge incontinence.

2. Urgency along with frequency, nocturia and incontinence.

3. Urgency often associated with frequency and nocturia, with or without urge incontinence.

4. Urgency without the presence of voiding lower urinary tract symptoms such as hesitancy or poor stream.

5. An out dated term for what is better described as Detrusor Over activity.

2. In order to make a diagnosis of OAB:

1. The patient must undergo urodynamic studies to prove detrusor over activity.

2. The patient must fill in a bladder diary to demonstrate significant frequency.

3. The patient must not have neurological disease.

4. All of 1, 2 and 3.

5. None of 1,2 and 3.

3. First line treatment for a woman with OAB who suffers from hypertension might be:

1. Tolterodine 2mg orally twice daily

2. Lifestyle modification and bladder retraining

3. Mirabegron 50mg orally once daily

4. Clam illeo-cystoplasty

5. Intravesical botulinum toxin injections

4. Which of the following would not be suitable treatment of a gentleman with OAB and uncontrolled hypertension?

1. Tolterodine 2mg orally twice daily

2. Lifestyle modification and bladder retraining

3. Mirabegron 50mg orally once daily

4. Sacral neuromodulation

5. Intravesical botulinum toxin injections

5. A patient undergoes urodynamic studies and is found to have evidence of detrusor overactivity. Which of the following management strategies should they be commenced on?

1. Lifestyle modification and bladder retraining.

2. Lifestyle modification, bladder retraining and an anticholinergic.

3. Lifestyle modification, bladder retraining and Mirabegron.

4. They may not need any treatment, and treatment should be directed based on the patient's symptoms, not merely the urodynamic findings.
5. Given proven DO, they should have intravesical botulinum toxin, or sacral neuromodulation.

Answers

1. Answer: 3

This is the International Continence Society's definition.

2. Answer: 5

OAB is a clinical diagnosis, which can be supported by urodynamics or a bladder diary, but these are not necessary for the diagnosis. Patients with neurological disease may be predisposed to OAB.

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3. Answer 2

It is often reasonable to try conservative measures first. That said, it is not uncommon for patients to have pharmacotherapy alongside conservative measures, so 2 could also be considered correct. The other options are not considered first-line.

4. Answer 3

Mirabegron is contraindicated in uncontrolled hypertension.

5. Answer 4

Patients can have DO without having symptoms of OAB. If the patient is asymptomatic, they do not require treatment. If they have symptoms, then 1 or 2 would be reasonable first-line strategies.

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TESTICULAR LUMPS & BUMPS: WHAT TO DO WITH TESTICULAR CANCER

F New, S Deverill, A Wedderburn

Abstract

Introduction

Currently, testicular cancer is the 16th most common cancer among males in the UK and represents approximately 1% of male cancers (1). Of note, incidence of testicular cancer is slowly increasing. Annually in the UK around 2300 men are newly diagnosed with testicular cancer and there are approximately 7 new cases per 100,000 males/year (2). The lifetime risk in 2012 was 1 in 195 men in the UK (3)

Diagnosis

An Ultra sound Scan (USS) of the testis is the imaging modality of choice to diagnosis testicular cancer. The tumour markers LDH, BHCG and AFP can be helpful but are only raised in 51% of men with testicular cancer. A CT C/A/P is required to stage men with testicular cancer, and ideally should be performed pre-operatively, if this is not possible a CXRAY should be performed pre-operatively.

Treatment

The mainstay of treatment is an urgent inguinal radical orchidectomy +/- chemotherapy depending on grade and stage. The patient should be offered a testicular prosthesis, and sperm banking prior to chemotherapy.

Outcomes

The 5-year survival rates are as high as 86-92% (4) if caught early, raising importance of self-examination and diagnosing early.

Case history

Initial Presentation

A 34-year-old male presented to Accident and Emergency department experiencing left loin to groin pain, he was admitted overnight and referred to the urology team in the morning. On examination a large left sided scrotal swelling was also noted, the patient had thought this was due to hitting his testicle repeatedly whilst cycling and until it was mentioned had not informed the clinicians of this.

The patient had past medical history of anxiety but otherwise fit and well with no previous surgical history. He was a non-smoker with no family history of malignancy, and no previous testicular problems. He had been suffering with unexplained weight loss over the past 3-4 months but had put that down to eating less. On examination the patient had a hard, large, craggy, non-tender left testis, which did not transilluminate, and a normal right testis. He had palpable left inguinal lymph nodes, and on abdominal examination there was a suggestion of a firm mass to the left of his midline, and some left flank tenderness.

Clinical problem

This was suggestive of metastatic testicular cancer, so an urgent ultrasound of his testis was arranged for the same day. Blood test were performed including LDH, aFP and bHCG.

Investigations

Ultrasound of the Scrotum was performed which suggested a 7 x 4cm left testicular mass. Tumour markers were raised LDH 392 iu/l (90-275), ∂FP 10 ng/ml (<35), bHCG 10 iu/l (<5). His U+E's were normal as was his FBC.

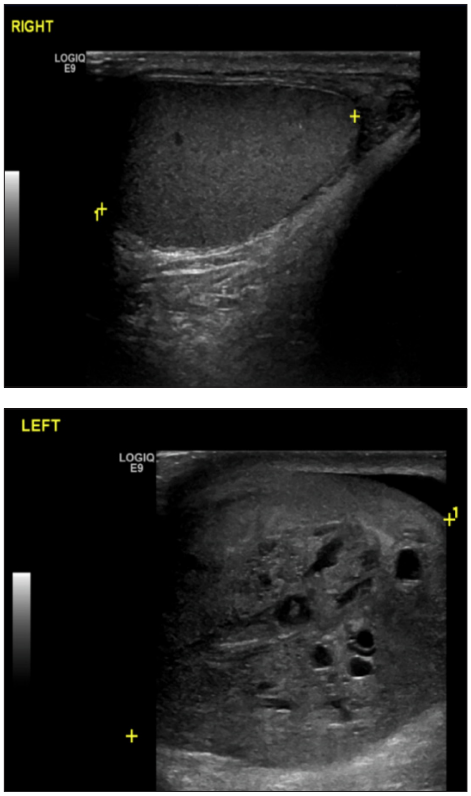

Figure 1: Ultrasound of the Scrotum comparing normal right testis with left sided testicular tumour.

Once the tumour markers and testicular ultra sound confirmed a testicular cancer, due to the findings on physical examination a staging CT chest/ abdomen and pelvis was performed. This demonstrated retroperitoneal spread of his testicular cancer. It was also causing minimal compression of the left ureter, which could have accounted for his left sided flank pain.

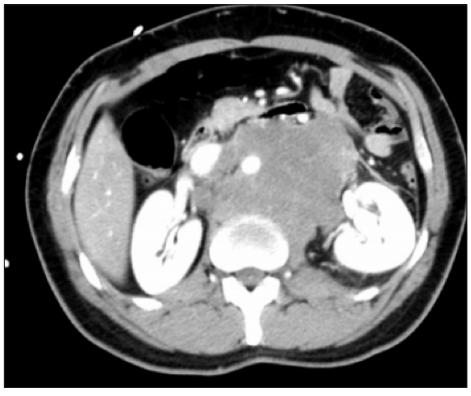

Figure 2: CT demonstrating retroperitoneal spread of testicular cancer

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Treatment

As soon as the results were back the findings were explained to the patient and his partner, which was quite a shock to him as he initially he came in with flank pain, and not about his abnormal testicle. He was sent home but 2 days later was brought in for an urgent inguinal radical orchidectomy. He choose to have a testicular prosthesis fitted on the understanding of slightly increased infection risk and the possibility of delay of chemotherapy in 0.6-2% of cases (5). He was referred onwards for sperm banking prior to chemotherapy treatment of his metastatic disease.

His histology from the orchidectomy showed a mixed teratoma and embryonal carcinoma, with the presence of vascular invasion. He was staged at stage IIC, which means he will be undergoing induction chemotherapy, followed by 3 cycles of bleomycin (BEP, 22-day cycle), with a follow up CT scan at 4-6 weeks to assess any regression of his retroperitoneal lymph nodes.

Discussion

This patient initially presented with loin to groin pain, but through thorough examination the correct diagnosis was ascertained and therefore the appropriate investigations were performed.

History and examination are highly important, the salient points are the duration of symptoms, whether there is a lump the patient can feel, whether it is painless or painful, whether there has been a change in size of the mass and over how long. Most commonly testicular cancer presents as a painless lump in the testis, but sometimes it can enlarge more quickly and cause pain in the testis or, as in our patient with his loin pain due to his spread of testicular cancer.

This patient had no risk factors for testicular cancer such as; any previous history of surgery on genitalia (specifically undescended testis or hypospadius repairs as child), personal history of previous contralateral tumour, personal history of fertility problems, family history of testicular cancer. He had thought his testis was the way it was due to repeat trauma from cycling, and did not even mention being concerned about it in the history, on further questioning he thought it was a range of what a normal testis felt like. A breakdown of alternative diagnosis for a scrotal mass are in table 1.

Malignant Testicular Tumour	Spermatocele
Lymphoma	Varicocele
Benign Testicular Tumour	Hernia
Trauma (haematocele, haematoma, rupture)	Sebaceous cyst
Missed Testicular Torsion	Lymphoedema
Epididymo-orchitis	Fluid overload
Epididymal cyst	

Table 1: Differential diagnoses for Scrotal lumps and Scrotal Pain.

Atypically, this patient presented with abdominal pain rather than his testicular mass. Other atypical symptoms include cough and shortness of breath and which are suggestive of metastatic disease. Gynaecomastia, is due to raised BHCG.

The examination of the patient revealed a hard mass in his testicle which extended into his spermatic cord, and a palpable retroperitoneal mass; without a full examination of this patient the correct diagnosis could have been missed, or a delayed diagnosis could have been made. He had unusually palpable inguinal lymph nodes but no other palpable lymph nodes and his chest examination was normal.

His initial investigations happened promptly due to the accurate diagnosis in the thorough history and examination, he received his testicular USS and tumour markers on the same day, and as the cumulative findings suggested metastatic disease a CT C/A/P was performed the next day, this did not delay his inguinal orchidectomy, which happed 3 days after diagnosis. If his CT couldn't have been done pre-operatively a Chest XRAY would have sufficed, and the CT could have been performed post operatively to stage him.

Losing a testicle can have a psychological impact on a patient, he was offered an insertion of a testicular prosthesis at the time of surgery which he accepted, he was made aware of the risk of infection the possible resultant delay of chemotherapy.

His histology demonstrated a mixed teratoma and embryonal carcinoma (a non-seminomatous germ cell tumour, NSGCT), size 7x 4cm, please see table 2 for a breakdown of the different types of testicular malignancies. It had the presence of vascular and lymphatic invasion, which is a poor prognostic feature; other poor prognostic features for NSGCT are the percentage of embryonal carcinoma, which can predict metastatic disease. Rete testis invasion and tumours larger than 4 cm, are poor prognostic features in seminomas.

Germ cell tumours		**Sex cord Stromal tumours**	**Unclassified**	**Other tumours**
Seminoma	**Non-seminomatous germ-cell tumour (NSGC)**			
Spermatic seminoma	Mature teratoma	Leydig cell tumour	Mixed germ cell/sex cord stromal tumours	adenocarcimoa of the rete testis
	Embryonal carcinoma with teratoma (teratocarcinoma)	Sertoli cell tumour		lymphoma
	Embryonal carcinoma	Granulosa cell tumour		metastatic
	Yolk sac tumour			
	Choriocarcinoma			

Table 2: Types of testicular tumour: WHO classification (7)

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His stage was IIC based on the American joint committee on cancer staging classification of TNM and serum tumour markers (AJCC TNM). Stage I disease is confined to the testis, stage II has varying degrees of nodal involvement depending on size, and stage III indicates supra-diaphragmatic and visceral metastasises please see table 3 and 4 for the full breakdown.

pT Primary tumour:	
• pTX	• Primary tumour cannot be assessed
• pT0	• No evidence of primary tumour
• pTis	• Intratubular germ-cell neoplasia (Carcinoma-in-situ)
• pT1	• Tumour limited to testis and epidiidimis, without vascular/lymphatic invasion, may involve tunica albuginea but not vaginalis.
• pT2	• Tumour limited to testis and epidiidimis, with vascular/lymphatic invasion, or involving the tunica vaginalis.
• pT3	• Tumour invades spermatic cord with or without vascular/lymphatic invasion
• pT4	• Tumour invades the scrotum with or without vascular/lymphatic invasion
N Regional lymph nodes:	Clinical:
• Nx	• Regional lymph nodes cannot be assessed
• N0	• No regional lymph node metastasis
• N1	• Metastasis in a lymph node mass 2cm or less, in greatest dimension, or multiple lymph nodes, none more than 2cm.
• N2	• Metastasis in lymph node >2cm, not more than 5cm, or multiple lymph nodes, any one >2cm but less than 5cm
• N3	• Metastasis in a lymph node >5cm
pN lymph nodes:	Pathological:
• Nx	• Regional lymph nodes cannot be assessed
• N0	• No regional lymph node metastasis
• N1	• Metastasis in a lymph node mass 2cm or less, in greatest dimension and 5 or fewer positive lymph nodes, none more than 2cm.
• N2	• Metastasis in lymph node >2cm, not more than 5cm, or more than 5 nodes positive nodes, less than 5cm, or evidence of extranodal extension of tumour
• N3	• Metastasis in a lymph node >5cm
M Distant Metastasis:	
• Mx	• Distant metastasis cannot be assessed
• M0	• No distant metastasis
• M1	• Distant metastasis
• M1a	• Non-regional lymph node(s) or lung
• M1b	• Other sites
S Serum Tumour Markers:	
• Sx	• Serum tumour markers not available/not performed
• S0	• Serum marker study levels within normal limits LDH (U/L) hCG (mU/ml) AFP (ng/ml)
• S1	• <1.5x N and <5000 and <1000
• S2	• 1,5-10 x N or 5000-50000 or 1000-10000
• S3	• >10 x N or >50000 or >10000

Table 3: TNM staging of testicular Cancer (8)

Stage	TNM + tumour markers
Stage I	pT1-4, N0, M0, Sx
Stage II	Any pT, N1-3, M0, Sx
• IIA	Any pT, N1, Mo, Sx
• IIB	Any pT, N1, M0, S1
• IIC	Any PT, N2-3, M0, S0-1
Stage III	Any pT, any N, M1, Sx
• IIIA	Any pT, N1, M1a, S0
• IIIB	Any PpT, N1, M1a, S1
• IIIC	Any pT, N1-3, M1a, S0
	Any pT, any N, M1a, S2
	Any pT, N1-3, M0, S3
	Any pT, any N, M1a, S3
	Any pT, any N, M1b, any S

Table 4: AJCC stage groupings for testicular tumours (8

He was sent to the nearest fertility centre to bank sperm, which was done, after his surgery and before his chemotherapy, which is the normal pattern; he would have been consented for sperm banking, HIV and Hepatitis B testing.

As his staging was IIC and he is in the good prognosis group (see table 5) he is currently undergoing 3 cycles of bleomycin chemotherapy, and will be followed up at 4-6 weeks with a CT scan to ensure regression of his retroperitoneal lymph nodes, as well as repeat tumour markers. If his CT shows regression but a mass remains and his tumour markers normalise he would be suitable for retroperitoneal lymph node dissection, if his tumour makers continued to rise he would be offered salvage chemotherapy.

Prognosis group	5 year progression free survival	5 year survival	Criteria
Good	89%	92%	All of the following: • Testis/retroperitoneal primary • No non-pulmonary visceral mets • AFP< 1000ng/ml • hCG <5000 IU/l • LDH < 1.5 x upper limit of normal
Intermediate	75%	80%	Any of the following: • Testis/retroperitoneal primary • No non-pulmonary visceral mets • AFP>1000ng/ml < 10000ng/ml • hCG >5000 IU/l <50000IU/l • LDH >1.5 < 10 x upper limit of normal
Poor			Any of the following: • mediastinal primary • Non-pulmonary visceral mets • AFP >10000ng/ml • hCG >50000IU/l • LDH >10 x upper limit of normal

Table 5: Prognosis based staging for NSGCT based on the International Germ Cell Cancer collaborative group (4)

The EAU guidance on testicular cancer follow up in metastatic NSGCT or seminomas recommends CT Abdomen/Pelvis twice a year for the first two years, then once a year from year 3-5, and as indicated after this. A CT Chest/brain is recommended yearly for 5 years if there were indications for either (such as neurological findings, previous metastasis). Physical examination, tumour markers and Chest XRAY are recommended four times a year for the first 2 years, then twice a year for the next 3 years and then yearly lifelong (6).

The survival rates are much higher the early the tumour is diagnosed and treated, this puts onus on the patient to self examine and be vigilant in reporting abnormalities.

TESTICULAR LUMPS & BUMPS: WHAT TO DO WITH TESTICULAR CANCER

F New, S Deverill, A Wedderburn

MCQs:

1. What is the imaging modality of choice for detecting testicular cancer?

A - USS testis

B - MRI testis

C - Clinical diagnosis

D - CT testis

E - All of the above

2. What other imaging would you like pre-operatively?

A - Nothing

B - CT Chest/Abdomen/Pelvis

C - CT A/P

D - Chest

E - CT A/P with CXRAY

3. What microscopically and macroscopically features indicate poor prognostics in seminomas?

A - Vascular and lymphatic invasion

B - < 4 cm in size

C - > 4 cm in size and rete testis

D - Pure seminoma

E - No microvascular invasion

4. Which one of the below tumours is a non-seminomatous germ cell tumour?

A - Leydig cell cell tumour

B - Adenocarinoma of the rete testis

C - Granulosa cell tumour

D - Sertoli cell tumour

E - Choriocarcinoma

5. A patient has an orchidectomy with histological proven seminoma confined to the testicle, with a single retroperitoneal lymph node <2 cm on CT C/A/P, and with normal tumour markers, what is his stage according to the AJCC groupings for testicular tumours?

A - Not enough information to decide

B - Stage II B (

C - Stage I

D - Stage II A

E - Stage IIC

MCQs Answers:

1. What is the imaging modality of choice for detecting testicular cancer?

A USS (correct answer- high sensitivity and specify for detecting testicular cancers)

2. What other imaging would you like pre-operatively?

B CT C/A/P (correct answer- this is to exclude life threatening respiratory compromise pre-operatively from widespread metastasis, where the patient would be required to have pre-operative chemotherapy rather than an initial inguinal orchidectomy.

TESTICULAR LUMPS & BUMPS: WHAT TO DO WITH TESTICULAR CANCER

F New, S Deverill, A Wedderburn

3. What microscopically and macroscopically features indicate poor prognostics in seminomas?

C > 4 cm in size and rete testis involvement (correct answer, vascular and lymphatic invasion indicate poor prognosis in NSGCT)

4. Which one of the below tumours is a non-seminomatous germ cell tumour (NSGCT)?

E Choriocarcinoma (correct answer, see table 2)

5. A patient has an orchidectomy with histological proven seminoma confined to the testicle, with a single retroperitoneal lymph node <2 cm on CT C/A/P, and with normal tumour markers, what is his stage according to the AJCC groupings for testicular tumours?

B stage II B (correct answer, see table 3 and 4)

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THE ACUTE SCROTUM

S Jallad, W Akhter, V Izegbu, R Kavia

Abstract

The acute scrotum is a true urological emergency condition that is commonly seen by surgeons, urologists, paediatricians, accident and emergency as well as general practitioners. It can be a challenging and daunting experience to many junior doctors.

The conditions that can present with acute scrotum can range from simple findings that needs no more than explaining and reassurance to other conditions that will require immediate surgical intervention. By being aware of the differential diagnosis and adopting a methodological approach, the management of the acute scrotum becomes easier. This review explains the different causes of acute scrotum and present guidance to their management.

Introduction

The acute scrotum is a condition that is commonly seen by surgeons, urologists, paediatricians, accident and emergency as well as general practitioners. It can be a challenging and daunting experience to many junior doctors. The conditions that can present with acute scrotum can range from simple findings that needs no more than explaining and reassurance to other conditions that will require an immediate surgical intervention.

By adopting a methodological approach and being aware of the differential diagnosis, the management of the acute scrotum becomes safer. The golden rule is an acute scrotum is testicular torsion until proven otherwise, especially in young adults and paediatrics. Conditions presenting as acute scrotum can be classified into ischaemic, infective, traumatic, cancerous, abdominal conditions, systemic diseases and idiopathic conditions.

1. Ischaemic Conditions

a. Torsion

Testicular torsion is caused by a sudden rotation of the testis on its axis, resulting in twisting of the spermatic cord that causes venous obstruction resulting in oedema, reduced arterial perfusion and haemorrhagic infarction. It can present at any age, the incidence in young males is 1:4000. The incidence peaks at the 1st year of life and a larger peak between 12 and 18 years (1). Irreversible ischaemic injury can begin within 4 hours of spermatic cord occlusion, resulting in reduced fertility and even testicular loss (2). Rates of salvage of the affected testis depends on the degree of twist (3) and more importantly the duration, as successful salvage rates was reported to be 90% at 6 hours and drops steeply to just 10% at 24 hours (4).

On examination, the typical signs are a high riding testes "Brunzel sign", tender to touch (see image 1), the testicle's orientation may be abnormal with absent cremasteric reflex "considered most sensitive" (5,6).

Image 1: Acute testicular torsion. The testes rotate inward on its axis causing the tender testicle to lie higher in the scrotum, with an abnormal orientation and loss of the cremastric reflex.

Imaging can aid in the diagnosis of equivocal cases. Doppler ultrasonography has emerged in the last decade with high accuracy in detecting testicular torsion (7), however this is operator dependent. Other modalities with higher accuracy include MRI and nuclear medicine (8), though the cost and availability in the acute setting made them unlikely to become front-line modalities in investigating acute scrotal pain. The definitive diagnostic test is the surgical exploration; this negates any time delay whilst waiting for investigations. In our practice the role for imaging is in delayed presentation >24 hours, or those where there is a suspicion of testicular cancer.

A typical history of torsion that resolves abruptly should raise the suspicion of intermittent torsion. Doppler ultrasound may show hyper-perfusion of the testicle. If suspected, an elective exploration and bilateral orchidopexy is recommended (9).

b. Torsion of testicular appendage

The testicular appendage (Hydatid of Morgagni) is a vestigial remnant of the Müllerian duct that attaches to the tunica vaginalis at the upper pole of the testes. Torsion of the appendage typically presents at paediatric age peaking between 10 and 12 years (8). It causes haemorrhagic infarction. The patient typically presents with less intense pain than testicular torsion and a classic 'blue dot' sign, though this is only present in up to 20% of cases (see image 2).

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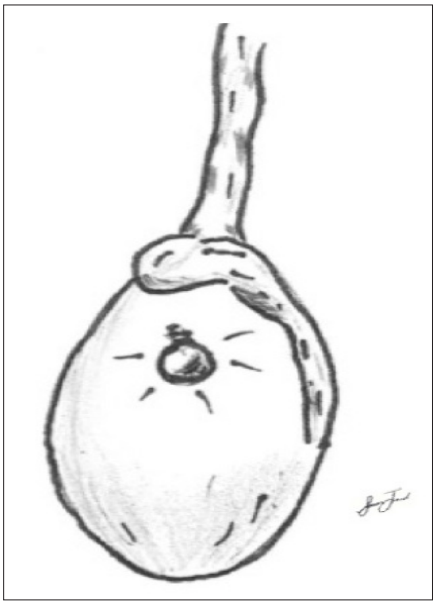

Image 2: Torsion of testicular appendage. The presentation is less intense than testicular torsion, the testicle has a normal lie and orientation and cremasteric reflex may be present. The blue dot sign is characteristic but may not be present.

When diagnosed either clinically or radiologically, management is normally conservative. In many cases testicular torsion can't be excluded and surgical exploration is warranted to establish the diagnosis and the cyst can be excised (10).

2. Infection

a. Epididymo-orchitis

It is an infection of the epididymis +/- the testes and normally presents with a gradually increasing pain with swelling and erythaema of the scrotum on the infected side and can be accompanied with dysuria, urethral discharge or low-grade pyrexia. The incidence of epididymo-orchitis amongst children is not rare (11) and is usually a reactive inflammatory process to an infection and has a benign course. Recurrent epididymo-orchitis warrants further urological investigations to rule out functional or anatomical urinary tract abnormality.

On examination, there is swelling and tenderness that is limited to the infected epididymis (see image 3). Elevation of the scrotum can relieve the pain in epididymitis "Prehn's sign". Urine dipstick may show leukocytes or positive nitrates. A urine sample for culture and chlamydia test +/- urethral swab (depends on the local laboratory guidelines) is needed to investigate the causative organism.

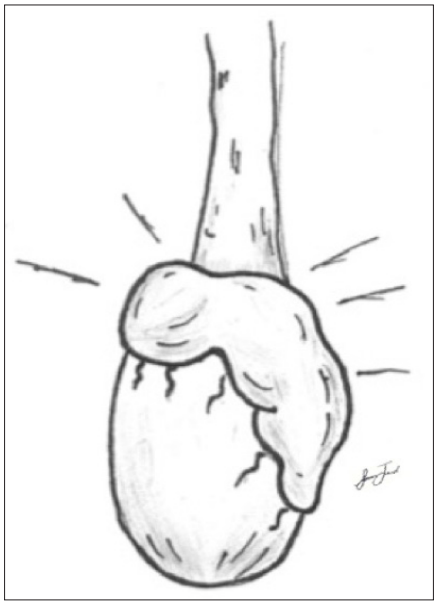

Image 3: Epididymo-orchitis. The gradual pain and swelling are typically more evident in the epididymis, which is tender. The testicle has a normal position and lie and may not be tender. The history and presence of other urinary symptoms may aid in establishing the diagnosis.

Sometimes it can be difficult to distinguish from testicular torsion (12) and a scrotal colour Doppler ultrasound can help establish the diagnosis showing swelling and hyperaemia of the infected epididymis with normal blood flow to the testicle. The typical pathogens can be classified into either sexually transmitted disease (Chlamydia or Neisseria) or enteric related (mostly Escherichia coli) (13).

Older reports showed that patients younger than 35 years old are more likely to have sexually transmitted disease though a careful sexual history can help clarify the likely organism and help guide the antibiotic therapy. If sexually transmitted disease is confirmed or most likely, the patient's sexual partner will require treatment.

Tuberculosis epididymitis should be considered in immunodeficiency patients and patients from high prevalence countries especially in the presence of discharging sinus. The presence of viral symptoms and swollen salivary glands, mumps should be considered.

Untreated cases or complicated infection can deteriorate into an abscess, which presents as clinically hot swollen fluctuant tender scrotum. It will mostly require surgical drainage and packing of scrotal wound.

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b. Fournier's gangrene

It is a necrotising fasciitis involving the perineal and genital area that is usually caused by multiple microbes, that can include aerobic an anaerobic organisms, causing tissue necrosis and life-threatening sepsis (14). The causative condition could be due to ano-rectal infection or a urological infection or instrumentation.

Patients are very ill, mainly elderly and suffer with co-morbid conditions that affect their immunity like diabetes or alcoholism. Clinical signs include erythaema that spread rapidly with or without necrotic areas. Crepitus indicates presence of trapped gas in the affected infected tissue. Although diagnosis is clinical, imaging can show the extent of tissue necrosis.

Fournier's gangrene is a surgical emergency that would require rapid aggressive resuscitation and broad-spectrum antibiotics, surgical debridement and intensive medical support.

Fournier Gangrene is a serious medical condition with high mortality rates. A Severity Index has been proposed to predict severity and mortality based on the deviations of certain parameters; temperature, respiratory rate, heart rate, haematocrit, white cell count, serum sodium, potassium, creatinine and bicarbonate with a score of 1-4 for each. A score of 9 or above have been found to correlate with higher mortality (15). More recently, this scoring system has been modified to include age and extent of disease (16).

3. Trauma

Significant scrotal trauma is not common but can be categorised into blunt trauma or penetrating trauma or degloving injury.

Blunt trauma to the scrotal area can cause damage to the testicle when it is crushed against the pubic bones. A scrotal Doppler ultrasound is likely needed to exclude testicular rupture or significant haematocele, which would require surgical exploration or debridement and closure of the tunica breach. Absence of blood flow may indicate evulsion of the cord or testicular infarction.

Penetrating trauma is uncommon, but would require surgical debridement and exploration to assess the degree of injury and control bleeding. Degloving injuries of the scrotal skin would require surgical debridement and closure.

4. Testicular tumours

Testicular masses can be either benign or malignant. Testicular cancer accounts for 1% of male neoplasms. Testicular tumours are uncommon in children. The peak incidence is in the 3rd decade for non-seminoma and 4rth decade for seminoma (17). Testicular tumours are generally painless and mostly present as a palpable lump detected on self-examination. Intra-tumoural haemorrhage can present with acute pain (18). Ultrasonography will identify the mass and establish the diagnosis.

5. Abdominal conditions

a. Incarcerated Hernia can present with an acute scrotum and can be tender or non-tender. It is classically a swelling involving the inguinal and scrotal area. On examination, it is not possible to get above the mass and be reducible. Children might have previous history of intermittent scrotal swelling suggesting a patent processus vaginalis. Scrotal ultrasound might aid in establishing the diagnosis and rule out other differentials.

Incarcerated inguinal hernia requires immediate surgical repair due to the risk of ischaemia to the content of the hernia and the risk on the cord that may lead to testicular ischaemia (19,20).

b. Abdominal referred pain; renal colic, and especially distal ureteric colic, can present with abdominal pain that radiates to the scrotum because the pain is referred via the ilioinguinal or genitofemoral nerves (21). The pain is typically intermittent and there may be previous history of renal stones. The pain may be associated with urinary symptoms and urine dipstick may show haematuria. Generally, the scrotal examination is normal. Other acute abdominal conditions like appendicitis or diverticulitis can also present with groin and scrotal pain (22)

6. Systemic conditions

a. Henoch-Schönlein vasculitis is a systemic IgA mediated vasculitis with multi-organ involvement. Patients may have had headache and fever for few days followed by the classical purpuric rash. Other organs involved include kidneys, joints, gastrointestinal tract and rarely central nervous system. Patients can present with pain and scrotal oedema and swelling of the epididymis (23). An ultrasound scan may be required to exclude torsion when diagnosis is equivocal. Management is conservative and supportive. Steroids may be needed in renal or intestinal complications or the serious complication of encephalitis.

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b. Mumps is a contagious viral disease caused by paramyxovirus that often results in painful swelling of the parotid gland but a third of patients with mumps may not develop parotitis. Orchitis develop 1-2 weeks after parotitis in 20-30% of cases and 10-30% are bilateral (24). Management is supportive and the prognosis is usually good. Testicular atrophy can develop in 50% of affected men but rarely causes sterility, though the risk is higher in bilateral orchitis (25).

7. Idiopathic scrotal oedema

A self-limiting acute scrotal oedema and erythema that resolves without sequel. It was first reported in 1956 (26). It can be difficult to establish the diagnosis with history and examination. The scrotum skin is thickened and oedematous while the testis is in normal position and is non-tender. A colour Doppler scrotal ultrasound can help show scrotal wall oedema with a normal testicle. No treatment is required and management is mainly supportive. The prognosis is excellent and symptoms are expected to resolves in few days.

Conclusion

In summary there are a number of differential diagnoses that can explain acute scrotal pain. Testicular torsion is a true urological emergency, as there is a finite time within which a torted testis can be salvaged. Other diagnosis should only be made once torsion is excluded.

Test yourself

Q1: What is the incidence of testicular torsion in young males?

- *1:500*
- *1:2500*
- *1:4000*
- *1:20 000*
- *1:100 000*

Q2: A 10 year old presenting with acute scrotal pain and examination reveals tender blue dot at the upper testicle. What is the likely diagnosis?

- *Torsion*
- *Incarcerated hernia*
- *Torsion of hydatid of morgagni*
- *Trauma*
- *Testicular cancer*

Q3: An 18-year university fresher presenting with painful right scrotal swelling with low-grade fever and dysuria. Patient admitted recent unprotected sexual intercourse. What is the likely organism?

- *Chlamydia*
- *E Coli*
- *Proteus mirabilis*
- *Mumps*
- *Influenza*

Q4: A 37 year old presenting with abdominal and left scrotal severe pain. Pain is 10/10 and intermittent. Dipstick revealed microscopic haematuria. Scrotal examination is non-specific. What would be your next step?

- *Scrotal exploration*
- *Scrotal ultrasound*
- *CT KUB*
- *Admit for observation*
- *Start broad-spectrum antibiotics*

Q5: A 4 year old presenting with pain and swelling in the right scrotum that the parents noticed the night before. Examination was difficult as the child was in pain. What is the next step?

- *Admit for observation*
- *Start broad-spectrum antibiotics*
- *Give Calpol and review again in 1 hour*
- *Emergency scrotal exploration*
- *Arrange scrotal ultrasound if pain does not settle*

Answers

Q1

The incidence in young males is 1:4000. Incidence is much less at older age.

Q2

The classical blue-dot sign present in 20% of cases with torsion of hydatid cyst. It can be difficult to distinguish from testicular torsion.

Q3

The case is a typical example of epididymo-orchitis likely related to sexually transmitted disease. But note that testicular torsion is the main differential diagnosis.

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Q4

Abdominal conditions can present with referred pain to the scrotum. Ureteric colic usually present with severe pain and CT KUB is the standard diagnostic test to prove this.

Q5

Emergency scrotal exploration is the main treatment approach for suspected torsion. If the picture is equivocal or delayed presentation, then scrotal ultrasound may clarify the condition, but this can further delay the definitive management and risk losing the testicle.

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THE FORGOTTEN URETERIC STENT

R Kulkarni

Introduction

Ureteric stents are inserted for a host of reasons, most commonly upper urinary tract obstruction caused by stones, tumours or fibrosis. If left untreated, there is a loss of function in the affected renal unit, eventually leading to renal failure. A hollow tube placed across such an obstruction which transports urine from the renal pelvis to the bladder is a simple yet an effective method of decompression. Once inserted, they need to be removed once the obstruction has resolved. If not, they need to be replaced on a regular basis. The main reason for this is encrustation, which occurs due to the interaction between the stent and the host environment.

Urologists insert stents on a daily basis. Failure to remove or replace them at an appropriate time leads to the dreaded complication of the 'forgotten stent'.

This article is intended to make the junior doctors aware of this problem, its implications and the possible methods of avoiding this complication.

Indications for ureteric stenting

Ureteric obstruction is caused by a wide variety of pathologies. These are listed in table 1.

These can be divided into congenital and acquired. The latter can be divided further into inflammatory, traumatic, metabolic, neoplastic and iatrogenic. Not a complete list but includes the most common conditions that lead to upper urinary tract obstruction.

Obstruction can be unilateral or bilateral. Deterioration of renal function and urinary sepsis can add to the complexity of these clinical scenarios.

Post-traumatic strictures and malignant ureteric obstruction are often detected incidentally during imaging undertaken for other reasons.

Congenital	Acquired	
PUJ Obstruction	Trauma: usually iatrogenic	
Mega-ureter	Inflammatory	
Retro-caval ureter	Chronic infections	Tuberculosis
Tuberculosis		Schistosomiasis
Ureteocoele	Metabolic	Stones
Duplex systems	Neoplastic	Direct invasion
		Lymph nodes
		Urothelial tumours
	Other	Endometriosis

Table 1

Technique of stent insertion

In the majority of patients, upper tract decompression is achieved by the insertion of a JJ stent. This is usually performed through a cystoscope ("from below") by an urologist. A guide wire is passed up the ureter past the obstruction. Once the superior end of the wire has reached the renal pelvis, a JJ stent is inserted over the wire and the latter is then removed.

The same procedure can be performed in an ante-grade manner via a pre-inserted nephrostomy tube. This is usually undertaken by an interventional radiologist, but in some centres is also performed by urologists. The stent is inserted in a reverse manner ("from the top") and then the wire is removed.

Long-term ureteric obstruction caused by malignancy or recurrent benign conditions such as retroperitoneal fibrosis, iatrogenic trauma, ischaemia or following radiotherapy are often treated with novel metallic stents. These are usually segmental and used in special circumstances.

What are the problems with stents?

JJ stents are usually made from polymers like plastic. The most commonly used materials are: silicone, PTFE and polyurethane. These materials have specific properties, which make them biocompatible, but they interact with the host environment i.e. the urine. The colour and markings on these devices can leach and have a different reactivity to the host tissues. Stent diameter, length, material and shape vary between the manufacturers which can influence their durability and patient discomfort.

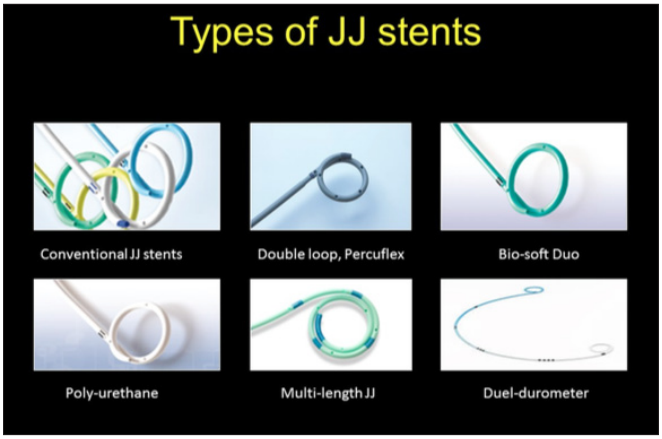

Figure 1

THE FORGOTTEN URETERIC STENT

R Kulkarni

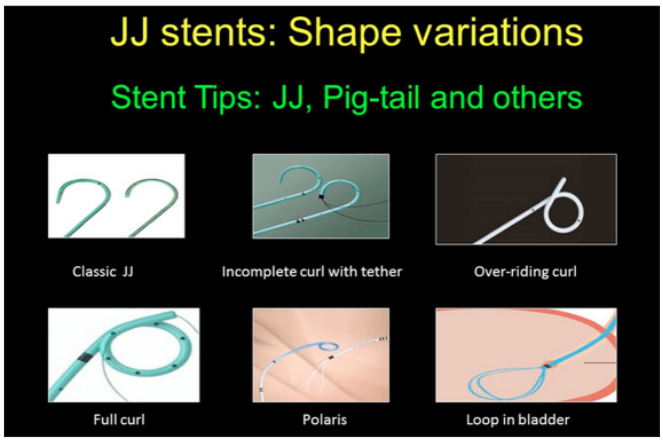

Figure 2

Metallic stents may reduce these side effects as they do not traverse the ureteric orifice, and so do not cause bladder irritation.

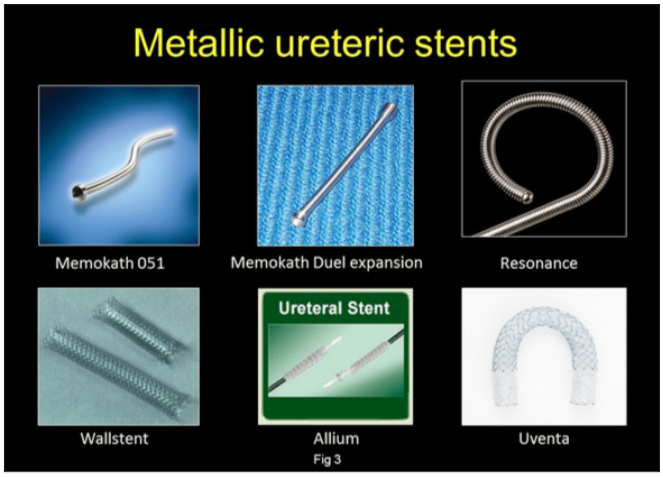

Figure 3

The shape of the commonly used JJ stents – as the name suggests - is like the letter J at both the ends. The distal curl causes bladder irritation due to mechanical contact. It is worse if the stent is too long and touches the trigone. Frequency, urge, urge-incontinence, pain, dysuria, haematuria and discomfort during sexual activity are common following stent insertion. Urinary tract infections may develop (1).

Encrustation of a ureteric stent is almost inevitable, but occurs at a variable rate. Formation of a bio-film on the stent surface which is a combination of urinary proteins is the first event (2,3,4). This provides a rich environment for bacterial colonisation as well as encrustation. Rigidity, obstruction of the lumen as well as the side holes will eventually develop and will lead to a degree of re-obstruction. Stones may develop on the stent material.

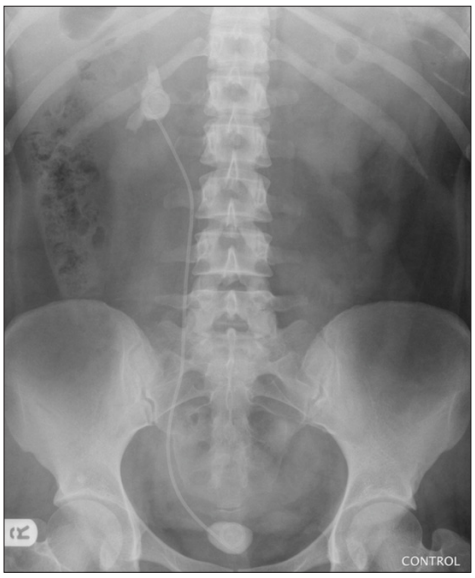

Figure 4. A forgotten JJ stent with large stones on both coils

Ureteric peristalsis is dampened due to the presence of a stent (5).

Reflux of urine through the lumen of a JJ stent occurs. This causes some loin pain especially during micturition.

Stents can migrate in either direction and can get misplaced.

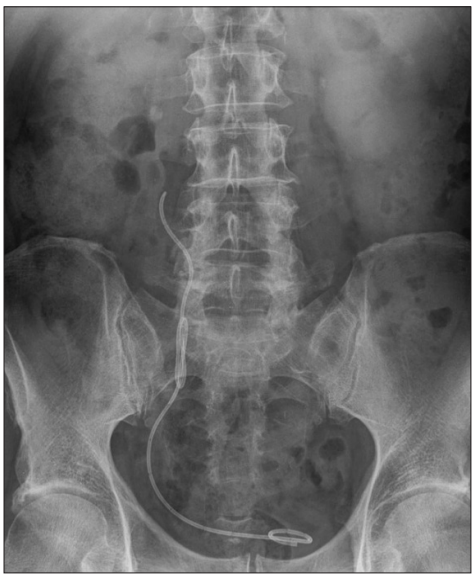

Figure 5. A distally migrated JJ stent

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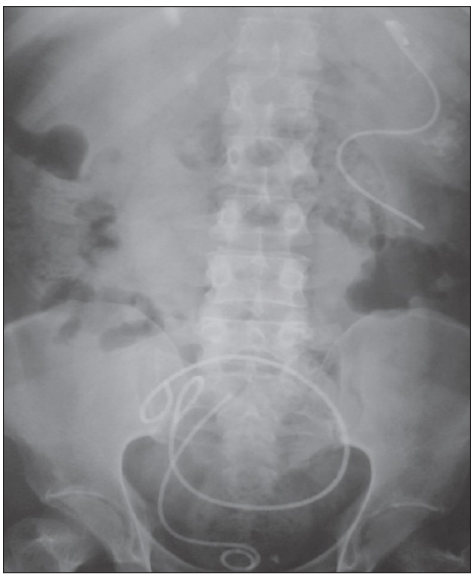

Figure 6. Fragmented and migrated JJ stents

Fragmentation and incorrect placement too has been reported.

All the above complications lead to a significant loss of quality of life (6). Inability to work or perform normal activities due to stent related symptoms are common, especially in the young. Therefore, stents should be removed as soon as their need is over.

Why are stents forgotten?

A formal plan to remove or replace a ureteric stent must be made at the time of insertion. The urologist (or the radiologist) performing the stent insertion should make this decision, document and arrange this. All members of the Urology team including the patient should be fully aware of this plan. These must be put in place by a robust liaison with the administrative team.

The duration of stent indwelling time is variable. In the vast majority of patients, stents are inserted after endo-urological procedures such as ureteroscopy for stones. The purpose of a JJ stent is to prevent upper tract obstruction due to ureteric oedema, which develops following instrumentation.

The stents are usually removed within 1 or 2 weeks after such procedures. The usual method of removing the stent is flexible cystoscopy under local anaesthesia. Although practical and quick, this may not be suitable for all patients especially with a low threshold for pain, previous unsatisfactory experience. It is then advisable to remove them under general anaesthesia.

Patients with chronic conditions like strictures need to have their stents left in situ till the underlying pathology is treated with corrective surgery. Prolonged stenting might be the only option if corrective surgery is not feasible or too risky due to their co-morbidity.

Failure to book a theatre slot for the removal or replacement of an indwelling stent is the most common cause of the forgotten stent. This happens due a wide variety of reasons.

Lack of cohesion in the team

In the modern NHS where the team structure has been decimated, it is common to have a different team of doctors looking after a patient every day. Inadequate hand-over, ignorance about the patient's clinical problems and management leads to a loss of continuity and a failure to book the patient to have the stent removed or changed.

This is compounded when stents are inserted over the weekend as most hospitals in the UK have a generic team of junior doctors undertaking ward rounds with consultants over the weekend. These junior doctors might not have had any training or exposure to urology nor do they know the patient well enough. A lack of knowledge leads to an inadvertent mistake.

Failure of communication

Continuity of care is essential part of medicine. Changing teams, inadequate documentation of the side and number (bilateral stent insertion is needed in a small number of patients) leads to a disjointed care. The lack of mention for the reason for stent insertion as well as the plans for removal in the operation notes, failure of a handover between the operating surgeon and the one undertaking ward rounds are the most frequent causes of the lost stent.

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System failure

Every urology department should have its own system for re-booking patients. This should include a formal process of transferring information from the discharge team to the booking office or the secretary. This could be either by a booking form or a paperless (electronic) system. Lack of a robust system is a very real cause of failure to re-book patients and thus resulting in stents being left in too long.

Patient factors

It is essential to involve patients in their own care. A discharge letter is usually given to the patient while leaving the hospital. Information about an indwelling ureteric stent should be explicit. It is important to make the patient aware of the need for a re-visit for removal or replacement of their stent. Frailty, extremes of age or cognitive issues may lead to a lack of effective communication.

Patient information sheets are essential. They not only make the patient aware of the side effects of the stent (and reduce re-visits), but also serve as a reminder that the stent needs removal or replaced. This information should be included in the information sheet with the contact telephone numbers.

Multiplicity of teams

Stents are often inserted by radiologists. They are also inserted in patients with other conditions such as complex gynaecological or colo-rectal pathology associated with ureteric obstruction. Patients often get 'lost' when multiple teams are involved in their care. These patients often return home after a prolonged period of hospital care, have other co-morbidity and have follow up appointments with many specialities. This too is a common cause of the forgotten stent.

Inter-hospital transfers

Patients referred from other hospitals for specialist care too are vulnerable as their complex problems may take priority and the existence of the ureteric stents is not adequately documented and therefore forgotten.

Stent-on-a string

Most JJ stents are manufactured with a nylon thread attached to their distal end. This is left hanging out of the urethral meatus (in either sex). The JJ stent can be removed by a sustained pull on this thread when the removal is due. This can be done by a healthcare professional or the patient. The thread can snap and will come out of the urethra without the stent. This may give the patient a false impression that the stent has been removed. Retained stents have been reported due to this complication (7).

What are the problems with forgotten stents?

Stents cause morbidity. Longer indwelling time simply prolongs this. Progressive encrustation leads to obstruction. Stone formation over the stent is inevitable. Recurrent obstruction and sepsis will result in loss of renal function in the stented kidney.

Removal of a stent which has been left in for a very long time is usually difficult. Encrustation results in rigidity. Such stents cannot be removed under local anaesthesia. Stones formed on stent surface may need fragmentation before removal of the stent. This may require litholapaxy or lasering of the stones on the stent itself. Percutaneous renal surgery (PCNL) may be necessary if the stones are large. Stents may break and migrate during these manoeuvres.

How to prevent this from happening?

Only a robust system of documentation and booking will prevent the problem of a forgotten ureteric stent.

Booking forms

A formal theatre booking form filled by the surgeon/radiologist immediately after the insertion of a ureteric stent with a clear date for intended removal or change is the most reliable method of preventing this complication. However, it relies on the administrative system to recall patients. A regular review of the patients on the waiting list will reveal patients who have not been contacted or those that have failed to respond.

Electronic systems

This is simply a paperless version of the above system and again is susceptible to the same pitfalls. It also relies on the input of the data into the system at the time of stent insertion.

Stent register

A file or a notebook with patient stickers and other details has been tried. This rarely succeeds as the initial enthusiasm is seldom maintained and patients do not get added to the 'book'. There are other problems with this system. Clarity as to who should add the names of patients, location of such a register, weekend entries, recall of patients and review of such a record on a regular basis is essential. This is laborious and inevitably fails.

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Web based systems

Attempts have been made to create a web based system which links the patient data on the PAS, the details of the procedure and a link to the urology department. This system sends regular emails to remind the team to remove or replace the stent. These will continue to be generated till the event has taken place and the loop closed. An attractive concept, which has not been universally accepted due to lack of uptake, inadequate security and potential breaches in patient confidentiality.

Other novel concepts

Mobile phones and emails have become a part of our lives. Hospitals routinely remind patients about their forthcoming appointments by texts. All medical devices also have a bar code. Linking the bar code to the patient's hospital number, their contact telephone number or an email address with the electronic system of the urology department to generate reminders has been explored.

Adequate safety measures need to be incorporated in these devices if these are to be used for this purpose.

Summary

A forgotten or a missing stent leads to morbidity, prolongation of patient discomfort and may result in irreversible damage. Complaints and litigation may result. This potentially avoidable complication needs to be kept in mind by all grades of doctors working in urology teams.

MCQs

1. What is the average indwelling time of a JJ stent?

A) 2 weeks

B) 6weeks

C) 8 weeks

D) 32 weeks

E) 64 weeks

2. What is the leading cause of stent morbidity?

A) Stent material

B) Encrustation

C) Length

D) Patient age

E) Stent colour

F) All of above

3. Stents get obstructed due to:

A) Infection

B) Haematuria

C) Encrustation

D) Migration

4. Inter-action between stent and the host begins with:

A) Formation of stone

B) Bio-film formation

C) Leaching of colour

D) Stent stiffness

5. Booking stent removal is the responsibility of:

A) FY doctor

B) Urology SpR

C) Consultant

D) Secretary

E) All of above

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Answers

1. A.

Most frequent indication of JJ stent insertion is after endo-urological procedures. A short period of stent indwelling time is adequate.

2. F.

Encrustation leads to obstruction, pain stiffness and infection. Long indwelling time increases this process and makes stent removal difficult. Long stents made from stiff materials cause more pain especially in younger patients.

3. C.

Encrustation results in slow but certain occlusion of the lumen as well as the side holes. Although the flow of urine around the stent continues, partial obstruction develops.

4. C.

Stent surface gets coated with the complex of naturally occurring urinary proteins and this biofilm promotes bacterial adhesion. Almost all stents are covered with a biofilm within 4 weeks of insertion.

5. E.

Rather obvious but a team approach is the only reliable method of avoiding stents being left in a patient for too long. Everyone involved in the care of the patient should take responsibility and ensure the addition of the patient to a designated theatre slot before discharge.

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TURP SYNDROME: A RARE BUT IMPORTANT UROLOGICAL EMERGENCY

R Mosey, B Osman, H Joshi

Abstract

A transurethral resection of the prostate gland (TURP) is a common surgical intervention within urological surgery, to treat voiding lower urinary tract symptoms (LUTS) or complications, caused by benign prostatic hyperplasia (BPH) (1).

A TURP is one of the most frequently performed urological procedures, however carries with it an uncommon but significant risk of causing TURP syndrome, an emergency which must be recognised and managed promptly (1, 2).

In this article we cover the diagnosis, presentation, early recognition and management of the condition.

We start with a case history of a patient who presents with TURP syndrome.

Case History

Mr X, a 68 year old gentleman was moved to recovery after his TURP for which he had a general anaesthesia (GA). He was a fairly fit and well man, with a past medical history of a Transient Ischaemic attack (TIA) 9 years ago. He was handed over to the recovery staff, it was mentioned he was in theatre for around 2 hours as he had a difficult large vascular prostate, but the irrigation seems to be running well and the catheter draining adequately with no significant clots.

He has taken a while to recover from the GA and has been getting confused in recovery; his observations have been stable apart from a slight rise in his blood pressure.

The recovery nurses call you to review the patient as he is more confused and his blood pressure is now 190/100, he also mentions he sees flashing lights and has tingling of his lips!

How is a TURP performed? And what is the post-operative risk of TURP syndrome?

A TURP is performed under a GA or spinal anaesthesia.

The aim of the procedure is to improve voiding LUTS secondary to BPH; this is achieved by resecting hyperplastic prostate tissue and removing obstruction to the outflow tract (1, 3, 4, and 5).

1. The patient is put into a lithotomy position. The bladder is filled with 1.5% Glycine (a hypotonic, inhibitory amino acid with non-electrolyte solution), to enable vision and non-conduction of electrical current which is used to heat a loop.

2. A telescope and resectascope along with a monopolar heated loop instrument are passed into the bladder via the urethra to remove obstructing prostatic tissue.

3. The prostate chips are then removed via a suction device and a 3 way catheter inserted along with irrigation in the form of normal saline to wash out the bladder (1, 3, 4, and 5).

The catheter will normally be removed around 24-48 hours after the procedure when the irrigation has been taken down and the urine has remained clear. TURP syndrome is rare, as displayed in the table below which highlights the risks associated with the procedure, produced by The British Association of Urological Surgeons (BAUS) (3).

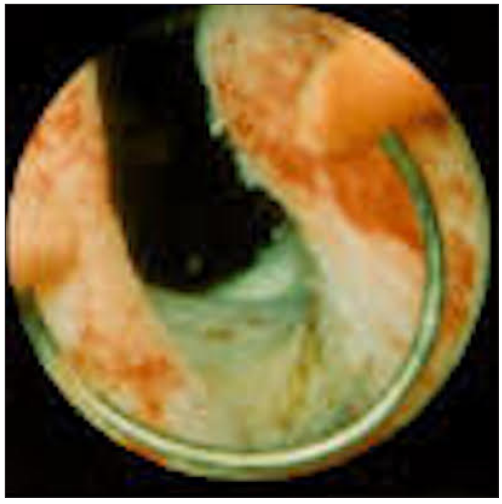

Figure 1: TURP and resectascope loop, courtesy of BAUS.

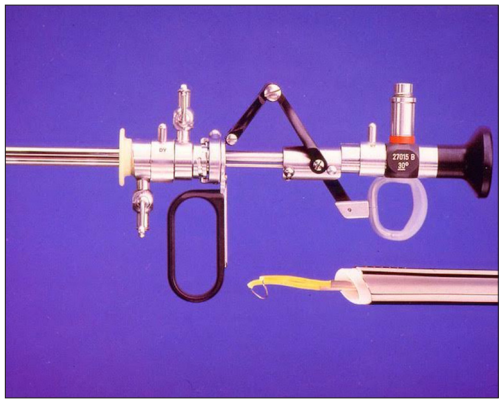

Figure 2: Resectascope, courtesy of BAUS.

What is TURP syndrome, the presentation and the pathophysiology behind it?

TURP syndrome is a triad of:

- *Hyponatremia*
- *Fluid overload*
- *Direct glycine toxicity*

TURP syndrome occurs in about 0.5-2% of cases. It results from absorption of large volumes of hypotonic irrigating solution (glycine). Absorption happens into the peri-prostatic venous plexus directly and indirectly to the peri-vesical and retroperitoneal spaces.

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It can also occur in percutaneous nephrolithotomy (PCNL) and transurethral resection of bladder tumours (TURBT) (4, 6).

Glycine is broken down largely by the liver and then the kidney into ammonia, glycolic acid and water. This excess of water causes dilutional hyponatremia. Glycine can also cause promotion of natiuresis from the kidney by producing ANP, resulting in further loss of sodium from the body (4).

The hyponatraemia can cause confusion secondary to osmotic cerebral oedema, with coning and death.

Fluid overload produces symptoms of heart failure, initial hypertension, shortness of breath and cyanosis, with later presentation of hypotension and bradycardia (1, 4, 5, 6).

Glycine also has a direct toxic effect on the heart causing bradycardia.

Glycine is an inhibitory neurotransmitter and at high levels can slow transmission of stimulatory waves, for example causing flashing lights as signals slowed from the retina to the cerebral cortex, or as in Mr X tingling of lips (1, 4, 5, and 6).

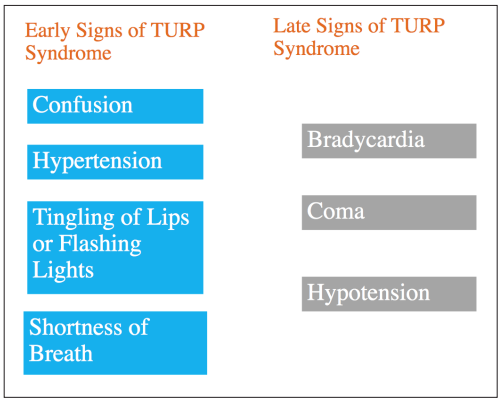

Figure 3: Early and late signs of TURP syndrome.

Diagnosis and differential diagnosis

If not familiar with TURP syndrome, it can be difficult to arrive at the diagnosis. In the case of (Mr X), he could have a number of diagnoses that could be causing his confusion and clinical state. Given his history of a TIA, a stroke could be considered as well as bleeding, hypoxia, infection, myocardial infarct, pulmonary embolus or reaction to opiates.

It is important to have a high index of suspicion of TURP syndrome whilst investigating other possible causes in acutely unwell patients post operative (2). In this clinical context, low serum sodium and concerning features of those listed above, with no clear alternate pathology, should be enough to begin initial treatment of TURP syndrome and instigate recruitment of senior involvement.

Prevention, detection and management

Prevention

Pre Procedure, identification and optimisation of pre-existing hyponatraemia should be addressed in all those who are being considered for a TURP.

Those with a large prostate size are at increased risk of bleeding and longer resection times and therefore higher absorption rates of irrigating solution (4). During the Procedure, an acknowledgment of the resection time should be highlighted. An aim for completion of the procedure in less than 60 minutes, with irrigating fluid at the lowest possible height, below 60cm from the operating table, is a usual standard, to limit possible absorption of irrigating solution (1, 4).

Alternate procedures such as using a bipolar instead of monopolar resection, allows the use of saline instead of glycine to be the irrigating medium. The bipolar system conducts and creates the heating element between two electrodes.

Laser prostatectomy in the form of green light and HoLEP are also alternatives that either requires no glycine and result in reduced blood loss. These alternate options are becoming increasingly used however, not all centres have the appropriate equipment or trained individuals to be able to offer them as standard (7).

Detection

Performing a TURP under spinal anaesthetic is preferable, so that conscious levels and early symptoms may be recognised sooner (1,2,4,5,6).

Glycine irrigating solution is prepared with 1% ethanol, detection of levels of excess absorption have been described by using a breathalyser.

If there are concerns that TURP syndrome may be a significant risk, checking the sodium during the procedure and administering prophylactic furosemide to off load excess fluid is also suggested (1,4,5,6).

Management

Hyponatraemia is classed as a sodium level less than 135mmol/l, however signs and symptoms of TURP syndrome are often only prominent with levels <130mmol/l.4.

Management of those with TURP syndrome can vary depending on sodium levels. Those with a sodium of <120 will most likely require a high level of HDU input, in comparison with another patient with a sodium of 130, they may be able to be managed with close supervision on the ward. However the patient and clinical state must be assessed and management guided by sodium levels alone is not recommended.

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Managing TURP syndrome is largely supportive and should ideally be undertaken in a high dependency setting. If TURP syndrome is suspected during the operation, the procedure should be terminated and glycine irrigation switched to saline (1,2,4,5,6).

1. The patient should be managed as in any other un-well patient and review and addressing them via the ABCDE approach is essential, with initial high flow oxygen, IV access and escalation to a senior.

2. Offloading excess fluid with a loop diuretic, such as 40mg of furosemide, if there are signs of pulmonary oedema.

3. Early involvement of the intensive care doctors is essential and strict monitoring is needed. Occasional intubation, anticonvulsants, atropine and adrenergic drugs are needed to control seizures, bradycardia and hypotension.

4. Sodium may need to be corrected with hypertonic saline in a monitored environment. Slow correction of the sodium is essential to avoid central pontine myelinolysis, which can ensue with rapid correction (1,2,4,5,6).

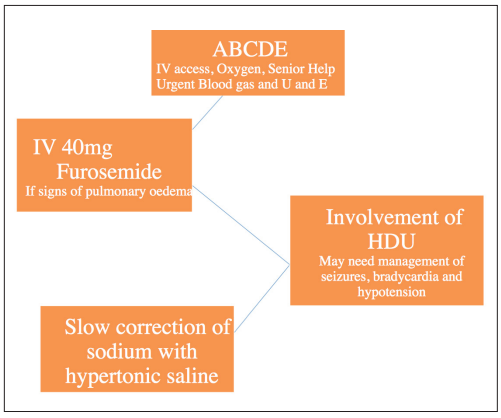

Figure 4: Flow Diagram of TURP syndrome management.

Discussion

TURP syndrome is rare and is becoming increasingly rare secondary to newer resection techniques as discussed. None the less, appropriate prevention, high suspicion and prompt recognition and management are needed with all patients undergoing a TURP, in order to correct a potential life threatening post-operative condition (1, 2, 4, and 7).

MCQ

1. How common is TURP syndrome?

A. 50%

B. 25%

C. 2%

D. 0.02%

E. 5%

2. What is the concentration of Glycine irrigation used in TURP?

A. 1%

B. 25%

C. 1.25%

D. 1.5%

E. 15%

3. Which is not a feature of TURP syndrome?

A. Visual Disturbance

B. High blood pressure

C. Low blood pressure

D. Confusion

E. Thirst

4. Which practice can reduce TURP Syndrome, select all those that apply?

A. Shorter Resection time

B. Resection of bigger prostate size

C. Using Bipolar resection in saline

D. Operating on patients under GA as opposed to spinal

E. Lowering the height of the irrigation

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5. Which one statement is correct?

A. Glycine is an excitatory neurotransmitter

B. Glycine is the only irrigation solution that can be used in TURP

C. TURP syndrome is very easy to diagnose and presents with profound cardiac failure early on

D. TURP syndrome is multifactorial caused by direct glycine toxicity, fluid overload and dilutional hyponatraemia

E. Glycine does not directly affect the brain, and confusion is caused by cerebral oedema

MCQ Answers

1. A

(TURP syndrome is quoted as affecting less than 1/50. Between 0.5-2% of those undergoing the procedure)

2. D

(The concentration is 1.5%)

3. E

(Thirst is not a feature of TURP syndrome, initially high blood pressure due to fluid overload, low blood pressure then forms at a late stage with cardiac failure)

4. A, C , E

(Resecting for shorter times on smaller prostates with lowering of irrigation height and operating using saline with specialist bipolar equipment can reduce the absorption of glycine. Operating on those under spinal can identify early signs of confusion and recognise TURP syndrome sooner)

5. D

(Direct CNS toxicity can occur, bipolar resection in saline is becoming increasingly used, cardiac failure is a very late stage of TURP syndrome)

Author

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URINARY CATHETERS - FRIEND NOT FOE

HN Raghallaigh, L Middleton, K Haq, R Cole

Abstract

Managing catheter-related problems, difficult catheter insertions and ensuring correct catheter placement can cause anxiety for new junior doctors. Knowledge of indications for catheterisation, types of catheters and tips and tricks for avoiding urethral trauma and false passage formation can help the foundation doctor deal with almost all 'catheter emergencies'.

We will discuss the catheter itself; types of catheters, difficult catheterisation and techniques to employ and commonly encountered catheter problems such as blocking and bypassing.

'The Eight Golden Rules of Catheterisation'

• First, be gentle, and never force a catheter.
• Second, have a go, but only one.
• Third, never use an introducer, but trying once with a 'Coude' tip catheter is an acceptable option.
• Fourth, use the smallest catheter to do the job.
• Fifth, avoid giving antibiotics to catheterized patients. All this can possibly do, is clone out antibiotic resistance in a system where microbial colonisation is normal and unchangeable.
• Sixth, do not over-inflate the balloon.
• Seventh, always replace the foreskin.
• And finally, rule number eight is that we must always measure the volume of urine drained, describe what we see, and perform a dipstick test the urine.

Background

What is a catheter?

A catheter is a hollow tube, allows drainage of urine from the bladder, which is usually inserted via the urethra temporarily or permanently to manage various conditions such as acute or chronic urinary retention, fluid management of the unwell or post-operative patient or for continence. It is one of the most commonly used medical devices in the world. The most commonly used urethral catheter is the Foley catheter, named after the Urologist Frederick Foley who invented the device with a balloon to retain its position in the bladder in the 1930's.

Why is it measured in 'French'?

The 'French' units are used to describe the external diameter of a catheter tube, and these units can sometimes be denoted by 'Ch' – e.x 12ch after the Frenchman Charriere who invented this measurement system.

Joseph Charrière was a famous French surgical instrument maker who lived in the nineteenth century. At that time, many of the engineering work shops in Paris had grown up along the banks of the River Seine. The Rue Maritine straddled one such engineering district and was very close to Charrière's bankside workshop.

The Maritine road was the centre for the finest makers of naval, maritime and navigational equipment, including telescopic tubes. The engineers here had some of the most accurate lathes and turning equipment in the world. Initially, Charrière's would borrow the use of the lathes that were dedicated to telescope design.

At that time, the lathes had the ability to turn with an accuracy of one-third of a millimetre. As such one millimetre is equivalent to three of Charrière's turns. A catheter with a diameter of 4mm is therefore described as being 12 Charrière - Ch (or French) in size. Likewise, a catheter with a diameter of 5.3 millimetres is 16 Charrière - Ch - or French.

An increasing French size corresponds to an increasing external diameter i.e the bigger the French, the bigger the external diameter of the catheter.

A common misconception is that a three way catheter is always 'bigger' than a two way catheter– this is not necessarily the case. Imagine an 18Fr three way catheter; this means the external diameter of this catheter is 6mm; but this catheter has two drainage channels within it instead of one. So an 18Fr two way catheter, which has one drainage channel only and still the same external diameter, will be bigger!

Does it matter what size I put in?

Traditional teaching states that you should insert the smallest catheter to do the job. In women, when inserting a two way indwelling catheter generally a 12-14Fr size catheter is used and in men usually a 14-16Fr.

Why do I need to insert a catheter?

Across the country, whether in hospital or community practice, the most common reason to have a catheter is to maintain continence. Most often, this is due to immobility, but there are many other reasons, all of which can present challenges for nursing care. Taken together, 90% of all catheters in current use, have been placed for reasons of continence.

In hospital practice, most catheters have been sited to monitor urine output- when a patient is acutely unwell. This accounts for about 7% of catheter usage.

Hospital admissions also include patients who present with acute urinary retention. Perhaps 2% of catheters have been placed for this reason.

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Types of Catheters

Two-way or 'Foley' catheters are described above.
They have two channels, one for drainage and one for balloon channel. The balloon generally holds 10mls of fluid. The drainage channel has 'eyes' or 'eyelets' on the side of the tip of the catheter which facilitate the passage of urine from the bladder. Usually a two-way catheter has two such 'eyes'.

A 'Three way' catheter has an extra channel for irrigation fluid to run into the bladder, in addition to the drainage and balloon channels.
The 'eyes' of this catheter are generally bigger and more numerous. Usually, when inserting a 'three way' catheter, this is to facilitate drainage of clots, pus or following a TURP. Generally, a 22-24Fr size is preferred.

Coude Tip
This has a curved tip of 45 degrees which allows negotiation around the bulbar and prostatic urethra and is useful in men with enlarged prostates. Three way catheters can also have a curved or coude tip.

An intermittent self catheter is usually a small, straight (but can also have a curved tip for men) catheter which is passed in and out to empty the bladder, and then disposed of.
This is usually referred to as 'CISC' (or Clean Intermittent Self Catheterisation) or 'self cath'. It is more acceptable to younger people than an indwelling urethral catheter, and can also be used as a means of self-dilating the urethra in men and women (or 'CISD' – Clean intermittent Self Dilatation).

A paediatric catheter is a two way Foley catheter, sized 6-10Fr.

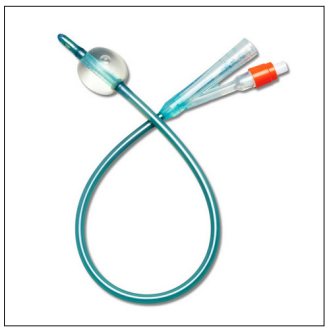
The 'open tip catheter', or the 'council' tip is a type of two-way foley catheter with a hole at the tip of the catheter (instead of the eyelets at the side) which can be passed over a wire, typically when using a flexible cystoscope during a difficult catheter insertion.

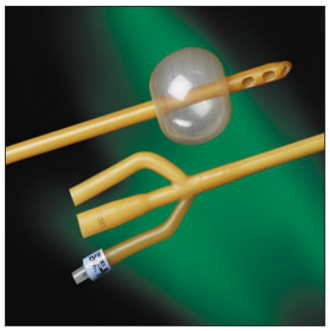
N.B BEWARE THE 'FEMALE LENGTH' CATHETER!

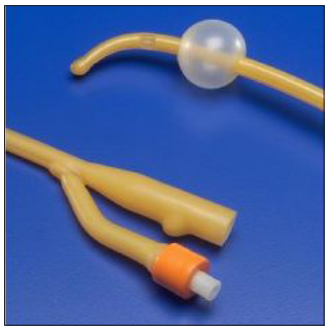
It is advised never to use a special length 'female catheter'. It is even recommended by the authors if one is to find a 'female length' catheter – to immediately discard it!

A male length catheter is approx. 40cm long. This can be used for both females and males, urethrally or supra-pubically. This should be standard practice.

The risk of stocking female length (i.e shorter catheters) is that someone may insert this into the male urethra and thus end up inflating the catheter balloon inevitable in the urethra, causing trauma and pain.







Images 1-4 (clockwise) – 1) A two way (foley) catheter, balloon inflated. 2) A three way, irrigating catheter, balloon inflated. 3) Example of a curved tip, 'coude' catheter. 4) A self cathter, or an 'in and out' catheter.

Catheter Materials

- **Silicone coated Latex/Sialastic**
- **Teflon/PTFE coated Latex**
- **Hydrogel coated Latex**
- **All silicone**

Broadly speaking, catheters can be dived into Latex (or rubber) tubes that are coated with something else. Or, they are made of pure silicone. Silver alloy catheters also exist, which are usually lates foley catheters with a layer of silver and Teflon/hydrogel coating internally and externally and are thought to have anti-infective properties.

Latex coated catheters have many favourable features and, in practice, there are three different coatings that are widely available for clinical use. The most common catheter used in hospital practice, is the PTFE – or Teflon coated catheter.

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For longer term use, and more widely used in the community, is the hydrogel coated catheter. Hydrogel is a composite water absorbing material – the exact nature of which is commercially undisclosed. They are the ones with a creamy white appearance. Finally, there are latex catheters that are coated with a special silicone elastomer – often referred to as Sialastic catheters. These are more yellowy in colour. Together, these are the four main material types of catheter available in the United Kingdom.

Regarding the three main types of latex coated catheter (the PTFE, or Teflon coated catheter, the hydrogel coated catheter and the silicone elastomer, or Sialastic catheter), after 28 days, the microscopic integrity of the PTFE Teflon coated catheter is compromised and so it should be changed. By 3 months, while still not necessarily visible to the human eye, this coating concern is very much amplified. For the hydrogel and sialastic catheters, the surface properties are generally well preserved at 28 days, but by three months, microscopic cracks are becoming apparent. These catheters should be changed after 3 months.

Difficult catheters (men)

However, the bulbar urethral bend is the site of great mischief. A well lubricated catheter will normally follow this naturally curved path. But sometimes, it does'nt. Sometimes it will dig a small hole and follow a straight line path.

Trying to force a catheter round the bulbar urethral bend, risks the formation of a 'false passage'. The more subsequent attempts, the bigger the hole. A catheter will always preferentially go in a straight line so, once a false passage is created, each attempt to pass a catheter will simply compound the problem.

Multiple attempts will tend to compound the problem. The more attempts, the worse the false passage becomes.

There are three ways to negotiate this defect. The first and safest, is under direct vision using a flexible cystoscope, and a guidewire. The scope is used to direct the guidewire towards the correct channel, then the wire passed through this opening and into the bladder. A catheter is then fed over the guidewire.

The second solution is to use a wire introducer. This looks a bit like a wire coat hanger. The wire introducer has an angled tip. A catheter is then back-fed over the wire. The wire-mounted catheter is then introduced into the penile urethra. Once the tip is positioned at the level of the bulbar urethra, the catheter is gently fed off the wire and into the bladder.

Urethral Stricture

A stricture is contracted scar tissue that markedly reduces the lumen size of a tube. This is the endoscopic appearance of a normal bulbar urethral just before the bend.

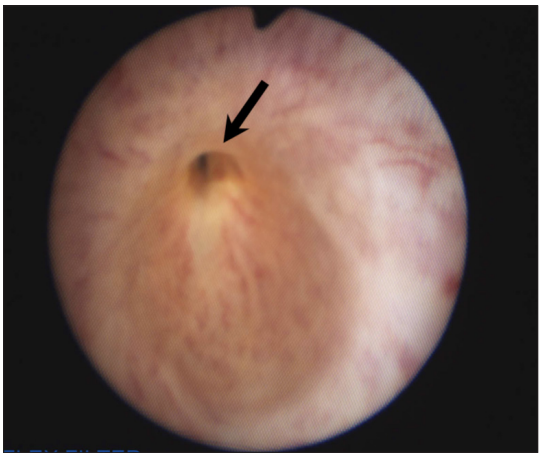

Image 5: Dense bulbar urethral stricture, as seen during flexible cystoscopy.

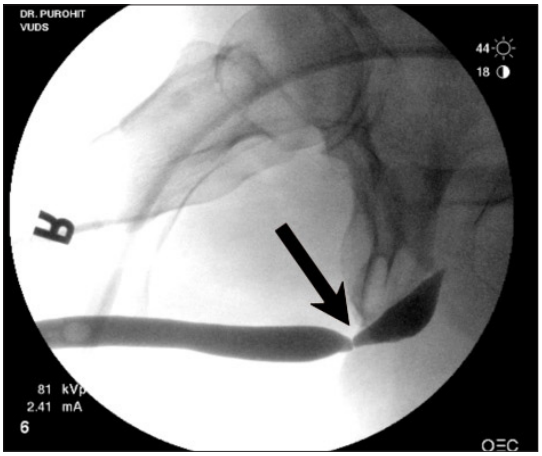

Image 6: XR image of a bulbar urethral stricture during urethrogram.

90% of urethral strictures occur in the bulbar region, and 10% at the peno-scrotal junction. In clinical practice, the vast majority of human urethral strictures are a consequence of previous urinary catheters. Below is an image in the saggital plane of a typical bulbar urethral stricture (Image 2).

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Common catheter-related Problems

- **Blocked – clots, pus, debris**
- **Kinked – poor catheter care**
- **Displaced – poor catheter care/insertion**
- **Balloon cant be deflated – faulty/filled with normal saline**
- **Bypassing**

Catheter associated problems, are some of the most frequently encountered challenges in clinical practice. The four most common examples include: catheter blockages, bladder spasms, urine by-passing, and catheter associated haematuria and clot retention.

Common causes of catheter blockages include compression of the catheter, or kinking of the catheter tube. These external causes are usually obvious. Another common reason for a patient to become uncomfortable is when the catheter drainage reservoir is raised above the height of the bladder. This is simply a problem of gravity and commonly occurs when a catheter bag is hooked over the cot sides of a hospital bed.

Debris that accretes in the bladder can block the catheter drainage hole. Likewise, blood clot in the bladder can block this drainage port. Similarly, the presence of a catheter can cause oedema to the urothelium, which can then get sucked into the eye of the catheter causing a blockage.

Urinary by-passing may occur if the catheter is blocked. Urine will always pass along the path of least resistance and this may be along the outside of the catheter. By passing may be a simple consequence of the irritation caused by the catheter itself. If this is the case bladder instability may also occur. This can be associated with painful bladder spasm, and the sense of stranguary.

In addition, if a catheter balloon becomes dislodged and ends up in the prostate, then painful spasm can occur. This may also result in detrusor instability, and bypassing.

Whatever the underlying mechanism, calls to see patients with catheter associated discomfort, by passing and, bladder spasm are extremely common. These are nearly always simple problems of general plumbing. Sorting out plumbing problems requires us to check all points of the drainage circuit.. Is the drainage bag overfull and in need of emptying? Has the catheter bag been hooked up above the level of the bladder? Is the catheter kinked?

Examine for a palpable bladder. If one is found, and the catheter bag has stopped collecting urine, then the catheter is blocked. If the bladder cannot be felt, and the catheter bag is empty, then the patient may have become anuric, and the problem one of a totally different nature. However, a catheter bag may be empty because it has been emptied. Check the fluid balance chart to see if this is the case. Having done these basic assessments, the problem will usually be readily apparent. If not, then the solutions are as follows: First, flush the catheter to make sure it is not blocked. This may be all you need to do.

If the pain and spasm persist, the catheter may be in the wrong place. So, deflate the balloon. If the catheter has been dislodged into the prostate, then the pain will subside as soon as the balloon is deflated, almost always confirming that that was what was causing the problem. If that is what happens, then reposition the catheter by advancing it forwards. Finally, re-inflate the balloon.

If the catheter still will not drain, or the blockages continue intermittently, it may be that the internal channels of the catheter have become blocked. When this happens, it will be necessary to replace the catheter with a new one. In summary, the approach is simple. Check the drainage bag, the catheter tube, and palpate for a bladder. If the catheter is not draining, or bypassing, or discomfort and intermittent bladder spasms are occurring, take these five logical steps in sequence: FLUSH, DEFLATE, RESITE, REINFLATE then REPLACE.

Sometimes, despite all measures to optimize the free flow of urine, catheter spasm and discomfort continues. As a last resort, anticholinergic medication, such as oxybutynin, tolterodine, or solifenacin can be helpful. Indeed, for those most problematic of cases, urologists will often inject botox into the bladder to reduce such catheter associated spasms.

Questions

1) What are the following indications for immediate urethral catheterisation?

a. 80 year old male with a one day history of inability to pass urine with a painful, palpable bladder. Bladder scan shows 900mls and he is pyrexial

b. 92 year old lady with a two day history of anuria and a 2 month history of worsening abdominal bloating

c. 24 year old male with a penile deformity (bruising and swelling) following intercourse

d. 85 year old male with 'red urine', presenting two weeks after a TURP, having recently restarted his warfarin

e. 25 year old female with renal colic, systemically well. Her nurse has noticed her fluid balance chart has had no urine output documented for 4 hours.

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2) Which of the following is an indication for urgent insertion of a supra-pubic catheter?

a. 85 year old male with a 'blocked' urethral catheter for the past 6 hours. Systemically well, nurses have tried flushing it once with no success.

b. 93 year old lady on warfarin, palpable pelvic mass and anuria

c. 75 year old male in acute, painful retention of urine. Nursing staff are unable to pass a two way catheter, and tell you they have tried multiple times with a 12Fr catheter.

d. 65 year old male with learning difficulties, brittle asthma, with a dense urethral stricture and painful retention of urine with >1,000mls on bladder scanning. He has new renal failure. Your spr has tried to perform a flexible cystoscopy but failed, as the camera wouldn't pass.

e. 75 year old male, history of alcoholic liver disease with cirrhosis and chronic high pressure urinary retention. He has a known bulbar urethral stricture, and has previously refused a urethral catheter or urethral dilatation. His renal function is normal, and he is otherwise well.

3) Which of the following cases should you use an introducer?

a. 65 year old male in acute retention, with a 100cc sized prostate who the experienced SHO and A&E nurse cannot catheterise

b. 45 year old male with a previous optical urethrotomy, admitted with a temperature and 'dribbling' urinary stream. Bladder scan shows 400mls

c. 92 year old male referred by the medical team, with an USS finding of 'bilateral hydroureteronephrosis down to the VUJ', with 1,000mls in his bladder. He has no pain, and the a&e registrar failed to catheterise him.

d. 55 year old male on the urology ward. He had a TURP 2 days ago, and has failed his TWOC this morning. You notice the operation notes mentioned 'an undermined bladder neck'

e. None of the above

4) Which of the following patients needs a three-way catheter?

a. 55 year-old male on the urology ward. He had a TURP two days ago, and has failed his TWOC this morning. The nurse tells you his urine 'was a bit red' prior to his catheter being removed.

b. 82 year old male, admitted via A&E with a three day history of frank haematuria with clots. He has a tender, palpable bladder to the umbilicus, has a new Hb drop and has an 'AKI'.

c. 45 year old lady with MS. She had her first SPC sited electively yesterday, and the nurse looking after her has mentioned her SPC is 'bypassing' and she has leaked some 'red' urine urethrally.

d. 67 year old male with a long term urethral catheter, is referred to you from a&e with 'blood in his catheter bag'. He is otherwise well. They offer to remove his long-term catheter and insert a three way for you, to speed up his transfer to the ward.

e. A 45 year-old lady had bilateral ureteric stents inserted for malignant renal tract obstruction from ovarian cancer a few days ago. The gynaecology nurses looking after her inform you she has frank haematuria.

5) Which of these (catheterised) patients needs a TWOC arranging while you are writing their discharge summary?

a. A 89 year old male admitted under the orthopaedic team, who has had three failed TWOCs on the ward. His residual volume is approx. 1200mls.

b. A 92 year old man with recurrent UTIs and hospital admissions, found to have a painless palpable bladder with a PVR of 1400mls.

c. 99 year old lady with severe atrophic vaginitis and urethral meatal stenosis, admitted in urinary retention and renal failure. She had a urethral catheter inserted over a guidewire in ITU.

d. A 29 year old male who presented in renal failure due to bilateral obstructing ureteric stones. He has now had bilateral ureteric stenting, and his renal function has normalised. He has been stepped down from HDU, and is mobilising well.

e. 78 year old male admitted with clot retention, urosepsis and severe renal failure with hyperkalaemia requiring a period of haemofiltration on ITU. An USS of his kidneys on admission showed bilateral moderate hydronephrosis. He has now fully recovered and is keen to be catheter free.

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Answers

1) What are the following indications for immediate urethral catheterisation?

a. Correct. This is a classic case of acute retention, and to relieve the patients' pain he needs an urgent urethral catheter insertion.

b. Incorrect. This lady first needs assessing to ensure she doesn't have a pelvic mass, or is anuric from pre-renal causes. If in doubt, bladder scan or request a formal USS of her renal tract.

c. Incorrect. This is a classic case of penile fracture. He is likely to require urgent surgical intervention and may also have a urethral disruption. He should be assessed clinically for retention of urine, and a urethral catheter or SPC can be sited in theatre.

d. Incorrect. Not all cases of visible haematuria need catheterisation. If the patient is voiding good volumes, is not passing clots and is well we can avoid unnecessary intervention with a catheter. The patient should be encouraged to drink plenty of water, and PVR bladder scan will reveal if he is emptying well.

e. Incorrect. Many patients will temporarily experience difficulty passing urine associated with pain, or opiate use. Unless she is septic, unwell or has significant renal function derangement she should not require a catheter.

2) Which of the following is an indication for urgent insertion of a supra-pubic catheter?

a. Incorrect. You should assess the patients' catheter yourself. Is there too much tubing visible, ie has it been pulled out and the balloon lodged in the prostatic urethra? Is he bleeding with clots? Try flushing it yourself, deflating the balloon and advancing the catheter.

A bladder scan can also be performed to see if there is a large residual, which may indicated the catheter is indeed blocked. If this is the case, it can be changed for a new urethral and doesn't necessarily need an SPC insertion.

b. Incorrect. This lady is high risk due to her anticoagulation and her age. A diagnosis of retention should be confirmed with a bladder scanner, clinical examination or if any doubt an 'in-out'catheter.

Assuming a pelvic mass (especially in a female) is always a full bladder is dangerous, and trying to inserted an SPC in this case could have grave consequences. An USS pelvis or cross-sectional imaging (CT) should be performed if any doubt.

c. Incorrect. Although many nurses are experienced, you should try first or ask your senior to attempt urethrally prior to jumping to an SPC insertion. A 12Fr sized catheter is also likely to be too 'flimsy' and a 16Fr should be ideally tried.

d. Correct. This case has already had registrar input. Generally speaking, if a urethra cannot be cannulated using a wire and a flexible cystoscop, and SPC will be required. He is also in pain with a significant residual and renal impairment, and therefore an SPC is justified.

e. Incorrect. This man is likely to be coagulopathic and therefore an SPC is contra-indicated. He is also not in pain, and due to his normal renal function a conservative approach of either monitoring his PVR and renal function or discussing the merits of a urethral dilatation in clinic again under LA is indicated.

3) Which of the following cases should you use an introducer?

a. Incorrect

b. Incorrect

c. Incorrect

d. Incorrect

e. Correct. You should never use an introducer! This instrument should only be used in theatre, in the hands of a registrar or consultant or technically only in those patients whose urethra has been inspected before cystoscopically.

4) Which of the following patients needs a three-way catheter?

a. Incorrect. Not all patients who fail their TWOC after a TURP will still have clots requiring re-catheterisation with a three way. Always speak to the patient and his nurse to ascertain the urine colour, presence or absence of clots and the voided volumes. Try and see the urine colour yourself. Usually a two-way catheter is all that is needed.

b. Correct. This patient has clot retention and is compromised, and will need bladder irrigation and clot washout, which can only be facilitated on the ward with a three way catheter. This is best achieved with a 22Fr size at least.

c. Incorrect. This is a common scenario. Some urethral leakage will persist for a while after an SPC insertion, and this in addition to the bypassing can be caused by bladder spasm. This can be managed as described in the article. Visible haematuria can also be an expected finding immediately following SPC insertion.

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d. Incorrect. Again, you should assess the patient for the presence of clots, clot retention or a pyocystis. Unless any of these factors are present, he can be managed conservatively by establishing a cause for his haematuria (UTI, trauma, bladder stones etc) and if well he can have imaging and a flexible cystoscopy as an outpatient to find a cause.

e. Incorrect. This lady is very likely to have haematuria relating to her bilateral stents, which can usually be managed without any catheterisation.

5) Which of these (catheterised) patients needs a TWOC arranging while you are writing their discharge summary?

a. Incorrect. It is unlikely this geneltman will pass a further TWOC. Ensure his bowels are opening, there is no reversible cause for retention such as a UTI and consider performing a TURP or inserting a long-term SPC which may be more comfortable. He should be seen in outpatients by a urologist to discuss.

b. Incorrect. This man is likely to have chronic urinary retention with associated UTIs due to his bladder outflow obstruction. He will likely 'fail' a TWOC and simply be re-catheterised. A discussion regarding long term urethral/supra-pubic catheterisation should occur, or if he is dextrous an dmotivated one could also consider CISC.

c. Incorrect. This lady is likely to need a prolonged period of catheterisation, and has chronic urinary retention. Removing her catheter which was difficult to insert, would be foolish! The options here would be to take advice from the gynaecology team regarding treating her vaginitis, reassessing and performing a formal Cystoscopy & urethral dilatation down the line. Again, this case should be discussed with a urologist.

d. Correct. This man is young, has had the cause of his anuria and renal failure treated and should not be catheterised longer than necessary.

e. Incorrect. This gentleman has what sounds like high pressure urinary retention, and he also had haematuria which will need to be investigated as an outpatient with a flexible cystoscopy. He should have a conversation regarding a TURP, versus a long term catheter.

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URINARY RETENTION - MANAGEMENT GUIDE FOR NON-UROLOGISTS

O Blach, A Ali, C Coker

Abstract

Urinary retention is the most common urological emergency encountered by junior doctors, yet it is often the most poorly managed one. With a comparable burden on patients' quality of life to an episode of renal colic, urinary retention warrants prompt and appropriate management, each and every time.

In this article, we aim to summarise the current evidence base behind this common urological emergency, highlight the clinically relevant distinction between precipitated and spontaneous acute retention, and high-pressure and low-pressure chronic retention, and outline the best practice management of urinary retention.

In doing so, we aim to equip junior doctors with the necessary knowledge to effectively and safely manage a variety of patients in urinary retention.

Introduction

Urinary retention is the most common urological emergency encountered by junior doctors (1), yet it is often the most poorly managed one. Its complexity is often underestimated. The wide range of presentations, a myriad of pathological processes behind it, and the plethora of definitions in the literature (2), make urinary retention challenging to understand and to get right each time.

With a comparable burden on patients' quality of life to an episode of renal colic (3), urinary retention warrants prompt and appropriate management.

Urinary retention refers to the inability to completely empty the bladder (4). It can be acute, chronic, or acute-on-chronic. Traditionally, acute urinary retention (AUR) has been defined by the International Continence Society as a painful, palpable or percussable bladder, when the patient is unable to pass any urine; chronic urinary retention (CUR) is defined as a non-painful bladder, which remains palpable or percussable after the patient has passed urine (5).

In this article, we aim to summarise the current evidence base behind this common urological emergency and, in doing so, equip junior doctors with the necessary knowledge to effectively and safely manage a variety of patients in urinary retention.

Epidemiology

AUR is often unexpected, typically inconvenient and always unpleasant. The longer a man lives, the higher his chances of developing AUR. A 70-year-old man has a 1 in 10 chance of experiencing AUR over a 5-year period (6). This increases to 1 in 3 in an 80-year-old (7).

Men with lower urinary tract symptoms (LUTS) (IPSS scores >8), large prostates (>30-40cc), and poor urinary flows (Qmax <12ml/s) are at the greatest risk (6), as evidenced by the Olmsted County Study, Proscar Long-Term Efficacy and Safety Study (PLESS) and the Medical Therapy of Prostatic Symptoms (MTOPS) trial (8-10).

PSA was the strongest predictor of both AUR and the need for bladder outflow obstruction (BOO) surgery in a commonly quoted community study from Minnesota (11). A precipitating event was identified in over a half of the participants of these studies.

AUR occurring in any other group should be carefully assessed. AUR is extremely rare in infants and is usually associated with infection (2). In children, the high rate of severe underlying pathology is remarkable and should alert physicians to the importance of prompt and comprehensive evaluation (12). In women, careful neurological assessment, bimanual pelvic examination and a pelvic ultrasound should be performed as a minimum (13).

In contrast, data for CUR are sparse (6). The exact incidence and prevalence of CUR, along with the overall burden of it, remain unknown (14). However, it is understood that CUR affects predominantly elderly men (14).

Aetiology & pathogenesis

Urinary retention can be broadly classified, based on its aetiology and pathophysiology (3-4), into acute - precipitated or spontaneous, and chronic - low-pressure or high-pressure retention.

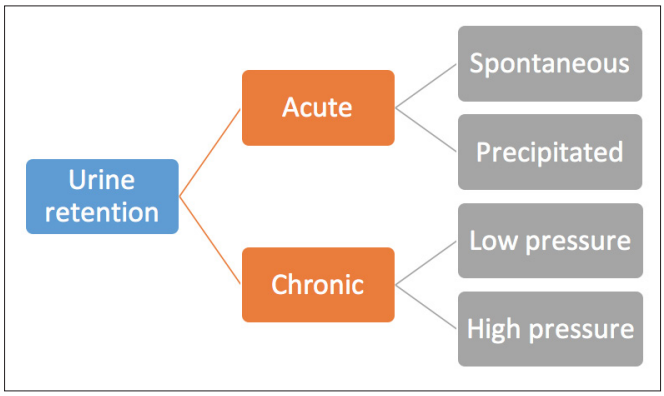

Figure 1

Several shared mechanisms have been postulated behind both AUR and CUR. These can be obstructive, myogenic and neurological, as summarised in Figure 2.

Figure 2

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A clinically relevant distinction must be made between precipitated and spontaneous AUR (15). The former can be triggered by any infectious or inflammatory process, surgery, anaesthesia, pharmaceuticals, ETOH and constipation. The latter is most commonly a sign of BOO, which could be either due to progression of benign prostatic hyperplasia (BPH) or urethral stricture (16). In the PLESS study, precipitated and spontaneous AUR were shown to have different outcomes, with spontaneous AUR being more commonly associated with further AUR episodes and BOO surgery (17).

Similarly, in CUR, it is essential to differentiate between high-pressure chronic retention (HPCR) and low-pressure chronic retention (LPCR), as the two have different aetiologies, associated complications and managements. The terms high and low refer to the detrusor pressure at the end of micturition (2).

HPCR is characterised by a high voiding detrusor pressure in association with poor urinary flow rates and high post-void residuals, often due to mechanical BOO or sphincter overactivity. Intravesical pressure remains persistently elevated throughout the storage and voiding phases, creating a back-pressure on the upper tracts, and eventually resulting in bilateral hydronephrosis and ultimately renal failure, the hallmarks of HPCR (2). In contrast, LPCR is seen in very compliant 'floppy' bladders with low detrusor pressures, poor flow rates, and very high post-void residuals, however, without associated renal failure or hydronephrosis (18).

Presentation

AUR should be diagnosed promptly and treated as an emergency in patients presenting with lower abdominal pain and distension, inability to pass urine, and a palpable and percussable suprapubic mass. Patient may or may not have preceding LUTS. Renal insufficiency is not often a complicating factor – patients in AUR, typically, seek medical help promptly to relieve their severe discomfort.

In contrast, CUR has a more insidious onset, developing over months to years (14). Patients may be asymptomatic, or have very mild LUTS. Adult nocturnal enuresis, occurring when urethral resistance at night is overcome by the maintained high bladder pressure (2), is almost pathognomonic of CUR, and should immediately alert one to this diagnosis. CUR should be considered in patients with non-painful, palpable or percussable bladders after passing urine and persistent residual volumes of >300 ml, or in patients presenting with many litres in their bladders (4). It should always be ruled out in anyone with new or worsening renal insufficiency (19).

In both AUR and CUR it is essential to elicit a full urological history, differentiating between storage and voiding LUTS, and maintaining high index of suspicion for any red flag symptoms, e.g. haematuria, recurrent infections and bladder pain. The rest of the history should be focused on any gastrointestinal complaints, general wellbeing, relevant past medical and surgical history, and pharmacotherapy.

Initial assessment & management

Initial assessment and management of both AUR and CUR are largely identical (2). All patients with suspected AUR or CUR warrant thorough examination, focusing on the presence of a suprapubic mass, pain and any hernias. Any scars should be noted, in the rare cases where suprapubic catheterisation may be considered. A per rectum (PR) exam is compulsory, noting not only the size and consistency of the prostate, but also presence or absence of hard stool in the rectum, anal tone, and sensation.

Bladder volume scan is a useful adjunct pre-catheterisation, but should not delay it. Urinalysis should be performed as a quick screen for infection (leucocytes, nitrites), diabetes (glucose) and renal insufficiency (protein). Catheter specimen of urine (CSU) should be sent for further tests (microscopy and cultures, urine protein to creatinine ratio), if appropriate.

Renal function should be checked in all cases (19-20), however, PSA testing is best avoided for at least 4-6 weeks after the acute episode, to avoid falsely high results (21).

Catheterisation is required in all cases of AUR (2). Ethically, this should be performed as early as possible to ensure patient comfort and 'safety' of a bladder, and should not be delayed, e.g. by referral to A&E or Urology, providing one has appropriate training.

Following initial catheterisation, urine output should be meticulously monitored. The volume drained in the initial 15 minutes should be recorded as the residual; this can be used for crude distinction between AUR (<1L) and CUR (>1L), but has to be carefully interpreted in relation to the symptoms (pain) and evidence of renal insufficiency.

The clinical importance of accurate recording of the residual 15 minutes post-catheterisation is highlighted by the Alfuzosin in Acute Urinary Retention (ALFAUR) study (16), in which elderly (>65) patients with AUR and residuals >1L had significantly higher risk of trial without catheter (TWOC) failure; those successfully TWOC'd but with high residuals in turn had a high rate of AUR recurrence.

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Catheterisation in CUR is somewhat less clinically urgent – pain is minimal or absent, and there is no risk of bladder rupture (22-24). Indications for catheterisation in CUR include renal insufficiency and bilateral hydronephrosis (i.e. signs of HPCR), very high residuals on bladder scan, or in acute-on-chronic retention (2). In the absence of these, catheterisation can be avoided to minimise the associated morbidity, and patients should be considered for alpha1-blockers and / or early surgery.

Patients with CUR should be observed for diuresis and decompression haematuria. Post-obstructive diuresis occurs secondary to salt and water offloading, loss of the cortico-medullary gradient or high urea levels resulting in osmotic diuresis (2). If consistently draining >200-250ml per hour for >3 hours after catheterisation, patients should be admitted for fluid replacement at 50-80% of their hourly urine output.

This should be reviewed after 24 hours to avoid iatrogenically-perpetuated diuresis. Decompression haematuria is usually self-limiting after 48-72 hours, therefore practice of slow decompression (timed clamping and unclamping of the catheter) is unnecessary.

Ultrasound of the renal tract could be considered in patients with very high residuals and in patients with evidence of renal insufficiency. This should typically be performed 24-48 hours after decompression by catheterisation. All women should have a pelvic ultrasound to rule out pelvic masses compressing the bladder outlet.

It is essential to always re-assess the patient after any intervention, especially catheterisation, to ensure resolution of their symptoms and signs. This is because patients with other more sinister differentials (AAA, diverticulitis, abscess, perforation, bowel ischaemia, pelvic malignancy) can sometimes be incorrectly referred as UR (2); UR can also arise secondary to any of these conditions...

Failed catheterisation

Suprapubic catheterisation (SPC) is a viable alternative to the traditional urethral route. In an acute setting, it tends to be reserved only for cases of urethral catheter failures and should only be performed by adequately skilled clinicians, due to the risk of serious complications, such as bowel perforation and peritonitis (25-26). In all cases of >3 failed attempts at urethral catheterisation, a Urologist should be contacted urgently. Urethral catheterisation under flexible cystoscopic guidance or SPC insertion may be considered by the specialist at this point.

If Urological advice cannot be obtained, or appropriate expertise for SPC insertion is not available at a particular time, British Association of Urological Surgeons' suprapubic catheter practice guidelines (27) permit suprapubic aspiration of urine using a needle of up to 21 gauge placed 2 finger breadths above symphysis pubis as a means of temporarily relieving the patient's symptoms.

According to the Reten-World survey (16), there is no difference in long-term complication rates between urethral catheters and SPC in terms of asymptomatic bacteriuria, lower UTI, or urosepsis. SPC is however the preferred method for many patients, due to lesser discomfort, ability to maintain normal sexual function, and lower incidence of bypassing (28-29).

With the growing popularity of safer Seldinger suprapubic catheters (30), introduction of specific NICE guidelines on SPC catheterisation under USS guidance, and wider teaching of the Seldinger method, the use of suprapubic catheterisation as the primary means of decompression in AUR in Emergency Departments may increase in future.

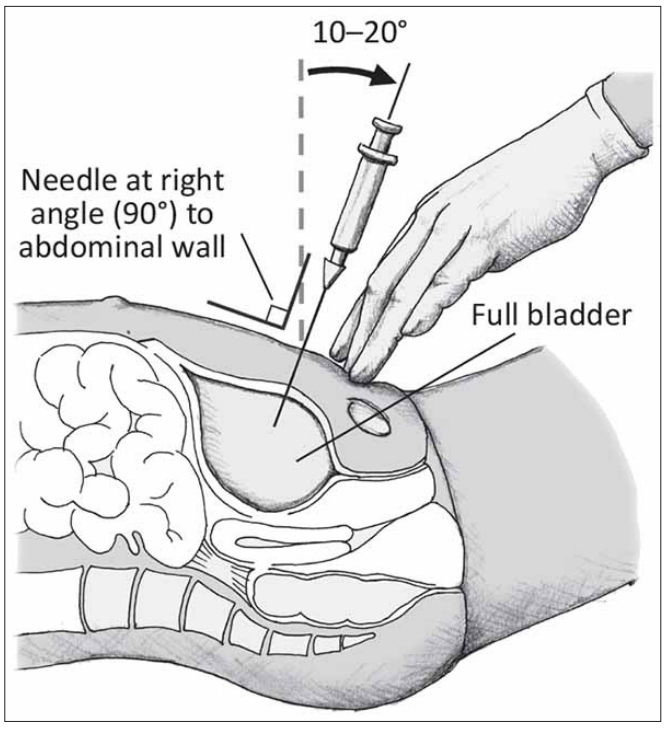

Figure 3

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Beyond the initial management

Currently in the UK, the delayed treatment of both AUR and CUR is varied. There is also no uniform consensus on the optimal duration of catheterisation (16), especially for AUR, and the management following it. TURP remains the gold standard treatment for BPH with complications (31). However, the potential morbidity of prolonged catheterisation, along with the greater morbidity and mortality associated with emergency surgery (within days of catheterisation), have led to an increasing use of TWOC.

In AUR, TWOC is now considered for the majority of patients. Removal of catheter after 1-3 days not only reduces the risk of comorbidities, but also allows surgery to be postponed to an elective setting, and in some patients, may prevent the need for it altogether (3).

Age <65 years, precipitated AUR (UTI with no obstructive LUTS, constipation, newly started anticholinergics or sympathomimetics), PVR <1L, and prolonged catheterisation, have all been linked to a higher chance of passing TWOC (16). Increased probability of successful TWOC with longer catheterisation (62% after 3 days vs. 44% after 1 day (7)) must be balanced against the significantly increased risk of comorbidities (if catheterised >3 days (7)). In the current NHS climate, however, TWOC is rarely performed in <14 days.

Use of an alpha1-blocker prior to attempting TWOC may also be of help, especially in spontaneous AUR. AUR related to BPH has been associated with increased alpha-adrenergic activity (3); alpha-blockade can be used to reduce bladder outlet resistance and facilitate micturition (32). In the Reten-World survey, 82% of patients received an alpha1-blocker before TWOC, with significantly greater success in those receiving alpha1-blockers, regardless of age (16). A recent meta-analysis concluded that alpha1-blockers increase the success rates of TWOC (33).

TWOC can be also considered, together with clean intermittent self-catheterisation (CISC), as an alternative to an indwelling catheter, in select patients with LPCR, providing they are subject to strict follow up. CISC is safe, simple, and, with proper training, widely-accepted and well-tolerated by patients. CISC is especially valuable in patient with LPCR who are considering BOO surgery, in that it may aid pre-operative recovery of bladder contractility. It can also be used in those who fail to void after TURP, i.e. patients with pre-existing detrusor failure, and is particularly important for patients with neurological bladder dysfunction (34).

In contrast, patients with HPCR must not be TWOC'd. These patients are typically discharged with a long-term indwelling catheter until seen in a Urology clinic, where they are counselled with regards to their long-term options: BOO surgery, permanent urethral or SPC catheter, or 'on-the-clock' CISC (suitable for small minority of patients).

Prevention before cure

Risk factors for AUR – age (>65), LUTS (IPSS scores >8), large prostates (>30-40cc), and poor urinary flows (Qmax <12ml/s) - are well established (6). Yet for patients, AUR is often unexpected, terribly inconvenient, unpleasant, and associated with significant anxiety. Even with exemplary management, AUR is a source of significant morbidity and huge burden on patients' quality of life. Increasing efforts are therefore placed on preventing AUR in the first place (19).

In men with large prostates, the use of 5alpha-reductase inhibitors (finasteride) alone, or in combination with alpha1-blockers (doxazocin) has been shown to significantly reduce the probability of AUR (MTOPS)10.

In men with moderate-to-severe LUTS, care should be taken when prescribing anticholinergics or sympathomimetics (alpha-adrenergic agonists). Instead of restricting these medications in all patients, baseline flow rate and PVR should be considered prior to prescribing them and following their initiation to ensure that CUR is not developing (19).

Finally, in men at high risk of AUR undergoing orthopaedic, inguinal, or colorectal surgery, careful fluid and pain management should be applied. Prophylactic use of alpha1-blockers has been suggested following encouraging results of one RCT (35), but there is still no clear guidance on who should specifically receive it.

Conclusions

With the aging population, urinary retention is likely to remain the most common urological emergency encountered by junior doctors (1). The simple steps outlined in this article should help junior doctors with little urology experience to manage it well, each time. Nevertheless, these should not detract junior doctors from seeking prompt urological advice in cases of failed catheterisation and high pressure urinary retention.

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URINARY TRACT INFECTIONS: INTERPRETATION OF INVESTIGATIONS & MANAGEMENT OF THE ACUTELY SEPTIC PATIENT

TG Moore, SD Naylor, LK Lee

Abstract

Urinary tract infections (UTIs) are a common cause of hospital admission and sepsis worldwide. There are many predisposing risk factors for UTIs including being female, elderly, mechanical or functional obstruction of the urinary tract, renal insufficiency and immunosuppression. The diagnosis of lower UTIs is made based on recognition of characteristic signs and symptoms of dysuria, urinary frequency, suprapubic pain and turbid urine. Patients with acute pyelonephritis may complain of flank pain, fever, systemic illness and these can occur in the absence of lower urinary tract symptoms.

When these signs and symptoms are combined with urinalysis and positive midstream urine (MSU) cultures, there is a high degree of sensitivity and specificity. Once MSU have been cultured, targeted antibiotic therapy can be commenced. The case presented in this report follows the diagnosis and management of a patient who had urinary sepsis with a background of multiple predisposing risk factors. The patient was managed in the Intensive Care Unit (ICU) and was found to have a 19mm ureteric calculus.

This was therefore, by definition, a complicated UTI, not a simple one. He was treated with broad-spectrum intravenous (IV) antibiotics, organ support and a percutaneous nephrostomy. The case is an example of how to recognise and treat a patient with severe urosepsis and the importance of careful management of patients to prevent morbidity and mortality. The report ends with some multiple choice questions on some of the topics discussed.

Introduction

Urinary tract infections (UTIs) include all infections from the kidneys to the urethra. Those involving the bladder are known as cystitis to the layperson, while those that affect the upper urinary tract include pyelonephrits. These infections affect 150 million people each year and are one of the most common causes of infection worldwide.(1) They typically affect women but are also common in patients such as those with diabetes, malformation or obstruction of the urinary tract, long term catheters and compromised immune systems.

In addition to this, UTIs are the third leading cause of sepsis in Europe.(2) Infections of the urinary tract are categorised as uncomplicated or complicated. Uncomplicated UTIs are those affecting otherwise healthy individuals who have no structural or neurological disease of the urinary tract. On the other hand, complicated UTIs involve features that predispose the patient to infectious disease of the urinary tract such as mechanical or functional obstruction, neurogenic bladder, foreign bodies such as calculi or drainage devises, pre-existing renal disease, pregnancy, and immunosupression. As already mentioned, UTIs are rare in adult men so are, by definition, also complicated. These factors lead to more severe pathology and require more intensive, longer courses of treatment.(1)

Case

A 61-year-old man presented to the Accident and Emergency (A&E) department with a seven day history of worsening abdominal distension, nausea, malaise, fever and one day without passing stool or flatus. He had a background of:

- *Paraplegia secondary to spinal cord injury at the level of T5/T6*
- *Chronic kidney disease with split renal function 75% right 25% left*
- *Recurrent UTIs*
- *Previous staghorn calculus.*
- *Intermittent self-catheterisation*
- *History of Methicillin-resistant Staphylococcus aureus (MRSA) culture from urine*

On examination the patient was pale, sweaty and clammy, with a temperature of 38.4ºC. His heart rate was 133 (regular), blood pressure 65/30, respiratory rate 30, and his oxygen saturation was 95% on room air. On auscultation, the chest was clear, and palpation revealed a distended tympanic abdomen, however tenderness could not be assessed due to the patient's loss of sensation.

A urine dip was positive for blood +++, protein ++ and leucocytes +. Routine bloods revealed an acute kidney injury (creatinine 309 and urea 17.7), and raised markers of infection (C-reactive protein (CRP) 314 and white cell count (WCC) 19.4), lactate was 3.8 and liver function was mildly deranged. A radiograph of the abdomen revealed dilated loops of small bowel and chest radiograph had no abnormalities.

The sepsis pathway was initiated in the A&E department and the patient was given a stat dose of Meropenem, catheterised and fluids were started. A nasogastric tube and a flatus tube were inserted and despite resuscitation with 6L crystalline fluids, blood pressure could not be maintained and urine output was poor. Consequently, an infusion of Mannitol was commenced.

The patient was then transferred to ICU where he was treated with Noradrenalin to maintain his blood pressure, and his infection was treated with Meropenem and Teicoplanin due to possible MRSA sepsis. A CT of the thorax, abdomen and pelvis was requested which revealed: a 19mm ureteric calculus on the right hand side at the level L4/L5 with surrounding inflammatory changes; gross hydronephrosis (9cm) of the right kidney; a prominent collecting system on the left side; bilateral renal cysts (as can be seen in figure 1). The following day, once the patient had been stabilised, a right percutaneous nephrostomy was performed to relieve his obstruction.

Blood and midstream urine (MSU) cultures later revealed growth of Escherichia Coli (E. Coli), with sensitivities to multiple antibiotics. The patient was stepped down from IV antibiotics to oral Co-amoxiclav for two weeks and was then discharged home with follow-up for elective removal of the calculus.

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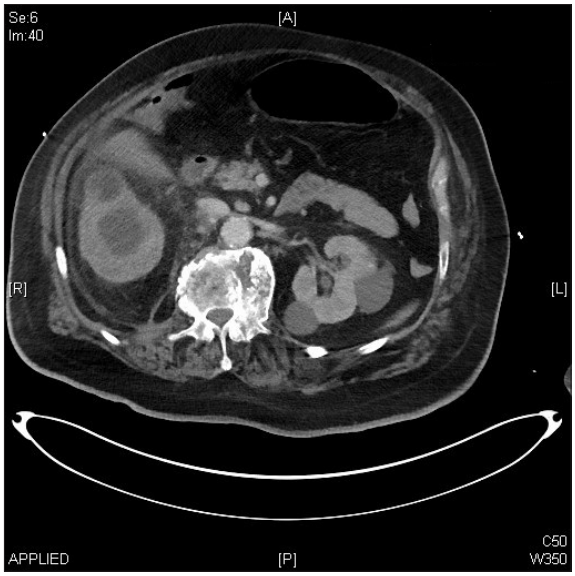
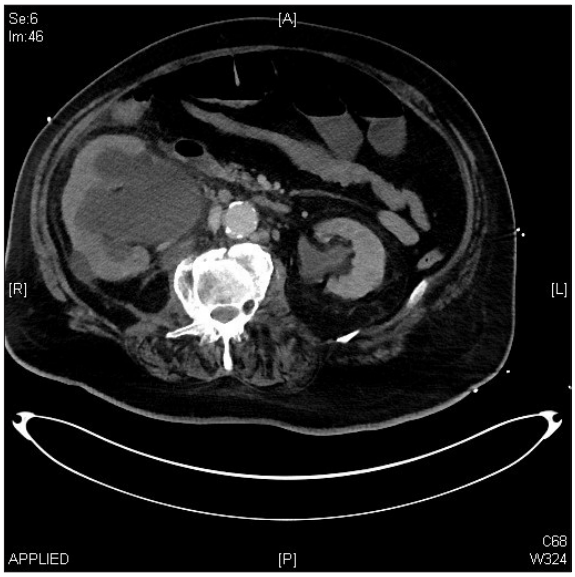
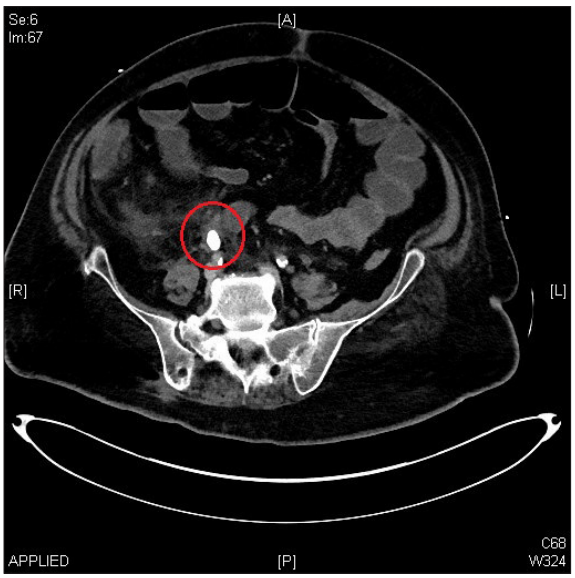
Figure 1: CT of the abdomen and pelvis showing signs of right sided obstructive uropathy and pyonephrosis:



A) Enlarged right kidney with perinephric stranding and incidental findings of multiple left kidney cysts



B) Extensive hydronephrosis of the right kidney



C) Obstructing calculus (19mm) of the right ureter at the level of L4/L5 as highlighted by the red circle

Discussion

Diagnosis of urinary tract infections

A UTI is defined as any infection that affects the urinary tract.. The diagnosis of lower UTIs is a clinical diagnosis based on characteristic symptoms of dysuria, urinary frequency, haematuria, suprapubic pain and turbid urine. Those presenting with pyelonephritis may have an absence of lower UTI symptoms, but complain of flank pain and be systemically unwell.

Patients with urosepsis may also have signs such as pyrexia, tachycardia, hypotension and tachypnoea. Laboratory findings suggestive of inflammatory processes such as raised WCC and CRP are present and the diagnosis is confirmed by the presence of positive urine dip and MSU culture results. Deranged urea and electrolytes may also be present and indicate obstruction of the urinary tract or severe sepsis.

Urine dipsticks are a useful element of diagnosis, especially in patients with minimal urinary signs and symptoms. Urine dips are inexpensive, quick and widely used in both hospitals and community. When combined with targeted antibiotics, they have been found to be the most cost effective method of managing UTIs.(3)

Urine dipsticks test for nitrites, leucocytes, blood and protein in the urine.

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Nitrites are formed as the result of endogenous nitrates, which are converted by certain bacteria present. Pseudomonas, Candida and Streptococci do not form nitrites, so particular care must be taken in situations where these are higher risk (e.g. Enterococcus in hospitalised patients). Used alone, the sensitivity of nitrites is 23%, whereas the sensitivity of leucocytes is 49%.(4) Blood is the most sensitive single marker (64%) but has a low specificity, so is not of great use for a diagnosis of UTIs when used alone.

The low specificity of blood is due to numerous causes of false-positives, including menstrual blood, calculi, strenuous exercise and haemoglobinuria. (4) The combination of blood, leucocytes and nitrites has the highest sensitivity and specificity. Interestingly, the appearance of the urine has also been shown to be a good predictor of infection. When assessed against a bright background, the turbidity of urine has a sensitivity of 90% and specificity of 66%.(5)

The following point system was created by Little et al(6) and combines urinalysis with clinically picture. When the patients in their study had a total of 3 or more points, 84% of them were shown to have an infection. Furthermore, they found that if the total score was 4.5 or above, then there was a specificity of 97%.

- **Positive nitrite = 2**
- **Positive leukocytes = 1.5**
- **Haematuria = 1**
- **Moderately to severe dysuria = 1**
- **Moderately to severe nocturia = 0.5**

The gold standard for diagnosing UTIs is MSU culture. Not only does it confirm the diagnosis, it provides invaluable information regarding the causative organism and antibiotic sensitivities, which are crucial for successful management. It has been found that urine culture can be worthwhile even when there is a negative urine dip.(4)

Although testing urine is important, there has been a shift away from giving antibiotic treatment to non-pregnant patients with asymptomatic bacteriuria.(7) This is of most relevance in the over 65s where up to 20% of asymptomatic healthy women will have a positive urine culture.(7) As well as age and gender, other risk factors for asymptomatic bacteriuria include sexual activity, comorbidity, institutionalisation and catheterisation.(5) In contrast, pregnant women with asymptomatic bacteriuria should be treated with antibiotics as it is associated with a reduction in pyelonephritis, pre-term labour and low birth weight.(5)

Imaging the urinary tract

Although UTIs are a clinical diagnosis, imaging of the urinary tract is useful for confirming pathology and identifying complicating factors.(8-9) First-line imaging when investigating UTIs consists of an ultrasound scan (USS) of the renal tract to exclude obstruction. However, uncomplicated UTIs in systemically well females do not routinely need imaging.

Ultrasonography is particularly useful as it is cheap, quick and non-ionising. Signs of obstruction include hydronephrosis and blunting of the calyces. There are many signs that can indicate infection on USS, including enlargement of the kidney, hypo- or hyper-echogenic segments, abscess formation and the presence of gas. These may only be present in around 25% of cases.(8,10)

CT scans of the kidneys, ureters and bladder (KUB) provide far more detailed imaging of the renal tract than ultrasonography. They are often reserved for complicated UTIs, where the additional information that they provide can be used to plan surgical interventions. These may include percutaneous nephrostomy or ureteric stenting, and abscess aspiration. Features such as perinephric stranding, thickening of the renal fascia and enlargement of the kidney may be present, which are highly suggestive of infection..

Additionally, signs such as parenchymal swelling or streaky areas of hypo- and hyper-enhancement spreading from the papilla to the cortex confirm the diagnosis of pyelonephritis. As well as this, CT KUB provides detailed structural information of the urinary tract, identifying abnormalities such as abscesses, strictures, obstructing masses, calculi and gas.(8)

Magnetic Resonance Imaging are difficult to interpret, but can still be useful in pregnant patients in whom irradiation is contraindicated.

Treatment

The treatment of UTIs consists of anti-microbial therapy, symptomatic management and, in the case of complicated UTIs resolution of the complicating factor. In patients where UTIs progress to urosepsis, sepsis specific therapy is also required.

As mentioned previously, lower UTIs in women are a very common, mostly benign illness and in most cases a short course of antibiotics and simple over-the-counter analgesia is sufficient or, in some cases, self-treatment with fluids. In cases of uncomplicated lower UTIs, an empirical three day course of Nitrofurantoin or Trimethoprim is effective in curing infection in 94% of patients.

It is important to note that, although rare, Nitrofurantoin can cause serious and potentially irreversible pulmonary complications. Both of these antibiotics have good activity against E. Coli. This can be extended to a five to fourteen day course for those patients with complicated lower UTIs. In those who do not respond to this initial management, urine cultures and sensitivity should be checked and antibiotics changed accordingly. (11)

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In contrast to women, UTIs in healthy males are uncommon and 80% are secondary to pre-existing urological disease.(5,12) For cases of UTIs in men, a seven day course of Nitrofurantoin or Trimethoprim is recommended by NICE, in addition to the symptomatic control as described for women.(12)

If prostatitis is suspected, for example, in men with pyrexia or recurrent UTIs, then a quinolone antibiotic is recommended rather than Nitrofurantoin, which has poor tissue penetration. Regardless of gender, if lower UTIs are recurrent (more than two every three months), then specialist referral should be made.(12)

Pyelonephritis is often the result of an infective organism in the urinary tract ascending from the bladder to the ureters and kidneys; however, they may also develop through haematogenous spread. These infections can cause both acute and chronic impairment of kidney function and have the potential to develop into urosepsis. They should therefore be treated more aggressively than lower UTIs and may need hospital admission for treatment.

Criteria for admission include pyrexia, high Early Warning Score (EWS), inability to take oral fluids and significant co-morbidity.(13) Antibiotic treatment with oral Co-amoxiclav for 10 to 14 days should be commenced or, if the patient is penicillin allergic, then they can be treated with ciprofloxacin for 10-14 days. Both of these antibiotics have a broad-spectrum of activity and very good tissue penetration.(5)

It is important to correlate antibiotic choice with the sensitivity of isolated organisms from MSU cultures. Pain should be treated with paracetamol or codeine. Full hydration should be maintained to protect against AKI and flush out infection. In general, men should be referred for further investigation, as infection is likely to be secondary to a complicating factor. Women with recurrent pyelonephritis should also be referred for further investigation.(13)

As UTIs are one of the most common indications for antibiotics in adults, they play an important role in worldwide antibiotic resistance. The World Health Organisation (WHO) have extensively studied the increasing resistance of common antibiotics in treating UTIs.(14) Most worryingly, there are some UTIs that are now multidrug-resistant. For this reason, it is recommended that non-pregnant patients with asymptomatic bacteriuria do not require antibiotics.(5,11) Some literature also recommends against using low-dose antibiotics for prophylaxis, however, this is still sometimes indicated.(15)

Urosepsis occurs when a UTI initiates a cascade of systemic inflammatory responses, resulting in organ dysfunction. It is a life-threatening disease with an overall hospital mortality rate of 40%.(2) Successful treatment consists of rapid diagnosis, treatment with appropriate antibiotics and optimal management of urological disorders, in particular drainage of any urological obstruction. In severe sepsis, organ support such as vasopressors, inotropes, ventilation and haemodialysis may also be required.(16)

The Sepsis 6 should be initiated as a priority, which consists of:

1. *Blood and urine cultures*
2. *Lactate and full blood count*
3. *Accurate urine output measurement*
4. *IV antibiotics*
5. *IV fluids*
6. *Oxygen*

Broad-spectrum IV antibiotics should be started and adjusted according to clinical response and the results of culture sensitivity. Our trust recommends the use of Tazocin however guidance will vary depending on local sensitivities. Most cases of urosepsis are the result of obstruction and as such any obstructing lesions should be identified using the imaging modalities described above and promptly relieved by the use of ureteric stenting or percutaneous nephrostomy.(16)

Successful management of urosepsis:

- *Sepsis 6*
- *Rapid diagnosis*
- *Broad-spectrum antibiotics*
- *Organ support*
- *Correction of urological abnormalities*

Conclusion

The case presented above describes a patient with numerous risk factors for developing complicated UTIs. The patient's history highlights the potential severity of UTIs and the necessity of careful management if urinary sepsis develops. Management of urinary sepsis should involve rapid diagnosis, IV broad-spectrum antibiotics and organ support until there is clinical improvement and MSU cultures have indicated antibiotic sensitivities.

In addition to this, clinical improvement and urine and/or blood cultures have indicated antibiotic sensitivities. it is important to correct any urological abnormalities that could have caused urosepsis, such as obstruction. Diagnosis of UTIs should be made based on a combination of symptoms and urinalysis, which have a high and sensitivity and specificity when used together.

Imaging is useful to indicate severity of disease and identify potential risk factors. In most patients with suspected UTI, USS is the imaging tool of choice. However, if calculi are suspected then a radiograph and CT KUB are indicated. Lower UTIs are one of the most common bacterial illnesses in adults and can usually be treated with a short course of antibiotics and over-the-counter analgesia.

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Current guidance recommends that uncomplicated UTIs in women and men should be treated with antibiotics for three and seven days, respectively. Different antibiotics should be used where pyelonephritis is suspected as not all antibiotics have good tissue penetration so would be uneffective. Asymptomatic bacteriuria should not be treated with antibiotics, except in pregnant women. The overuse of antibiotics has contributed to multidrug-resistant infections and poses a significant risk to vulnerable patients.

UTIs may progress to more severe infections that require hospital admission and can be associated with serious morbidity and sometimes death. Therefore patients with complicated UTIs or urosepsis require prompt diagnosis, appropriate antibiotics and resolution of any urological abnormalities or organ disfunction.

Multiple Choice Questions

1) Nitrofurantoin is a poor choice of antibiotic in pyelonephritis because:

A) It has poor renal excretion

B) It has poor activity against common infective organisms in pyelonephrits

C) It is poorly tolerated

D) It has poor tissue penetration

E) It can cause renal impairment

2) Cases of asymptomatic bacteriuria should be treated in:

A) All patients

B) Only if it is persistent for over two weeks

C) In pregnant women

D) In elderly women

E) Patients with artificial heart valves

3) The most common organism causing UTIs is:

A) Klebsiella pneumoniae

B) Enterococcus faecalis

C) Escherichia Coli

D) Proteus mirabilis

E) Staphylococcus saprophyticus

4) A urine dipstick that is positive for blood, nitrites and leucocytes has a specificity for UTIs of:

A) 22%

B) 49%

C) 73%

D) 81%

E) 97%

5) What is the minimum length of antibiotics in males with cystitis:

A) 3 days

B) 5 days

C) 7 days

D) 14 days

E) 21 days

Answers

1. Correct answer (D)

Nitrofurantoin has a good level of renal excretion and is therefore commonly used to treat lower UTIs. However, it has very low tissue penetration and therefore it is a poor choice in pyelonephritis, where infection has reached the kidneys. In addition to this, Nitrofurantoin can exacerbate AKIs. Instead, a course of Ciprofloxacin or Co-amoxiclav should be prescribed.

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2. Correct answer (C)

In the majority of patients, there is limited benefit in treating asymptomatic bacteriuria. It is a relatively common finding in healthy individuals, particularly in elderly women. Treating these patients will increase the prevalence of antibiotic resistance and risk the patient suffering from unnecessary side effects. In pregnant women, however, treatment of asymptomatic bacteriuria is indicated, as without treatment approximately one third of cases will progress into acute pyelonephritis, which is linked to premature labour.

3. Correct answer (C)

While all of these pathogens are known to cause UTIs, E.Coli is the most common. Infections with Proteus mirabilis should be investigated further as they are linked with renal calculi. It is postulated that this is because they produce urease, which converts urea into carbon dioxide and ammonia, increasing the pH of urine causing calcium and struvite precipitates leading to stone formation.

4. Correct answer (D)

The presence of blood, nitrites and leucocytes in urine as detected by urine dip has both high sensitivity and specificity for UTIs.

5. Correct answer (E)

Current guidelines advise that all males with cystitis should be treated with a seven-day course of antibiotics. This is due to the high propensity that infection is secondary to some form of complicating factor and therefore requires more intensive treatment. Cases of recurrent cystitis or a first case of pyelonephrits in men warrants further investigation for an underlying abnormality of the urinary tract.

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UROLOGICAL TRAUMA IN ADULTS

S Yan, D Sharma, N Watkin

Abstract

Urological trauma has been found to occur in 10% of trauma cases, with the kidney being injured in up to 5% of cases. This review article discusses the assessment and management of Urological trauma in adults.

The kidney is commonly injured in blunt trauma and sudden deceleration injuries. The standard modality of diagnostic investigation for suspected renal trauma is a spiral computed tomography (CT) scan. Renal injuries are classified by the American Association for the Surgery of Trauma (AAST) severity score. Grade I to IV renal injuries can be managed conservatively, with certain findings being indicative of surgical exploration.

90% of bladder and 75% of posterior urethral trauma is associated with pelvic fractures. The bladder can also sustain iatrogenic injuries. Cystograms and urethrograms are standard investigations in the diagnosis of these injuries, as recommended by the American Urological Association and European Association of Urology. Management of bladder and urethral injuries is dependent on site of injury and diagnostic imaging findings.

Guidelines and recommendations exist for the assessment and management of Urological trauma which aim to preserve organ function.

Introduction

Trauma is the commonest cause of mortality in those under the age of 40 in the UK, with an estimated occurrence of 20,000 cases each year in England (1,2). An approximated 7% of the annual NHS budget, equating to £1.6 billion, is dedicated to the management of trauma nationwide (3). In 2010, Santucci and Bartley reported that 10% of trauma cases were found to be associated with injuries to the genitourinary system (4).

In this article, we will discuss and explore the assessment and management of Urological trauma in adults.

Renal Trauma

The kidney is the most commonly injured organ of the urinary tract and is reported to be injured in up to 5% of trauma cases (5). The majority of renal trauma is the result of blunt injury rather than a penetrative injury, with road traffic accidents and sudden deceleration being the predominant mechanisms of injury. (5).

Clinical assessment of trauma patients should take the form of the approach recommended by Advanced Trauma Life Support (ATLS). ATLS was devised to improve the care and management of trauma in "rural areas" and has been shown to empower clinicians with decision-making skills, knowledge and clinical skills (6). Following a systematic approach of assessment, including examination for evidence of blunt or penetrating injuries, other bedside investigations can be performed.

Essential focused investigations include urinalysis, haematocrit and baseline creatinine level (5). In suspected renal trauma, the pivotal piece of information is the patient's haemodynamic stability (5). The American Urological Association's guidelines on renal trauma state that diagnostic imaging is indicated in stable patients who have sustained blunt trauma with macroscopic haematuria or microscopic haematuria and a systolic blood pressure recorded at < 90mmHg at any point (8). Diagnostic imaging is also indicated in patients whereby the mechanism of injury or clinical examination reveals a high index of suspicion of renal trauma or if there are major associated injuries (5,8).

The standard diagnostic assessment for suspected renal trauma in haemodynamically stable patients is a contrast-enhanced spiral computed tomography (CT) scan (9). The spiral CT scan comprises of an arterial phase, nephrographic or corticomedullary phase and importantly, a delayed excretory phase, which takes place 1-3 minutes after injection of intravenous contrast (9).

In 1987, the American Association for the Surgery of Trauma (AAST) developed a grading system for individual organ injuries, including one for the kidney (7). To this date, renal trauma is still classified according to this scale based on CT scan findings, as demonstrated in Table 1 (5,7). CT scans not only identify and grade renal injuries, it also allows us to recognise pre-existing renal pathology, comment on contralateral renal function and identify other organ injuries (8).

Grade	Injury Description
I	Contusion or non-expanding subcapsular haematoma No laceration
II	Non-expanding perirenal haematoma Cortical laceration <1 cm deep without urinary extravasation
III	Cortical laceration >1 cm without urinary extravasation
IV	Laceration: through corticomedullary junction into collecting system OR Vascular: segmental renal artery or vein injury with contained haematoma, or partial vessel laceration, or vessel thrombosis
V	Laceration: shattered kidney OR Vascular: renal pedicle injury or avulsion

Table 1. Adapted American Association for the Surgery of Trauma renal injury severity scores. Moore et al, The Journal of Trauma 1989.

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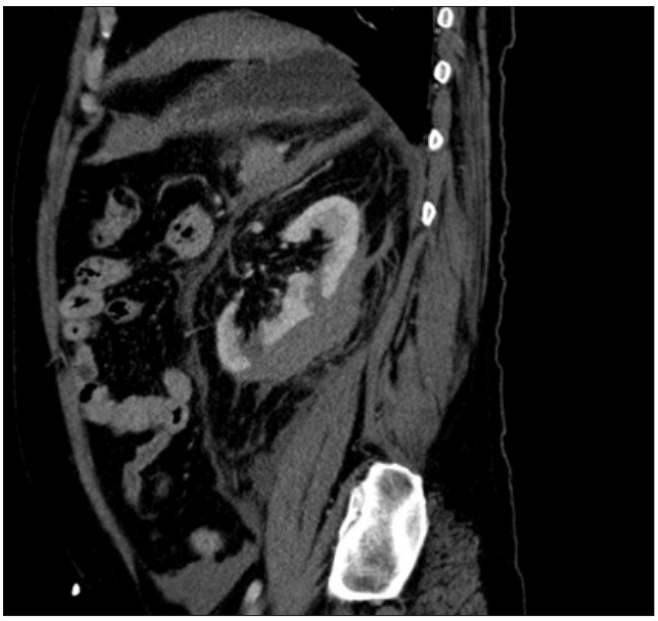

Figure 1. Saggital CT scan image of kidney showing Grade III injury.

The majority of renal trauma is managed conservatively, with less than 5% of blunt trauma to the kidneys requiring surgical intervention (10). Routine surgical exploration of a kidney in the case of penetrating renal trauma is no longer recommended. It is still indicated where there is evidence of an expanding pulsatile retroperitoneal haematoma during laparotomy or where a Grade V pedicle injury is suspected and if there is haemadynamic instability suspected to be originating from renal injury (10).

In modern day practice, most Urologists would advocate conservative management of Grade I to IV injuries (11,14). Broghammer et al reported a meta-analysis in 2007, showing that 90% of Grade IV renal injuries resulting from blunt trauma could also be managed conservatively, with only 12.6% of them requiring subsequent surgical intervention (11). Those renal injuries that result in persistent haemorrhage are managed first line by selective renal artery embolization, which is performed by interventional radiologists to control haemorrhage.

This option is increasingly being utilised as interventional radiology has become more readily accessible across the nation. Repeat CT scans are recommended in Grade IV and V injuries at 48 to 72 hours after injury and if clinically indicated (10). These repeat scans allow clinicians to identify any signs of complications. Complications of conservatively managed renal trauma include secondary haemorrhage, urinoma formation, pyelonephritis, arterio-venous fistula or pseudoaneurysm formation, hypertension, loss of renal function and calculus formation (10).

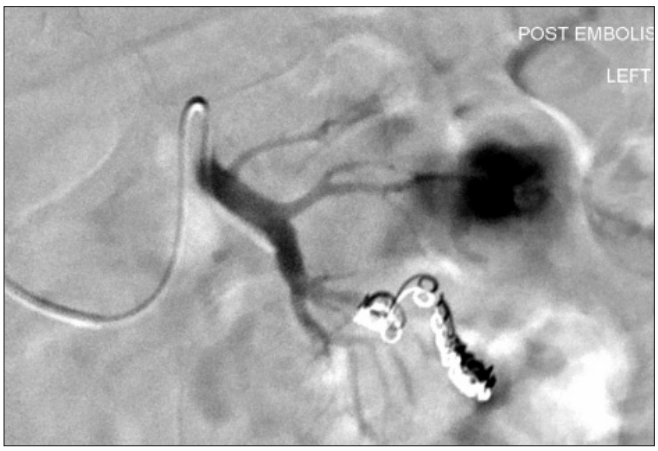

Figure 2. Image demonstrating selective embolisation of renal artery.

Bladder Trauma

Lower urinary tract injuries are mostly associated with blunt trauma, but can occur in penetrating or iatrogenic injuries (12). Up to 90% of bladder injuries and 75% of posterior urethra injuries are associated with pelvic fractures respectively (12). The anatomical position of the bladder lends itself to potential iatrogenic injuries during lower abdominal, pelvic and endoscopic surgery (10).

In the trauma setting, the triad of lower abdominal or suprapubic pain, inability to void and visible haematuria suggests a potential bladder injury or perforation (10). The clinical assessment of the patient should again, be adherent to the ATLS principles with involvement from the trauma, emergency, anaesthetic and surgical teams if necessary. There are various signs and symptoms found to be related to bladder and urethral injury; these are summarised below in Table 2 (11).

Level of Injury	Clinical Signs
Bladder	Haematuria
	Inability to void
	Abdominal tenderness
	Abdominal distension (urinary ascites)
	Suprapubic bruising
	Entrance/exit wounds in lower abdomen, perineum or buttocks (penetrating injury)
Male urethra	Blood at the urethral meatus
	Inability to void
	Haematuria and dysuria (in partial rupture)
	Scrotal, perineal and/or penile swelling
	High-riding or impalpable prostate (unreliable sign)
	Difficulty/inability to insert urethral catheter
Female urethra	Blood at the urethral meatus and/or vaginal itroitus
	Inability to void
	Haematuria (in partial rupture)
	Labial swelling
	Vaginal laceration

Table 2. Clinical signs and symptoms associated with bladder and urethral injury, adapted from Lumen et al, EAU Trauma Guidelines, 2015.

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Both the American Urological Association (AUA) and the European Association of Urology (EAU) recommend conventional cystography (or cystogram) or CT cystography as a diagnostic modality of suspected bladder injuries (13). The EAU recommends that imaging in the form of cystography is required in the setting of visible haematuria and pelvic fracture (14).

These are performed in the retrograde fashion, which means that in the absence of urethral injury, a urethral catheter is passed into the bladder to fill the bladder with diluted water-soluble contrast (10). The bladder should be filled with up to 350mls of diluted contrast, after which AP and post-drainage radiographic films are taken in the interventional radiology suite to obtain a conventional or plain cystogram (10,12). The post-drainage films are of particular importance as a bladder full of radio-opaque contrast may disguise the presence of injury to the posterior bladder wall (10). This can be performed with CT imaging which could identify other injuries to the surrounding structures (12).

Bladder injuries can be extraperitoneal (60%), intraperitoneal (30%), or a combination of both (10%) (10,13). The EAU and AUA guidelines both recommend that uncomplicated extraperitoneal bladder injuries can be managed conservatively by free drainage of the bladder with a urethral catheter for 10 to 14 days, antibiotics and clinical observation (10,13).

Complicated extraperitoneal bladder injuries, such as exposed bone within bladder lumen and the presence of rectal or vaginal lacerations, indicate surgical intervention (13). Persistent urinary extravasation, bladder neck injury, failure of catheter to drain or if the patient is undergoing surgery for a pelvic fracture or other viscus organ repair are also indications for surgical repair of the bladder (10,13). A follow up retrograde cystogram should be performed at 2 to 3 weeks to assess for complete healing of the bladder injury after conservatively managed and surgically managed extraperitoneal injuries, as recommended by the AUA and EAU (10,13).

Intraperitoneal bladder ruptures are usually caused by a "blowout" injury, whereby there is a sudden rise in intravesical pressure (8,14). This leads to rupture, usually at the dome, of the bladder at its weakest and most mobile point (14). Interruption of the intraperitoneal surface of the bladder results in urinary extravasation and it is unlikely to heal without surgical intervention and can lead to further complications such as peritonitis, systemic sepsis and death (10,14).

The AUA and EAU both recommend formal surgical repair of intraperitoneal injuries of the bladder from trauma (8,14). Surgical repair should be performed in a two-layer closure of the bladder defect and this could be undertaken laparoscopically if there are no other intra-abdominal injuries (14). The less commonly encountered penetrating injuries of the bladder should all undergo emergency surgical exploration through a midline cystostomy incision (14).

Surgical exploration allows the surgeon to inspect the bladder wall and distal ureters, debride devitalised bladder muscle and repair the defect (14). Drainage of the bladder is still recommended following surgical repair through a urethral catheter to allow the closed wound to heal (10). A follow up cystogram is not necessarily required after simple surgical repair of an intraperitoneal injury; imaging should be performed on a case-to-case basis (13).

Urethral Trauma

In the trauma setting, urethral injuries are divided into injuries involving the anterior urethra and those involving the posterior urethra in male patients. The anterior urethra consists of the bulbar and penile urethra, distal to the perineal membrane (15).

This part of the male urethra can be traumatised in straddle or fall-astride injuries, penile fractures, penetrating injuries or insertion of foreign bodies (10,14,15). The most common part of the anterior urethra to be injured is the bulbar urethra, which occurs during straddle crush injuries (14).

The posterior urethra, which consists of the membranous and prostatic urethra, is commonly injured following road traffic accidents and fall from a height (10,15). These forms of blunt trauma often lead to a disruption of the pelvic ring (72% of cases), which in turn have a shearing effect; this causes the prostate to be displaced posteriorly and the membranous urethra to move anteriorly (10,15). This occurs because of the anatomical fixation of these structures, the prostate being attached to the puboprostatic ligaments and the membranous urethra being attached to the urogenital diaphragm (10).

Initial clinical assessment of the trauma patient should be undertaken in line with the ATLS principles in a multi-disciplinary approach. Visible blood at the urethral meatus is the cardinal sign of the presence of urethral injury (14). However, 25% of anterior urethral injuries and 2% of posterior urethral injuries may present without blood at the meatus (14).

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Other signs and symptoms indicative of urethral injury include the inability to void, a palpable distended bladder, visible haematuria and painful urination (14). Assessment of the patient should also include a digital rectal examination to exclude a pelvic haematoma and associated rectal injury, which is present in 5% of cases (10,14). This usually results from the prostate-membranous urethral disruption described above and can lead to the "high-riding prostate" on examination, although this is a relatively unreliable examination finding in the acute setting of urethral injury (10,14).

Female urethral injuries are rare due to the shorter length of the urethra compared to the male urethra. When they do occur, they are almost exclusively due to pelvic fractures and are often associated with concurrent bladder rupture (13). Therefore, a pelvic fracture with blood at the vaginal introitus, vaginal laceration, haematuria, urethrorrhagia, labial swelling and/or urinary retention should raise the suspicion of urethral injury (14).

If no signs of urethral injury are present, then a urethral catheter may be passed. However, if resistance is encountered on insertion of the catheter, the procedure should be abandoned and a retrograde urethrography should be obtained (16).

The EAU recommends an immediate retrograde urethrography (or urethrogram) as the standard diagnostic investigation in suspected urethral injury or if blood is seen at the urethral meatus in stable patients (8,10,14). This is performed with the patient in a 30-degree oblique position with the bottom hip and leg in the flexed position (10). If the severity of the patients' injuries or patient discomfort prevents this positioning, then supine positioning can be adopted (10).

An initial scout film is performed to assess for pelvic fractures and foreign bodies, then a 12Ch catheter is inserted into the fossa navicularis just inside the urethral meatus and inflated with 2 ml of sterile water to prevent contrast leakage (10,14). To obtain the retrograde urethrogram, 20 to 30 ml of water-soluble contrast is injected with fluoroscopic guidance or a series of plain radiographs if fluoroscopy if not available (10,14).

In patients who are haemodynamically unstable, the retrograde urethrogram should be postponed (14). One gentle attempt at urethral catheterisation may be undertaken; if the catheter does not pass easily, then a suprapubic catheter should be inserted to relieve retention (10). It should be noted that in female patients with suspected urethral injuries, cystoscopic evaluation should be performed in place of urethrography. Urethral injuries are classified by the AAST severity scale, which is demonstrated in Table 3 (10).

Group	Type	Injury Description
1	Contusion	Blood at the urethral meatus; normal urethrogram
2	Stretch	Elongation of the urethra without extravasation on urethrography
3	Partial disruption	Extravasation of contrast at injury site without contrast visualised in the bladder
4	Complete disruption	Extravasation of contrast at injury site without visualisation in the bladder; < 2 cm urethral separation
5	Compete disruption	Complete transection with > 2 cm urethral separation, or extension into the prostate or vagina

Table 3. The AAST urethral trauma severity scale.
Arya et al. Viva Practice for the FRCS (Urol) Examination, 2010.

As outlined in Table 3, urethral injuries can occur with varying degrees of interruption to the urethral mucosa. The retrograde urethrogram identifies the site and extent of urethral injuries; extravasation of contrast from the urethra is pathognomonic for urethral injury (14).

Management of urethral trauma depends on the type and extent of injury; there is limited high level of evidence in the literature. Currently, it is recommended that a contusion and stretch urethral injuries can be managed with gentle urethral catheterisation following a retrograde urethrogram confirming the absence of contrast extravasation (14,16).

In the event of a partial injury to the anterior or posterior urethra, a gentle attempt at passing a urethral catheter can be done. If this is not successful, then insertion of a suprapubic catheter under ultrasound guidance or direct visualisation during laparotomy is the next step for urinary diversion (10,14).

In complete posterior urethral injury, the EAU guidelines recommend suprapubic catheter insertion (14). The option of early urethral realignment has been shown to result in a lower subsequent stricture rate, allow for technically easier urethroplasty at a later date and if strictures were to develop, there is a 90% success rate with urethrotomy management (14).

This can be performed in stable patients and realignment endoscopically with a flexible or rigid cystoscope within 14 days is the recommended technique for the placement of a urethral catheter (14). The patient will then have both a urethral and a suprapubic catheter and the formal primary urethroplasty to be delayed to a later day (10,14).

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Immediate urethroplasty is not recommended due to its risk of urethral stricture (69%), impotence (56%) and incontinence (21%) (14). For unstable patients, a delayed urethroplasty with a suprapubic catheter in-situ in the interim would be the management of choice (14). In complete urethral disruptions, the option currently remains for suprapubic diversion and primary realignment or suprapubic diversion and delayed urethroplasty (14,16).

Immediate surgical exploration is indicated in penetrating urethral injuries with a primary or staged urethral repair, bladder neck injuries and rectal injuries (14). Untreated bladder neck injuries may result in incontinence from disruption of the internal urethral sphincter and infection of associated pelvic fractures (14). Delaying surgical exploration in associated rectal injuries carries a risk of fistula formation and systemic sepsis (14,16).

In female patients, distal urethral injuries do not interfere with the sphincter mechanism and will become hypospadiac; they do not necessitate surgical repair but may require a flap to prevent urethrovaginal fistulas (14). Proximal and mid-urethral injuries in female patients require immediate primary open repair (14).

Ureteric trauma

The ureter is a relatively mobile structure and is situated in a protected position, adjacent to muscle, vertebrae and the bony pelvis (13, 14). Its protected position renders ureteric trauma to be a rare occurrence, only accounting for up to 2.5% of trauma to the genitourinary tract (14). It is most commonly caused by an iatrogenic aetiology, often occurring during gynaecological procedures (14,15).

Iatrogenic ureteric injuries often occur in the lower ureters, resulting from ligation, crushing, partial or complete transection, thermal injury or devascularisation (14,15). Blunt trauma is the cause of up to a third of external ureteric trauma; penetrating ureteric trauma tends to be caused by gunshot wounds (14). External ureteric trauma has been reported to occur most commonly in the upper ureters (14).

As with other Urological traumas, a focused history and examination including the observation of surgical scars, full bladder and loin tenderness or palpable mass are key (10). Following blood tests and urinalysis, any abdominal drain fluid should be sent for biochemical analysis as a particularly raised urea and creatinine would indicate urine as the content of the drain fluid (10). In the cases of missed iatrogenic injuries to the ureteric, these can present with complications such as upper urinary tract obstruction, urinary fistulae or sepsis (14).

The imaging investigation of choice would depend on the clinical situation. In a stable patient, an urgent CT Urogram or IVU would be used in the practice of most Urologists. Evidence of contrast extravasation in CT or IVU would indicate the presence of ureteric trauma (14). If a CTU or IVU is inconclusive, a retrograde or antegrade urography is the standard investigation for confirmation of a ureteric injury (14).

Grade	Type	Injury Description
I	Haematoma	Contusion or haematoma without devascularisation
II	Laceration	< 50% transection
III	Laceration	≥ 50% transection
IV	Laceration	Complete transection with < 2cm devascularisation
V	Laceration	Avulsion with > 2cm of devascularisation

Table 4. The AAST ureter injury scale. Moore et al.

Table 4 outlines the AAST staging system for ureteric injuries, which is used to guide management options. Early diagnosis and repair of the injury provides a better outcome (14). Grade I ureteric injuries tend to be managed conservatively; a ureteric stent may be placed to avoid ureteric obstruction. In partial ureteric injuries, a stent is used to canalise the ureter and the defect repaired immediately with absorbable sutures (14). Canalisation of the ureter with stent placement reduces the risk of subsequent stricture development but has the potential to aggravate the ureteric injury (14).

In unstable trauma patients, definitive repair of the injury should be delayed and urinary diversion in the form of a nephrostomy tube should be arranged until ureteric repair (10,14). Injuries that present or are diagnosed late are usually managed with a nephrostomy tube with or without a ureteric stent (14). Laparoscopic and robotic surgical repairs are becoming increasingly reported. Proximal and mid-ureteric injuries can often be treated with a primary uretero-ureterostomy, whereas distal injuries are usually managed with primary ureteric reimplantation (14).

Conclusion

Urological trauma is associated with 10% of all trauma cases. It is important to identify clinical signs and symptoms that indicate the potential presence of injury to the genitourinary tract and involve all relevant specialty teams. There are guidelines and recommendations on diagnostic modalities for Urological trauma. The classification and severity of injury to genitourinary organs are mostly based on diagnostic imaging findings. The EAU and AUA have established management guidelines that are aimed to preserve organ function.

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Self-Assessment Questions

1. What is the commonest mechanism of injury to the kidney?

a. Penetrative trauma

b. Iatrogenic trauma

c. Blunt trauma

2. What is the standard diagnostic modality in suspected renal trauma?

a. Ultrasound scan

b. CT scan

c. MRI scan

d. Plain radiograph

e. Nuclear medicine scan

3. What percentage of bladder injuries is associated with pelvic fractures?

a. 10%

b. 30%

c. 70%

d. 90%

e. 100%

4. In bladder trauma, which of the following cases does not require immediate surgical exploration?

a. Extraperitoneal bladder injury

b. Intraperitoneal bladder injury

c. Exposed bone within bladder lumen

d. Vaginal laceration

e. Bladder neck injury

5. What is the cardinal sign of urethral injury in the trauma setting?

a. High-riding prostate

b. Blood in the rectum

c. Palpable bladder on examination

d. Blood at the urethral meatus

e. Penile bruising

Answers to self-assessment questions

Question 1: Answer c.

The majority of renal trauma is the result of blunt injury rather than a penetrative injury, with road traffic accidents and sudden deceleration being the predominant mechanisms of injury.

Question 2: Answer b.

The spiral CT scan comprises of an arterial phase, nephrographic or corticomedullary phase and importantly, a delayed excretory phase, which takes place 1-3 minutes after injection of intravenous contrast.

This assesses the structural integrity of the kidney and ureters and allows for grading of the severity of injury. The scan may also identify injuries of neighbouring structures.

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Question 3: Answer d.

Lower urinary tract injuries are mostly associated with blunt trauma and up to 90% of bladder injuries are associated with pelvic fractures. The triad of lower abdominal or suprapubic pain, inability to void and visible haematuria suggests a potential bladder injury or perforation.

Question 4: Answer a.

The EAU and AUA guidelines both recommend that uncomplicated extraperitoneal bladder injuries can be managed conservatively by free drainage of the bladder with a urethral catheter for 10 to 14 days, antibiotics and clinical observation. A follow up retrograde cystogram should be performed to assess for complete healing of the defect.

Question 5: Answer d.

Visible blood at the urethral meatus is the cardinal sign of the presence of urethral injury. However, 25% of anterior urethral injuries and 2% of posterior urethral injuries may present without blood at the meatus. Other signs and symptoms indicative of urethral injury include the inability to void, a palpable distended bladder, visible haematuria and painful urination.

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ISSN

1753-6995