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CORE SURGERY JOURNAL

Volume 3, Issue 3

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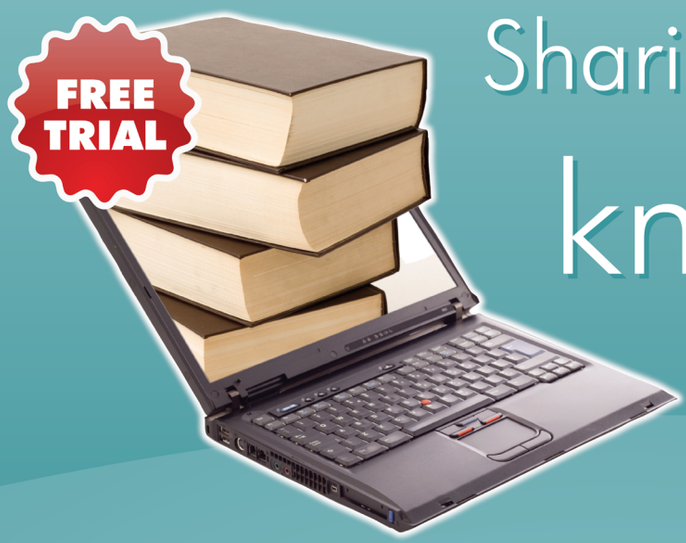

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CORE SURGERY JOURNAL

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Types of Article

Manuscripts are considered under the following sections:

1) Case based discussions
2) Practical procedures
3) Audit
4) Review articles
5) Course reviews
6) Research papers

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Submissions will only be accepted via email and must be accompanied by a covering letter. Please submit your article to **coresurgery@123doc.com.** The covering letter must include a statement that all authors have contributed significantly and accept joint responsibility for the content of the article. In addition any financial or other conflict of interest must be declared. All submissions must be accompanied by an electronic copy of the transfer of copyright form (see below).

Manuscript Style

Submissions should follow the style of the Vancouver agreement detailed in the International Committee of Medical Journal Editors' revised 'Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication', as found at **http://www.ICMJE.org/**

References

All articles must be referenced appropriately. The Vancouver system of referencing should be used; details can be found at **https://workspace.imperial.ac.uk/library/Public/Vancouver_referencing.pdf.** References should be cited using numerals in brackets [eg. (1)], in the order in which they appear. The list of references should reflect this order and names of journals should be abbreviated in the style used in Index Medicus **ftp://nlmpubs.nlm.nih.gov/online/journals/ljiweb.pdf.**

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Format of Articles

Guidelines for the format of respective article types are as follows. All articles must contain an abstract of 150-250 words, and must include up to five keywords for indexing purposes. A title page must be included containing the title of the article, author's initials, surname, specialty, grade, institute, contact mailing address and email address. The mailing address will not be included in the final article.

Case Based Discussions

Should be about 1000-1500 words long and should focus on clinical assessment, differential diagnosis or treatment. The basic structure should be as follows:

Abstract:	The salient points of the case and discussion.
Case history:	Including the initial presentation, clinical setting and problem, investigation and treatment.
Discussion:	Covering the critical aspects of the management and the treatment options.

Practical Procedures

Should be about 1000-1500 words long. Although not essential it is highly advantageous if pictures and diagrams are supplied to illustrate the most salient points. Articles should be set out as follows:

- Abstract (Essential) – A summary of the article structure and salient features.
- History and pathology
- Indications and contraindications
- Gaining informed consent /explaining procedure to patient
- Equipment required
- Draping / sterile field preparation
- Patient positioning and relevant anaesthetic points
- Documentation of procedure
- Recording of complications and management of such

Audit

Articles should be 1000-1500 words long and of high quality. Each article must contain an abstract. Completed audit cycles are strongly preferred as are audits which have led to guideline development.

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Review Articles

The topic should be relevant to core surgical trainees, and a maximum of 2500 words long. The review should include an abstract, and a clinical vignette of a case relevant to the topic. The aim of including a clinical case is to provide a focus for discussion, and to ensure that the review is relevant and useful to our readership.

Course Reviews

Should be a maximum of 1000 words and review a course which is either mandatory or desirable for core trainees and junior higher surgical trainees. An abstract is required summarising the article contents and salient conclusions.

Research Papers

Although the publication of research articles is not a core aim of the journal, Core Surgery welcomes research submissions if thought to be of interest to the readership. Articles should be written using the following headings (title page, abstract, introduction, methods, results, discussion, references). They should be a maximum of 2500 words of text including abstract, 30 references, 3 illustrations or figures. The abstract should be a maximum of 250 words and use the following headings (introduction, methods, results, conclusion). The title page should contain the title of the paper, the full names of the authors, the addresses of the institutions at which the research was carried out and the full postal address, email address and telephone number of the corresponding author.

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Summary

Articles considered for publication will be sent for review by our panel of consultants and junior surgical trainees. We wish you every success with your submission. Please contact the editorial team with any questions.

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SURGICAL BIOPSY TECHNIQUES FOR THE CORE TRAINEE

RE Steele, AG Titchener

Abstract

Biopsies are performed in a variety of settings and for a variety of purposes. The core surgical trainee need not be familiar with each and every technique, but a good working knowledge of the principles of biopsy is important. This article provides an overview of different types of biopsy and their general indications. The general steps required to perform a biopsy are illustrated with reference to transrectal ultrasound biopsy of the prostate (TRUS biopsy).

Keywords

Biopsy, Surgical, TRUS.

Introduction

What is a biopsy?

'Biopsy' – The removal and examination of tissue from a living body for diagnostic purposes.

Diagnosis from biopsy alone will often not be possible and results should be interpreted in the context of the clinical history, examination and relevant laboratory testing and imaging.

A positive biopsy result can provide a diagnosis, grade and stage a tumour and suggest further useful investigations and appropriate treatment. Whilst a false negative or unrepresentative biopsy can lead to incomplete treatment or inappropriate active surveillance. A well performed procedure is therefore key to a good patient outcome.

What are the indications for biopsy?

Generally speaking, a biopsy is usually performed for diagnostic reasons; either to guide future intervention or therapy or to assess the effect of a treatment. In some cases the biopsy may also be curative, e.g. excisional biopsy of a skin lesion. The majority of biopsies are performed in suspected cases of cancer, inflammatory conditions or as part of a screening programme e.g. prostate or breast.

The aims of a biopsy are to obtain a sample of tissue; adequate in quantity, of sufficient quality and therefore representative of the tissue area being biopsied. Often, the diagnosis may be known or suspected however, confirmatory tissue histology is usually required prior to definitive surgery or administration of cytotoxic chemotherapy or other interevention.

Surgical biopsy techniques for the core trainee
Back to Basics

Tissue biopsy can be performed via a variety of techniques dependant on the type and site of tissue and the type of sample required. In general terms there is an important distinction between histological and cytological diagnosis; for the former the biopsy must yield a sample of tissue in which the architecture is preserved while in the latter it is the type and morphology of the cellular component which is important. As biopsy is usually a form of invasive procedure, the morbidity at the sample site must be considered in balance with the expected results and effect on patient management.

There are many types of biopsy both in terms of tissue types, location and technique. This article will focus on Trans Rectal UltraSound (TRUS) Biopsy of the Prostate as an illustrative example.

Types of Biopsy

Biopsies may be open i.e. surgical; incisional or excisional or closed i.e. fine needle aspiration or core needle biopsy.

In open surgical biopsies, excisional involves excising the entire lesion whereas incisional only provides a sample of the lesion and is therefore generally the least favoured of the two as the entire lesion is not provided for analysis. However both preserve tissue architecture. There are conflicting reports as to whether incisional biopsies confer an increased risk of metastasis (1). Incisional biopsies are only usually performed when there is a low suspicion of malignancy, the lesion is very large or in a cosmetically sensitive or impractical place.

Open vs Closed

Open biopsies generally have greater diagnostic sensitivity when compared with a closed technique. However complications tend to be higher; 19% in open vs 0-1% in closed (1). Common complications include haematoma, infection, wound dehiscence, tumour spread and general anaesthetic risks.

Closed biopsies are more rapid, less invasive and are carried out in an outpatient setting and are therefore cheaper. Conversely, as mentioned, they have a lower diagnostic sensitivity leading to higher false positive rates. If results are negative but clinical suspicion remains high, an open biopsy may still be needed increasing cost and leading to delayed diagnosis for the patient.

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Biopsy techniques and tools

CLOSED

Aspiration

During FNAC a narrow gauge 22-25G needle is passed in and out of the lesion up to several times with the aim of dislodging cells, the direction of the needle should also be changed several times in order to sample different areas of the lesion. FNA is suitable for palpable lesions usually in the thyroid, breast, head and neck, lymph nodes and soft tissue. It is a rapid, minimally invasive and cost-effective method suitable for an outpatient setting. Accuracy of results appears to be dependent on the clinician's skill and experience (7). Correct positive biopsy results in FNA of the breast have shown 75-90% in palpable lesions but only 35-48% in non-palpable (2). FNA also cannot distinguish between invasive and non-invasive carcinoma as it does not preserve tissue architecture. FNA requires an additional CNB in 32% of cases (3).

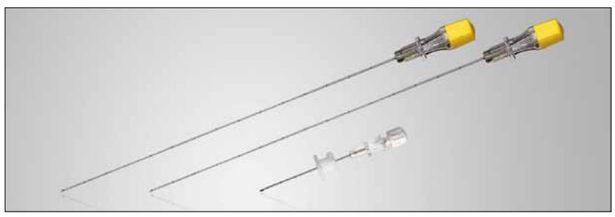

Figure 1: FNA Needle.

Core/Trucut

Core needle biopsy involves passing a wider bore hollow needle into the lesion and obtaining core samples, usually 3-6 in total. It may carried out freehand if the lesion is palpable or under ultrasound/MRI guidance if not. Core needle biopsy preserves tissue architecture and has greater sensitivity, specificity, predictive value, and accuracy than FNA in regard to determining malignancy (4), it correctly identifies over 90% of breast malignancies (5). Core needle biopsy is also favoured over Fine Needle Aspiration and Cytology (FNAC) when the primary is unknown.

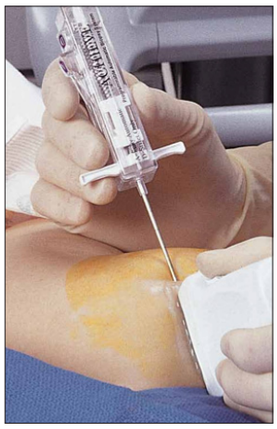

Figure 2: Trucut Needle.

OPEN

Incisional

An incisional biopsy should be made in the area of most growth or change in appearance. When planning a biopsy, one should consider the surgical approach; ideally, it should take the most direct route between skin and the target lesion in order to minimise contamination of surrounding tissue. It should also lie within the approach for future definitive surgery and the biopsy margins should be amenable to resection at the time of further surgery as they are deemed contaminated (2).

Excisional

With a diagnostic accuracy from 94-99% (4), open excisional biopsy was the gold standard until newer less invasive techniques were introduced. It has the advantage of a guaranteed sample size, the ability to diagnose tumours with grade and subtype and therefore correctly determines optimal patient therapy in nearly all cases. It is the biopsy of choice in conditions such as suspected melanoma. Guidelines state that margins should be of a minimum of 2mm and also a cuff of subcutaneous fat deep to the lesion should be excised also (13). There are many important disadvantages however; it is the most expensive and has the highest complication rate which can impact on future treatment i.e. wound dehiscence when adjuvant therapy is recommended.

Important general points regarding biopsies (6)

Quality

E.g. ulcers/abscesses should be biopsied at their periphery where there is most dynamic change and growth. Biopsy of the central aspect may obtain necrotic or degraded tissue less useful for diagnostic purposes.

Send abnormal and normal tissue; there may only be subtle changes, more evident when comparing to normal tissue.

Orientation of biopsy

Left/right, superior/inferior/medial/lateral edges are sometimes marked with sutures for example in breast wide local excision. It is Important for the pathologist to feed back which margins are incomplete and require further action.

Labelling

Request form needs to be clear and contain following information; patient details, specimen site, right/left, clinical picture so clinical and pathological elements can be correlated, differential diagnosis if possible; certain diagnoses require specific immunohistochemistry staining.

Size

Needs to contain adequate number of cells and relevant structures for examination

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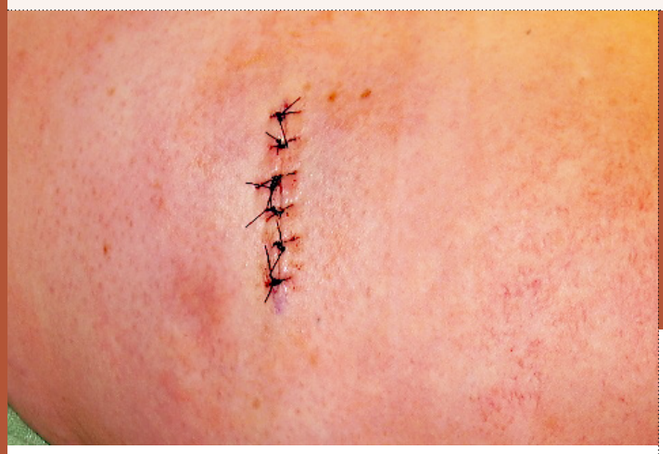

Avoid artefact

Sample needs to be representative of tissue

a. Surgical instruments e.g. forceps can tear tissue
b. Diathermy causes cautery artefact resulting in coagulated tissue making diagnosis impossible.
c. Avoid areas that have previously undergone radiotherapy. The tissue may be scarred and will not provide a definitive diagnosis.
d. Avoid injecting large amounts of local anaesthetic which can separate structures.
e. Ensure correct fixation. Formalin is normally used. Some samples require transport in certain media e.g. a synovial biopsy in suspected gout needs to be sent in alcohol so the crystals don't dissolve.

Step by step guide to TRUS biopsy of the prostate

INDICATIONS AND CONTRAINDICATIONS

The main indications include:

1. A raised PSA for age

2. Increasing PSA from known baseline (pre or post treatment)

3. Malignant feeling prostate on digital rectal examination(DRE)

Contraindications and cautions:

1. Urinary tract infection

2. Patients on warfarin or anti-platelet agents. These should be stopped prior to the procedure

3. Caution in patients taking steroids or who are immunocompromised due to increased risk of sepsis.

Surgical biopsy techniques for the core trainee
Back to Basics

Written consent

The patient should be fully counselled regarding the proposed procedure and the risks and benefits discussed in accordance with the General Medical Council guidelines on consent (8). This should involve discussion regarding the indication, benefits and risks as follows:

- *Bleeding. Haematuria and haematospermia are both common post procedure and may last a few days after which they should settle. Advise patient to drink plenty for the next few days. A small proportion of patients may experience rectal bleeding.*

- *Discomfort/pain. This should settle with simple analgesia.*

- *Urinary retention.*

- *Infection. Prophylactic antibiotics are given post procedure, choice varies between hospital trusts but typically a metronidazole enema and an oral course of antibiotics such as ciprofloxacin for three days are given. The incidence of UTI is ~5% and prostatitis ~ 1%. The most common complication requiring hospital admission post TRUS biopsy is urosepsis and mainly occurs in the first week post procedure. A recent study showed e-coli was the most causative organism (9). Fluroquinolones such as Ciprofloxacin continues to be the prophylactic antibiotic of choice (12).*

Equipment

- *Apron, gloves*

- *Lubrication jelly, gauze*

- *1% lidocaine and long needles to administer*

- *Ultrasound machine and probe, 18G core needle biopsy gun*

- *Specimen pots and clinical pathology request form*

- *Antibiotic enema (usually metronidazole)*

SURGICAL BIOPSY TECHNIQUES FOR THE CORE TRAINEE

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Procedure (11)

1. Position patient in left lateral position on couch with knees up to chest. Perform a DRE first. Take note of any haemorrhoids, fissures or tumours. Note the size, symmetry, nodules, texture and any tenderness of the prostate.

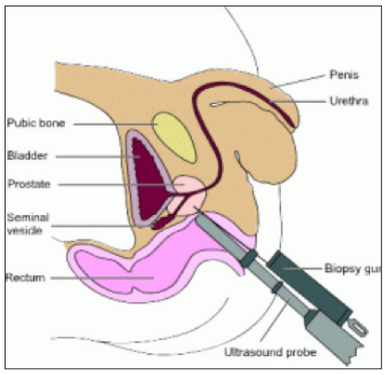

Figure 3: Insertion of ultrasound probe.

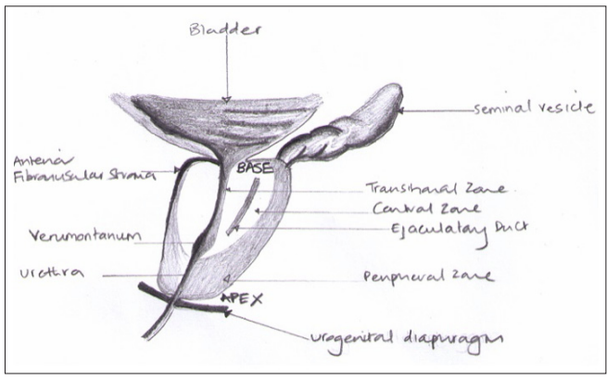

Figure 4: Anatomy of bladder base and prostate.

2. Insert the probe (Fig. 3) warning the patient first. Measure the prostate in 3 planes:

a. Anterior to posterior.
b. Height in the longitudinal plane.
c. Bladder neck to apex.
Most machines will then calculate the volume of the prostate.

3. Inject local anaesthetic into the peri-prostatic tissue (Fig. 5).

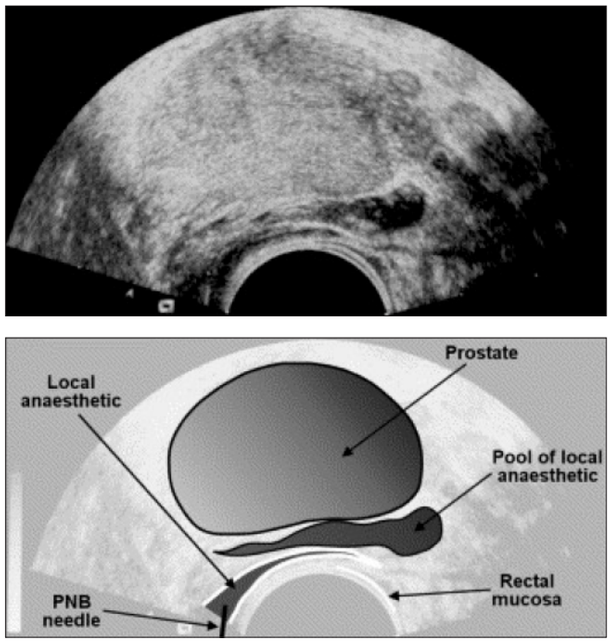

Figure 5: local anaesthetic infiltration under ultrasound guidance.

4. Biopsy using the biopsy gun 18G needle to obtain a tissue core

a. Introduce the needle and identify position on screen. The tip should be in peri-prostatic tissue just adjacent to the target area
b. Inform patient a biopsy will be taken and warn them about the sound of the gun!
c. Place each biopsy in the container pot containing normal saline. One pot each for right and left lobe.
d. Usually around ten-twelve cores are taken, 5-6 from each lobe of the prostate. Biopsies start from the base and start laterally and then move medially (Fig. 6). Then the middle of the prostate is biopsied, again starting in the lateral zone and then moving medially and then finally the apex. Additional biopsies have not proven to have better detection rates. However, suspicious areas felt on DRE or hyperechoic areas on US may be biopsied in addition.

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Surgical biopsy techniques for the core trainee
Back to Basics

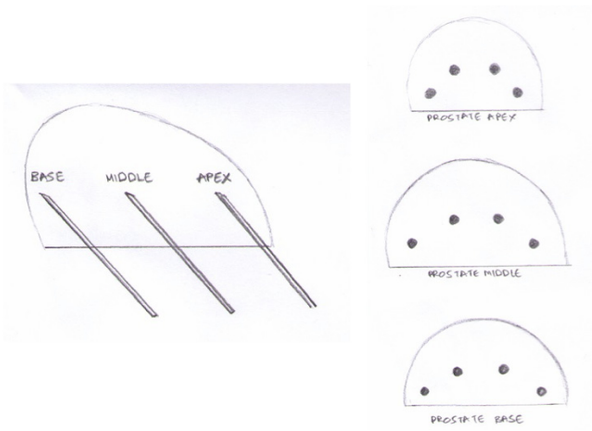

Figure 6: Cross sections of prostate biopsy target areas.

5. Remove the probe and insert a metronidazole enema to cover bacteraemia from bowel. Fill in pathology forms, label samples and document procedure in the notes

6. On discharge

a. Ensure patient understands signs and symptoms to look out for e.g. fever, haematuria, retention and who to contact if they develop any of these
b. Prescribe a course of oral antibiotics, usually ciprofloxacin for three days
c. Advise the patient to drink plenty of oral fluids to improve haematuria and prevent infection
d. Advise the patient results will be available in usually ten to fourteen days

A recent retrospective study showed that with increasing number of biopsies performed by a trainee, the length of the biopsy increased also thereby increasing sample quality. Improvement plateaued at around twelve procedures performed. This study therefore concluded that a trainee should perform the first twelve TRUS biopsies under supervision (10).

Questions

1. True or false?

a. Excisional biopsies have greater diagnostic sensitivity than incisional
b. Open biopsies are more cost-effective than closed
c. Ulcers and abscesses should be biopsied from the centre
d. Fine needle aspiration cannot distinguish between invasive and non-invasive carcinoma

2. Which one of the following do not preserve tissue architecture?

a. Incisional
b. Fine needle aspiration
c. Excisional
d. Core needle biopsy

3. True or false?

a. Fine needle aspiration has a greater sensitivity than core needle biopsy
b. Local anaesthetic should be injected into the neurovascular bundle during a TRUS biopsy
c. Hypoechoic areas on ultrasound maybe due to cysts, abscess or tumour
d. Haemtospermia is the most common complaint post procedure

4. Which of the following are indications for a TRUS biopsy of the prostate?

a. PSA>4 at any age
b. Family history
c. Increasing PSA from baseline

SURGICAL BIOPSY TECHNIQUES FOR THE CORE TRAINEE

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5. The following are true or false:

a. The incidence of prostatitis following TRUS biopy is 5%
b. UTI is a caution in TRUS biopsy
c. Greater number of core biopsies have
not been shown to increase detection rates
d. An aminoglycoside such as ciprofloxacin
is favoured for antibiotic prophylaxis

Short Answers

1. a) T; b) F – closed are more cost-effective, fewer side effects; c)F- this will only obtain necrotic tissue, they should be biopsied from the edge where there is most dynamic change; d) T as it does not preserve tissue architecture

2. b.

3. a) F; b)F – it should be injected into the peri-prostatic area; c)T; d) T

4. c. The following are the PSA references ranges for age; 40-49 ≤2.0; 50-59 ≤3.0; 60-69 ≤4.0; 70 + ≤5. There are no reference limits for those over 80 years of age

5. a) F – 1%; b)F – contraindication; c)T; d) F – quinolone such as ciprofloxacin

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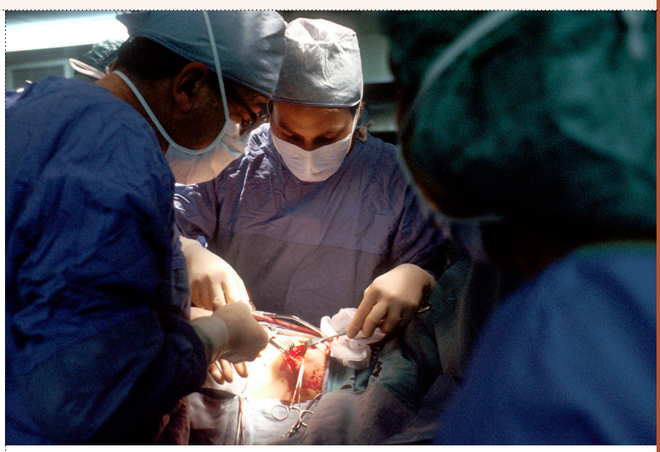

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GASTRO-OESOPHAGEAL REFLUX DISEASE & FUNDOPLICATION

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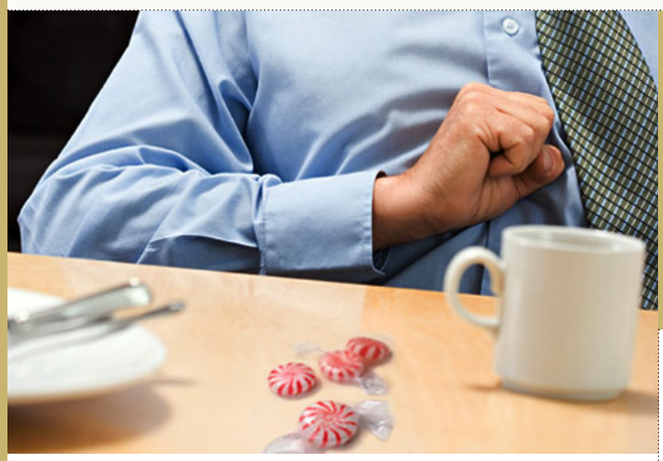

Abstract

Gastro-oesophageal Reflux Disease (GORD) is a common problem, particularly in the Western World. Reflux is predominantly determined by the physiological function of the lower oesophageal sphincter which maintains a pressure greater than that of the stomach, thus, preventing reflux. Dysfunction of this sphincter results in reflux.

Reflux classically presents with symptoms of retrosternal burning ("heartburn"), epigastric pain and regurgitation. A proportion of patients present with less-typical symptoms ranging from angina-like chest pain to laryngeal or even pulmonary symptoms. Diagnosis is, in many cases, purely based on clinical history, although endoscopy and pH monitoring may be required in selected patients.

Medical management has been the mainstay of treatment with excellent results with acid-suppression medication. Many patients require long-term medication as symptoms often recur on withdrawal of medication. Surgery, traditionally seen as the second line of treatment, restores the function of the lower oesophageal sphincter by restoring an intra-abdominal segment of oesophagus, repairing the crural defect in the diaphragm and wrapping the stomach around the intra-abdominal oesophagus (fundoplication).

Open surgery was associated with a significant morbidity and mortality and the advent of laparoscopic surgery led to surgical fundoplication gaining popularity. Short term results are, at least comparable, if not better than with medication.

Keywords

Gastro-oesophageal Reflux Disease (GORD), Lower Oesophageal Sphincter (LOS), Proton-Pump Inhibitor (PPI), Fundoplication.

Gastro-oesophageal Reflux Disease & Fundoplication
General Surgery

Introduction

Gastro-oesophageal reflux is defined as the reflux of gastric contents into the oesophagus, resulting in the typical symptoms of" retrosternal heartburn" and acid regurgitation. The majority of the population will experience these symptoms occasionally. Gastro-oesophageal reflux disease (GORD) is defined by the reflux of gastric contents leading to oesophagitis with symptoms sufficient to impair quality of life, or risking long term complications. (1)

There is no consensus definition on the frequency and severity of symptoms that are required for a diagnosis of GORD. When defined as at least weekly heartburn and/or acid regurgitation, the prevalence in the Western world ranges between 10 and 20%. In Asia, the prevalence is reported to be less than 5%. (2)

Case Vignette

A 32 year old female saw her GP reporting symptoms of epigastric pain and heartburn, occurring both during the day and waking her at night. Her past medical history consisted of asthma for which she used regular inhalers.

She was commenced on esomeprazole and had good symptom response. She re-presented 5 years later with dissatisfaction on long term medication and frequent relapses when it was discontinued.

She underwent endoscopy and 24 hour pH monitoring which confirmed the diagnosis of reflux. She had a laparoscopic Nissen Fundoplication without complication and was discharged from hospital on day 2 post-op. At her 3 monthly follow up, she had full resolution of symptoms without the need for further medical therapy.

Aetiology

A number of potential risk factors for GORD have previously been identified from epidemiological studies. Obesity and possibly increasing age are risk factors, although sex is not. In addition, genetics appears to play a role with a significant association with a parental family history. (3) Behavioural factors, such as alcohol consumption, cigarette smoking and diet, are thought to trigger GORD. There remains a lack of positive association in cross-sectional studies, perhaps as these patients have altered their behaviour to improve symptoms.

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Helicobacter pylori, a spiral shaped bacterium (image 1), located in the mucous layers of the stomach can inhibit or exacerbate acid reflux, depending on the extent to which it affects the stomach. Antral (distal) gastritis leads to an increase in the production of gastric acid, whereas, generalised atrophic gastritis leads to a decrease. Studies have, however, shown little or no effect of H. pylori eradication on GORD. (4)

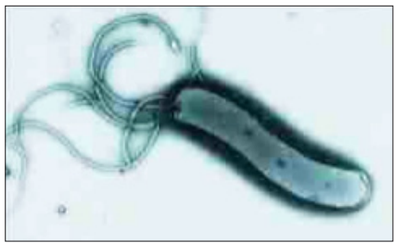


Image 1: Helicobacter pylori (courtesy of bioweb.uwlax.ed (E. Plyme))

Pathophysiology

The primary underlying mechanism for gastro-oesophageal reflux is the impairment in function of the lower oesophageal sphincter (LOS), a segment of smooth muscle in the distal oesophagus (image 2). This sphincter maintains a pressure by tonic contraction that is at least 15 mmHg above the intragastric pressure, thus, acting as a barrier to the reflux of gastric contents. (5) In response to oesophageal peristalsis, this sphincter relaxes, allowing the passage of contents into the stomach. The sphincter also relaxes at times when there is no swallowing or oesophageal peristalsis, termed transient lower oesophageal sphincter relaxation (TLOSRs). In healthy individuals, these are not associated with acid reflux, however, in GORD, an increased proportion are associated with acid reflux into the oesophagus.

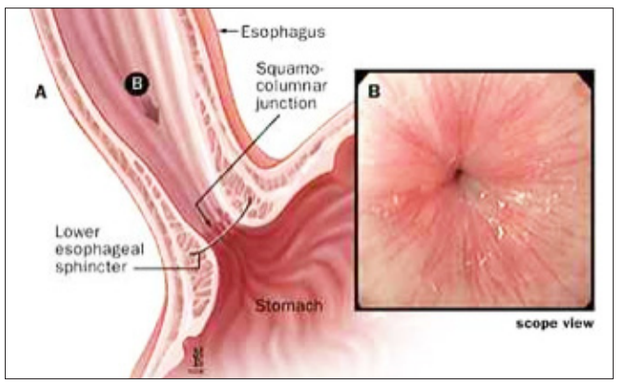


Image 2: Lower Oesophageal Sphincter. (courtesy of John Hopkins medicine: Gastroenterology and Hepatology)

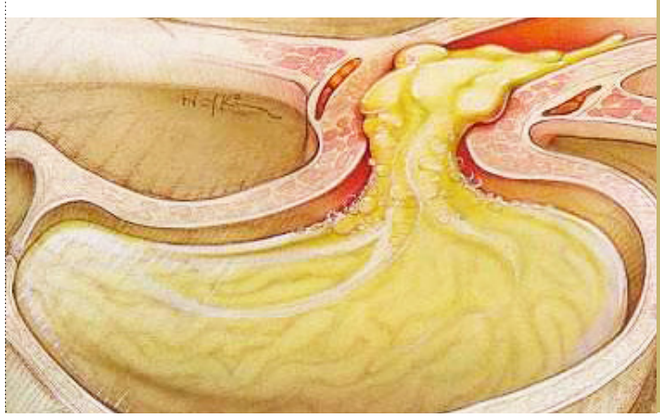
Hiatal hernia, in addition, predisposes to transient relaxation of the sphincter and, thus, increased reflux (6) as the striated muscles of the crus fail to exert its synergistic effect with the LOS. (7) It also results in an apparent shortening of the oesophagus which affects the function of the LOS. Whether severe inflammation producing fibrosis in the oesophageal wall results in true shortening is unclear, but may lead to worsening symptoms. (8)

The severity of the disease may be influenced by other factors. In patients in whom oesophageal peristalsis is impaired, following reflux into the oesophagus, there is a prolonged exposure of the oesophageal mucosa to the acid, promoting further damage. The damage to the oesophageal mucosa is also exacerbated when there is the presence of pepsin in the reflux contents. (5)

Oesophageal visceral hypersensitivity, abnormal tissue resistance, or sustained oesophageal contractions have been proposed as potential causes of reflux symptoms, particularly in those with normal endoscopy. (9) The microscopic changes of damage to the junction between epithelial cells which occurs in the oesophageal mucosa secondary to acid reflux may explain this increased sensitivity. (10)

Reflux of bile may have importance in contributing to symptoms, predominantly in those who develop Barrett's oesophagus. Gastric acid juice has the potential to become mutagenic, particularly when it comes into contact with nitrate-rich saliva. The nitrate content is converted into mutagenic chemicals, which may be implicated in the development of dysplasia. (11)

The adaptation of the mucosal lining of the oesophagus to the presence of acid can, in some patients, result in a change of cell type to columnar lined epithelium, a process termed intestinal metaplasia. This segment of cell change is known as Barrett's oesophagus. It is unknown why some patients develop Barrett's without apparent oesophagitis, and why others develop oesophagitis without Barrett's. Intestinal metaplasia poses an increased risk for the development of adenocarcinoma, although the majority are stable and do not undergo malignant transformation. A randomised, double-blind study has confirmed that acid suppression in the form of a proton-pump inhibitor induces a partial regression in the metaplasia, however, there is no clear evidence of this following anti-reflux surgery, although the rate of progression may slow. (12, 13)



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Diagnosis of GORD

The majority of patients present to primary care and the diagnosis is indicted by the clinical history. Patients can be treated without investigation as long as they have no "alarm" symptoms (table 1). (14)

Alarm Symptoms necessitating Urgent Endoscopy
· Dyspepsia with upper GI bleeding
· Dysphagia (particularly progressive)
· Unintentional Weight Loss
· Persistent Vomiting
· Epigastric mass
· Iron Deficiency anaemia
· >55 years with unexplained and persistent recent onset dyspepsia

Table 1: Alarm Symptoms

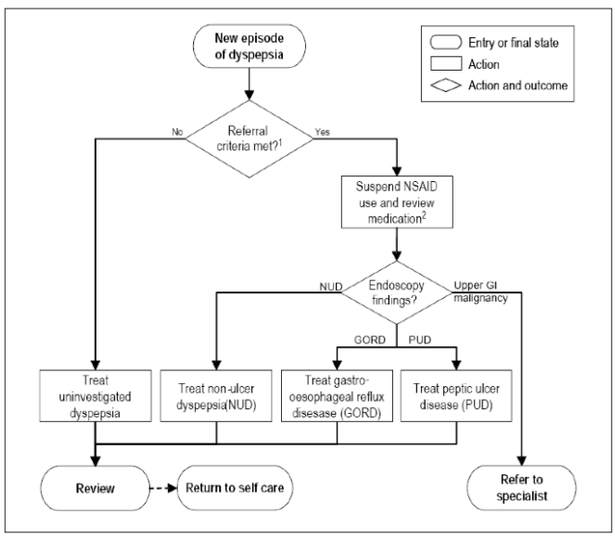

Image 3: NICE guidelines for Investigation of Dyspepsia (14)

The identification of oesophagitis with endoscopy is highly specific and also enables the identification of any complications (Barrett's oesophagus, strictures). A large proportion will, however, have a normal endoscopy and are often termed "endoscopy-negative reflux disease". Whether this is part of the same spectrum of disease as "endoscopy-positive reflux disease", or a different disease process is not entirely clear.

The gold standard of diagnosis is 24 hour oesophageal pH manometry. This is completed by passing a pH probe transnasally to 5cm above the LOS. Acid reflux is defined as a pH below 4. The total time under this threshold is the most reproducible measure of GORD. This test, as it is invasive and expensive, is generally reserved for those where there is important diagnostic uncertainty, or in those in whom anti-reflux surgery is being considered.

Management

Lifestyle factors are only weakly associated with reflux, thus, lifestyle modification has limited impact on symptoms. The mainstay of treatment is pharmacological and, in some cases, surgical.

Pharmacological Management

Acid suppression with proton-pump inhibitors (PPIs) should be used, alongside H. pylori eradication if present. GORD usually relapses when medication is stopped and, thus, the lowest dose necessary to control symptoms should be continued. Long-term use (> 10 years) of PPIs has been shown to be safe and effective, although the dose requirement can increase over time. (15)

The vast majority of patients will have their symptoms controlled with medical therapy. When this does not occur, further investigation into an alternative diagnosis is warranted. In patients with GORD and uncontrollable symptoms, surgery can be considered, however, data indicates that the patients who do best with surgery are those who previously responded to medical therapy. (16)

Endoscopic Management

Endoscopic therapy in the form of endoluminal gastroplication, endoscopic radiofrequency ablation and endoscopic injection of bulking agents have been trialled, particularly for patients resistant to medical therapy, however, none have consistently shown any improvement in symptom control. (14)

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Surgical Management

Surgery was traditionally considered to be the second tier of management for GORD, confined to patients with severe symptoms who were not adequately controlled with medical therapy, or in those who did not wish to remain on long-term medication. The development of minimally invasive (laparoscopic) surgery throughout the last 20 years has resulted in a change in this perception with the offering of surgery to a greater proportion of patients.

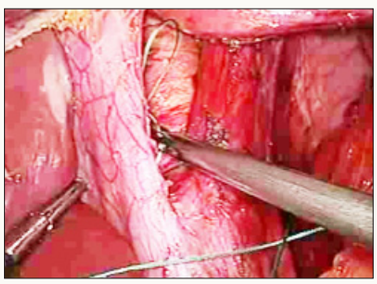
The first fundoplication procedure was performed in 1955 by Dr Rudolph Nissen. (17) He initially described a 360° wrap of the stomach around the oesophagus with plication of both the anterior and posterior walls. Modifications occurred, particularly during the 1970's, when the operation gained popularity, including the creation of the fundoplication using only the anterior wall of the fundus18, and the construction of a partial wrap to minimise the postoperative complications. (19, 20) The open procedures, however, were associated with significant morbidity and mortality.

Laparoscopic fundoplication was first undertaken in the 1990s and is now the surgical treatment of choice. Studies assessing the long-term outcome and durability of this procedure indicate that patient symptoms are dramatically improved with the results lasting at least 10 years following the procedure. (21) Post-operative complications are low, with the commonest being dysphagia.

Laparoscopic Fundoplication

The operation is carried out under general anaesthetic with full muscle relaxation. Pneumoperitoneum is achieved with the Hassan technique in the LUQ and further ports then placed.

The fundus of the stomach is mobilised by dividing the gastro-splenic omentum and the short gastric vessels. The GOJ is mobilised and if a hiatal hernia is present this is reduced into the abdomen. Ideally, 3cm of oesophagus should be able to be brought down into the abdomen without tension. Any large defect in the crura of the diaphragm can be repaired with sutures.



Defect between crura (courtesy of laparoscopy.com)

The fundus of the stomach is brought behind the oesophagus through the retro-oesophageal window. The wrap can be partial or full. In a full wrap, the two edges of the stomach are sutured together at the front of the oesophagus. Oesophageal muscle can be included in one suture to prevent displacement of the wrap.

Laparoscopic Fundoplication

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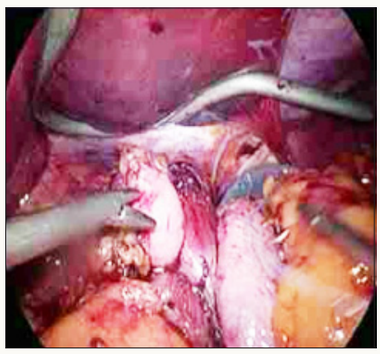

Fundus of stomach wrapped around oesophagus (Courtesy of laparoscopy.com).

The patient can have free fluids following the operation and diet reintroduced slowly. Initially swallowing may be difficult due to oedema causing dysphagia, but this usually settles. A minority of patients will suffer with long-term post-operative dysphagia.

Fundus of stomach wrapped around oesophagus (Courtesy of laparoscopy.com). The patient can have free fluids following the operation and diet reintroduced slowly. Initially swallowing may be difficult due to oedema causing dysphagia, but this usually settles. A minority of patients will suffer with long-term post-operative dysphagia.

As with open fundoplication, the wrap of the fundus of the stomach does not have to be complete. Various degrees of wrap have been undertaken: Belsey (anterior 270°), Dor (anterior 180°) and Toupet (posterior 270°) (image 4). Partial fundoplication in published American guidelines is said to produce similar reflux control to a total wrap, but with less dysphagia and, thus, less reoperation rates to correct this. (22)

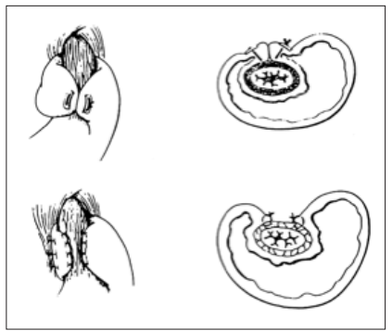

Image 4: Full and Partial Fundoplication (26)

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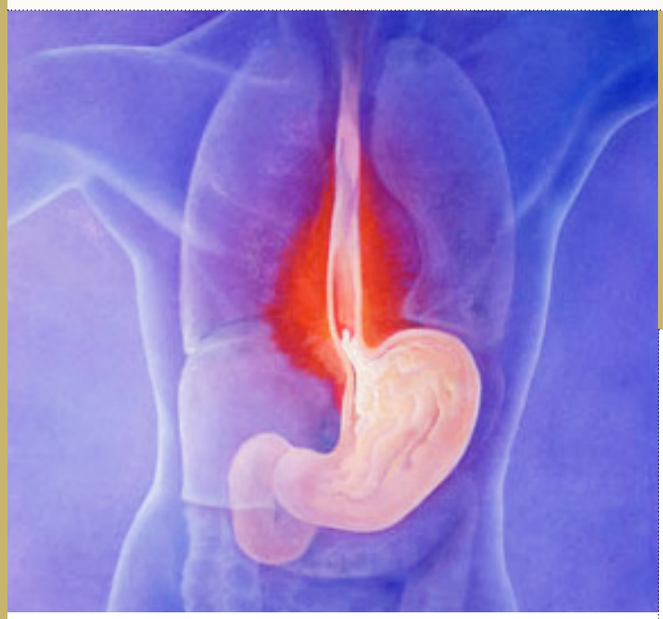

If the patient is undergoing fundoplication, and the oesophagus cannot be adequately mobilised so the abdominal segment is not under tension, a Collis gastroplasty may be needed (image 5). This is formation of a neo-oesophagus, around which a wrap can be fashioned.

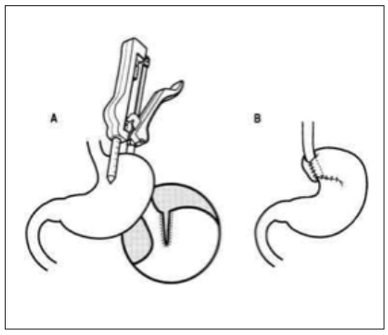

Image 5: Collis Gastroplasty (25)

Studies have been undertaken comparing laparoscopic fundoplication with medical therapy. The LOTUS trial, a multi-centre randomised control trial, has published 3-year data which indicates that laparoscopic fundoplication and esomeprazole medication are similarly effective. (23) Post-fundoplication complications were recorded as minimal and occurred in only 3% of patients. A recent meta-analysis, however, reached the conclusion that, in the short term at least, laparoscopic fundoplication resulted in greater improvements in health-related and GORD-specific quality of life measures when compared to medical therapy. (24) There was, however, a higher proportion of surgical patients who reported post-operative dysphagia. There is, thus, no clear evidence to support, particularly in the long term, one treatment strategy over the other, however, with the publication of longer term outcomes this may be rectified.

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Summary

GORD is a common presentation to primary care, which can result in a significant deterioration in quality of life and a substantial cost to the NHS. Pharmacological treatment, in the form of acid suppression, is an effective and safe treatment, providing both symptom control and regression of intestinal metaplasia. Laparoscopic fundoplication, with a partial or full wrap, is the surgical treatment of choice and provides equally effective short term results to that of medical treatment with minimal complications. The role of surgery, traditionally a second line treatment, is, thus, being reconsidered and gaining popularity.

MCQs

SBA: Select the single most appropriate answer.

1) The oesophagus passes through the diaphragm. At which level and with which other structures does this occur?

a) Azygos vein and thoracic duct at T12
b) Aorta and azygos vein at T8
c) Right phrenic nerve at T10
d) Oesophageal branch of Left Gastric Artery and Vagal Trunks at T10
e) Oesophageal branch of Right Gastric Artery + Vagal Trunks at T12

2) Which epithelial lining is seen in Barrett's Oesophagus

a) Columnar epithelium with H type cells
b) Ciliated Columnar epithelium
c) Non-keratinised stratified squamous epithelium
d) Columnar epithelium with goblet cells
e) Keratinised stratified squamous epithelium

EMQ: Select the most appropriate answer for each question.

a) H. pylori serology testing
b) 24 hour pH manometry
c) Upper GI endoscopy
d) CT chest, abdomen and pelvis
e) High Dose PPI
f) Barium Swallow

GASTRO-OESOPHAGEAL REFLUX DISEASE & FUNDOPLICATION

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3) A 79 year old male presented to his GP with dyspepsia and epigastric pain. Hb was 10.4. MCV 89.2. What is the most appropriate first line management?

4) A 48 year old female with epigastric pain and a cough had not improved on PPI therapy. Endoscopy was unremarkable. What is the next step in management?

5) A 69 year old female had an endoscopy showing mild oesophagitis. Biopsies were not taken due to intolerance of the procedure. What should be done?

Answers

1) A
2) D
3) C
4) B
5) A

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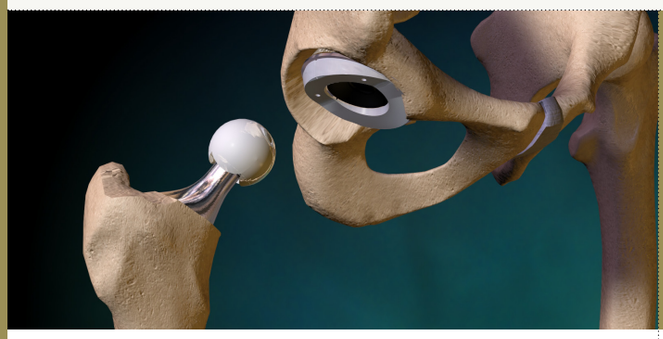
PRE-OP ASSESSMENT GUIDE FOR CORE TRAINEES - THR (TOTAL HIP REPLACEMENT)

E Gillott, S Kahane



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Abstract

Total Hip Replacement/Arthroplasty is a common procedure 76,759 procedures recorded in the National Joint Registry in 2010(1). Many patients attend pre-operative assessment clinics run by junior doctors. This article aims at guiding the junior through the most common questions faced during those clinics.

Key words
Total hip replacement, consenting, post-operative risks, osteoarthritis.

Case

You are a Core Trainee. You see an active 70 year old lady awaiting total hip replacement in your pre-assessment clinic. You are expected to assess her fitness for surgery and explain the procedure. She has additional questions relating to her condition and procedure.

Questions

What is osteoarthritis?

How is it diagnosed?

What is the treatment?

What is a hip replacement?

What are the risks associated with hip replacement surgery?

What should you pay special attention to in aftercare of hip replacement surgery?

Check this post-operative hip x-ray

She says she has been told she has osteoarthritis of the hip. She asks you what this means. What do you tell her?

· Osteoarthritis is the most common form of arthritis. Strictly speaking, arthritis means "inflammation of the joint". It is a degenerative disease and is commonly referred to as "wear and tear". It can affect one joint in isolation but commonly affects multiple joints. Though it can affect any joint, it is common in the hips, knees, hands, neck and low back. It affects the whole joint.

The load-bearing articular cartilage gets damaged and the body attempts to repair it by creating a wider surface (forming osteophytes at the joint margins) to spread the load. The subchondral bone hardens (scleroses). The capsule of the joint gets inflamed producing synovitis.

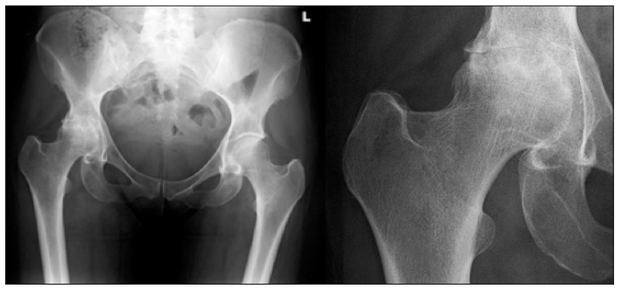
Prior to her name being added to this waiting list, what investigations are likely to have been carried out to reach this diagnosis?

· There is no specific laboratory test for osteoarthritis. The diagnosis is normally made through clinical examination and appearances on anteroposterior and lateral X-rays. Other tests can be performed but usually as a way of ruling out other causes of hip pain.

· The features seen on X-ray can be remembered by the mnemonic "LOSS":

a) L – Loss of joint space (caused by loss of articular cartilage)
b) O- osteophyte formation
c) S - subchondral sclerosis (increased bony formation around the joint), and
d) S - subchondral cyst formation

The x-ray is below is an example of osteoarthritis of the hip.



She asks you if having these X-ray findings means that a hip replacement is required. What do you tell her about treatment options for osteoarthritis of the hip?

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You should explain that there are non-surgical and surgical management options:

- **Non-surgical options include:**

- *Pain relief using the analgesic ladder*
- *Lifestyle modifications (weight loss if appropriate, diet and exercise)*
- *Occupational therapy input- mobility aids*
- *Physiotherapy - exercise regimes may delay the requirement for surgical intervention. Walking sticks can reduce the load transferring through the hip and therefore reduce pain.*

- **Surgical options include**

- *A hip replacement (arthroplasty),*
- *Or more rarely an osteotomy (though not for this age group).*
- *Only once conservative measures have been exhausted should management proceed down the surgical route. The primary clinical indication to proceed to surgery is as a pain relieving procedure through which they should also regain function.*

Your consultant has already placed her on the waiting list and she is in your pre-assessment clinic prior to his admission. She asks you if hip replacements are only performed to treat osteoarthritis. What is your response?

- More than 85 percent of hip replacements are done for osteoarthritis(2).
- Other common indications are other types of arthritis (rheumatoid, traumatic, inflammatory), avascular necrosis of femoral head, benign or malignant bone tumours. It is also an option after trauma for the treatment of proximal femoral fractures in young or active individuals.

He says he has been hearing things about metal hip replacements and wants to know what sort of hip replacement he will be getting. What do you say?

- Hip replacements comprise of a stem, a head and a cup liner inside the cup. These are mostly modular and they can generally be mixed and matched.
- The hip joint is basically a ball and socket joint. The ball (head) is attached to the stem. The stem sits inside the femur. The socket is referred to as the cup (and liner).
- The new hip replacement can be inserted with cement or without cement (i.e., press-fit).
- The surgeon will choose what the head will be made of and what the liner will be made of.
- The head will be made of metal or ceramic. The liner could be ceramic or polyethylene. The stem will be made of metal. The metal will be cobalt chrome, stainless steel or titanium.
- A lot of the controversy about metal hip replacements relate to the head and the cup-liner, specifically, a metal head moving inside a metal lining of the cup. The BOA suggests that surgeons and hospitals should now "not use such implants (large heads, stemmed, metal on metal bearings) which are not performing as well as was hoped"(3)
- The most common is to have a metal head and a polyethylene liner. This configuration has been used for many years.
- The surgeon will decide whether to use cement to hold the stem in place inside the femur or use a cementless prosthesis (i.e. a press-fit). Cementless prostheses have a hydroxyapatite coating to allow bony ingrowth and firm fixation. The same choice exists for the Cup.

The patient is very active and wants to know when she can drive again?

- She should be able to perform a safe emergency stop.
- It will probably be after about 6 weeks depending on how well the hip moves and how high or low the car seat is.
- If the patient feels able to drive before 6 weeks post operatively, they must ask the insurance company for permission.
- It may be awkward getting in and out of the car at first, and the physiotherapists will show the patient the safe way in order to reduce the risk of dislocation.

The patient may not ask you, but if you feel you have the rapport, it may be worth volunteering advice about resuming sexual activities.

- Patients should exercise caution, but should be able to have sex after six to eight weeks
- Patients should avoid vigorous sex and more extreme positions.(4)

The patient says she travels a lot. He wants to know when he can fly again and whether he will set of the security alarms in the airport?

- The alarm at airport security will probably be triggered, especially as sensitivity of the security system is set quite high. Its worth remembering that this procedure is for the ultimate safety of all.
- If the alarm goes off, the patient will be "wanded" – meaning the security staff wave a hand-held metal detector over the body to identify which part of the traveller has triggered the alarm. After that, they may be directed to the scanner.
- It's probably worth telling security about the artificial hip before they walk through the gateway – it might save some time by taking them directly to the scanner.
- Knowing that the screening process will probably take a little longer, the patient should allow extra time to clear security when making travel plans.
- Some people carry their "orthocard" with them – and you will always have your scar. (5)
- Remember to inform the patient that the risk of thromboembolism is higher in the early days post-surgery – he should therefore consider Flight stockings and anticoagulants for long-haul flights.
- This risk is raised for approximately 3 months.

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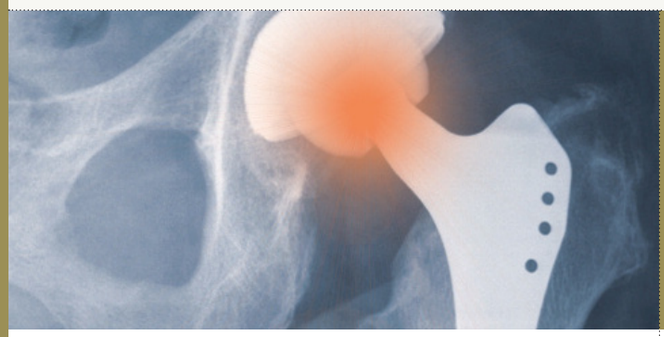

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Prior to his operation, what are you specifically checking in your clinic?

· Cardiovascular system

- All patients get an ECG pre-operatively if over an arbitrary age set by your hospital or if have a cardiac history
- Similarly most patients that need a hip replacement will be in the category to require a chest X-ray (though different hospitals have different policies).
- Check for cardiac pathologies

· Patients with heart failure, hypertension, previous stroke, congestive heart failure or ischaemic heart disease may be on aspirin, clopidogrel, warfarin, acenocoumarol, phenindione, dabigatran , etexilate or rivaroxaban.

- Ensure no recent MI

· Acute is ≤ 7 days, recent is 8-30 days, but any event should be noted.

· Patients with a history of MI within the last 6 months should have their surgery delayed as mortality is increased. The re-infarction rate for patients undergoing non-cardiac surgery within three months of a myocardial infarction is approximately 5%(6) and a reduction in mortality when waiting 6 months after an MI.

· If the patient has had a recent MI, Speak to the anaesthetist and discuss this patient

- Ensure no undiagnosed murmurs

· New murmurs require an echo

· The anaesthetist may require an echo for all patients with murmurs – make sure you know what their preference/policy is.

- Look for a pacemaker and ensure it has been checked within the last 1 year.
- Previous Cardiac Surgery

· Patients with metallic valves are likely to be on Warfarin – this needs to be stopped prior to surgery. It is always worth liaising with the patient's cardiologist to seek advice on appropriate management and optimum scheduling of the treatment.

- History of hypertension

· Check the blood pressure of every patient

· Provides a baseline to compare once admitted

· Hypertension needs to be controlled prior to admission

· A significantly high blood pressure may lead to delay in admission whilst the patient and GP work together to bring blood pressure under control.

· Patients may need a 24-hour tape and referring back to GP for medication adjustment.

· Know what your anaesthetist advised regarding which medications to take on the day of surgery, this is particularly important with regard to anti-hypertensives.

- Patients with metallic valves are likely to be on Warfarin;

· The patient will need to be advised when to stop their warfarin pre-operatively. Patients who have been on warfarin will need to have their INR checked on the day of surgery, so it is a good idea to ensure they are not first on the list.

· Patients may need to be converted to a heparin infusion pre-operatively and an additional coagulation screen done prior to surgery.

· Discuss the patient with their cardiologist to obtain a suitable management plan to reduce balance their risk.

· Some hospitals use Beriplex – a drug derived from plasma which has been virally inactivated. This is an expensive drug and is used for rapid reversal of anticoagulation with warfarin. It is preferable to plan warfarin omission and use an alternative short-acting anticoagulation prior to elective surgery.

· Respiratory System

- History of asthma

· Check if had ITU admissions

· Check PEFR

- History of COPD

· As above

- History of difficult intubations

· If the patient has then speak to the anaesthetist and discuss this patient – they may wish to see the patient themselves pre-operatively in clinic.

· Endocrine

- History of diabetes

· Check urine (for everyone) – this may be the first time their urine is tested and a new diagnosis of diabetes could be picked up in the pre-assessment clinic.

· If diabetic, send of blood for HbA1C and laboratory Glucose

· If on insulin, ask them to bring all their equipment with them when they are admitted – due to the hospital formulary system, the patients usual brands may not be readily available.

· They will have a sliding scale prescribe on admission

- History of steroid use

· Inform the anaesthetist and the operating surgeon.

· Steroids increase the bleeding risk, as well as the infection risk. In addition, the anaesthetist may decide they need additional steroid cover.

· It is good practice to contact the patient's endocrine team, as they may also have advice regarding pre-, intra and post-operative dosing.

- History of thyroid disorder

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· Specifically check for goitre – as this can affect the intubation
· Send blood for thyroid function test
· Deranged thyroid function can leads to cardiac disturbances
· Gastro-intestinal
- History of reflux, hiatus hernia, gastric and duodenal ulcers and obesity surgery
· The stress of surgery, combined with operative positioning and the anaesthetised state, all increase the risk of acid secretion and aspiration. The patient may need gastric cover in the form of a PPI (Proton Pump Inhibitor) or an H2 antagonist/blocker.
· Musculoskeletal
- Previous orthopaedic surgery
- This can affect positioning, placement of diathermy plates etc
- Check limb-length and document
- One of the risks of hip arthroplasty is the creation of a new limb length discrepancy – it is important to know whether there is a pre-existing discrepancy to allow accurate assessment afterwards
· Neurological status
- One of the risks of hip arthroplasty is damage to the nerves (superior gluteal nerve if antero-lateral approach, and sciatic nerve if posterior approach)
· It is important to know whether these nerves are already intact
- Patients may experience neuropraxia as a result of their positioning on the operating table
· Any pre-existing neurological disturbance should be assessed and documented – it will also help to established whether post-operative neuropraxia is new or pre-existing.

When explaining the specific risks and complications, what do you say?

· Complications are general (related to any surgery) and specific
· General complications are: Infection (increased risk of diabetes or immunosuppression), DVT and PE, plus heart attack and stroke for elderly and those with specific comorbidities. Limb length discrepancy, damage to nerves and vessels and dislocation should all be specifically mentioned on the consent form.
· The patient should also be informed that the skin around the scar will most likely be numb but that does not affect function, and that the whole lower limb will be swollen for a long time. It is worth telling them that it can take up to a year for swelling to resolve.
· For those patients undergoing ceramic-on-ceramic bearing, the prosthesis itself may fracture, and some patients experience "squeaking" of the hip whenever it is moved.

• **The specific complications are(7):**
- Intraoperative
· On table fracture of the femur or perforation of the acetabulum

• **Immediate(within 24 hours)**
· Dislocation (3%)

• **Early (within 30 days)**
· Deep Vein Thrombosis (2%)
· Pulmonary embolus (1%)
· Fat embolism syndrome
· Infection
· Early failure, early loosening
· Sciatic nerve palsy (1%)
· Dislocation

• **Late (after 30 days).**
· Prosthesis failure
· Ceramic fracture
· Squeaking if ceramic on ceramic bearings
· Loosening (septic or aseptic)
· Dislocation (3%)
· Infection
· Leg-length discrepancy (up to 15%)
· Thigh pain (7;8)

She sees that you are completing a Venous Thrombo-Embolism Assessment form. She asks you how you prevent the risk. What do you tell her?

· There is a national guidance from NICE (National Institute of Clinical Excellence) that addresses VTE (venous thromboembolism) prophylaxis (9) and within that guidance, NICE has recommended that all patients be assessed for their risk of developing a venous thromboembolism and appropriate prophylaxis be employed to reduce the risk for each individual patient. Each hospital has its own protocol that incorporates that guideline.
· That risk assessment covers all aspects of the patient's general health and past medical history as well as the type of surgery they are about to undergo. This is why it is important to ask about personal and family history of VTE, as well as patient's BMI, and co-morbidities.
· There are a variety of methods that can be used in isolation or in combination depending on the individual patient's circumstances and risk.
· The risk of thrombo-embolism cannot be excluded, but can be reduced or minimised by the use of mechanical and chemical methods.
- Mechanical relates to early mobilisation, arterio-venous boots, TED stockings.
- Chemical relates to aspirin, LMWH, warfarin and the newer oral anticoagulants.
· For patients undergoing Total Hip Replacements, this is achieved by following the NICE Glinical Guideline: Venous thromboembolism: reducing the risk: Reducing the risk of venous thromboembolism (deep vein thrombosis and pulmonary embolism) in patients admitted to hospital (9)
- Pre-op
· anti-embolism (TED - Thromboembolic deterrent) stockings which can be thigh or knee high OR
· foot impulse devices OR
· Intermittent pneumatic compression devices (thigh or knee length).

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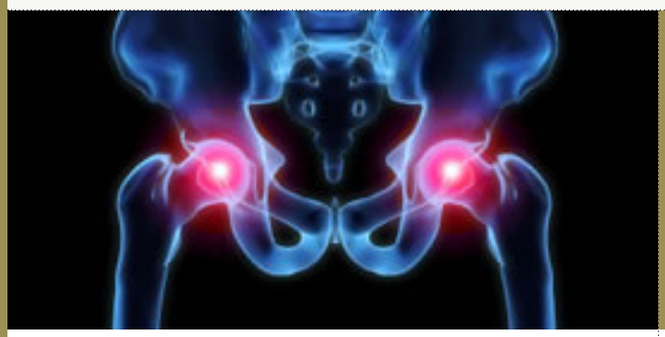

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- Mechanical VTE prophylaxis should be continued until the patient no longer has significantly reduced mobility.

- Intra-op
- Foot pumps/compression boots

- Post op
- NICE recommends starting pharmacological VTE prophylaxis after surgery providing there are no contraindications. The choice is made from:
- Dabigatran etexilate, starting 1–4 hours after surgery(9)
- Fondaparinux sodium, starting 6 hours after surgical closure provided haemostasis has been established
- LMWH, starting 6–12 hours after surgery
- Rivaroxaban, starting 6–10 hours after surgery
- UFH (for patients with renal failure), starting 6–12 hours after surgery.
- The pharmacological VTE prophylaxis should be continued for 28–35 days, according to the summary of product characteristics for the individual agent being used.
- Early mobilisation is also key to minimising the risk of VTE (Ramachandran & Poole 2002)

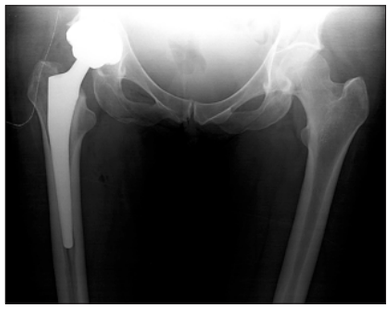
You are now looking after this lady on the ward post operatively. What will you need to check?

- She will need routine observations as these measurements provide a simple early warning sign of problems, e.g. increased heart rate, reduced blood pressure, increased respiratory rate, reduced saturations.
- Check that any further doses of IV Antibiotics have been prescribed – local hospital policies may vary, but a common regimen is a dose given at induction and two further doses at 8 hours and 16 hours post operatively.
- Check that DVT Prophylaxis is appropriately timed and prescribed according to the operative note/local policy
- Check her post-operative haemoglobin
- Arrange a post operative check X-ray

The day after the operation, her observations remain within normal limits. Her Hb post op is 10.4g/dL. Her pain is relatively well-controlled and she has had her post-op check X-ray. The nurses on the ward ask you to check the X-ray. What are you looking for?

- At core surgical level, you need to check the hip is in joint, that there is no fracture and that there is no cement in the wrong place. Alignment of the prosthesis and position of the components will be checked by seniors.

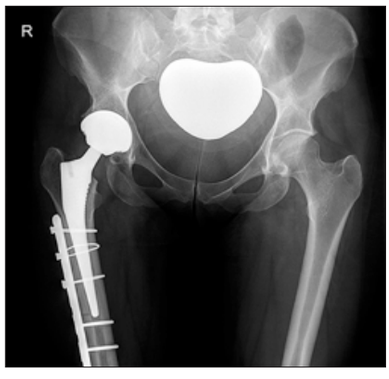
Below is the case of a female patient who underwent Right Total Hip Arthroplasty for Osteoarthritis. This is her post-operative check X-ray. What is your comment on this film?



- On this X-ray, there is a vertical fracture evident below the tip of the prosthesis. This is a subtle finding and could easily be missed. If the patient had borne weight upon this prosthesis, the fracture would likely have extended/displaced and caused a great deal of pain, and possibly early failure and need for revision.
- The right thing to do is to inform your senior immediately.

This lady went back to theatre and had a fixation of the fracture using a plate and cerclage wires. She was initially mobilised non-weight-bearing to allow the fracture to unite. She was seen in out-patient clinic at 6 weeks where she underwent wound review, functional and radiographic assessment.

At assessment, her pain had resolved, the wound was healed and X-rays were satisfactory to allow to progress to full weight-bearing. The fixation metalwork can remain in situ unless it causes a problem.



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MCQ's

1) Which of the following is not a common feature of osteoarthritis?
a) Joint space narrowing
b) Juxtaarticular osteopenia
c) Osteophytes
d) Subchondral sclerosis
e) Subchondral cysts

2) Which of the following is not an appropriate pharmacological VTE prophylactic agent?
a) aspirin
b) dabigatran etexilate
c) fondaparinux sodium
d) LMWH
e) They are all appropriate

3) Which of the following metals can be used for the stem of the implant?
a) Cobalt chrome
b) Stainless steel
c) Tantalum
c) Titanium
d) All of the above

4) Before a patient is listed for a hip replacement, there are non-operative management options that should be routinely considered. Which of the following is not one of them?
a) Analgesia
b) Hip arthroscopy
c) Lifestyle modifications
d) Occupational therapy input
e) Physiotherapy

5) Which of the following is the most common complication of Total Hip replacement?
a) Fat Embolism
b) Leg-length discrepancy
c) Pulmonary Embolism
d) Sciatic nerve damage
e) Squeaking

Answers

1 – B
Juxtaarticular osteopenia is a feature of rheumatoid arthritis.

2 – A
Aspirin or other antiplatelet agents are not regarded as adequate prophylaxis for VTE.

3 – E
Any of the metals listed can be used.
There is a long list of compounds used.

4 – B
The role of hip arthroscopy in osteoarthritis is currently unclear – it is thought it may be helpful in staging or planning for osteotomies. Patients may find minimal benefit from lavage but it is not routinely recommended as a treatment for hip arthritis.

5 - B
The literature suggests that 15% patients may experience limb-length discrepancy post total hip replacement.

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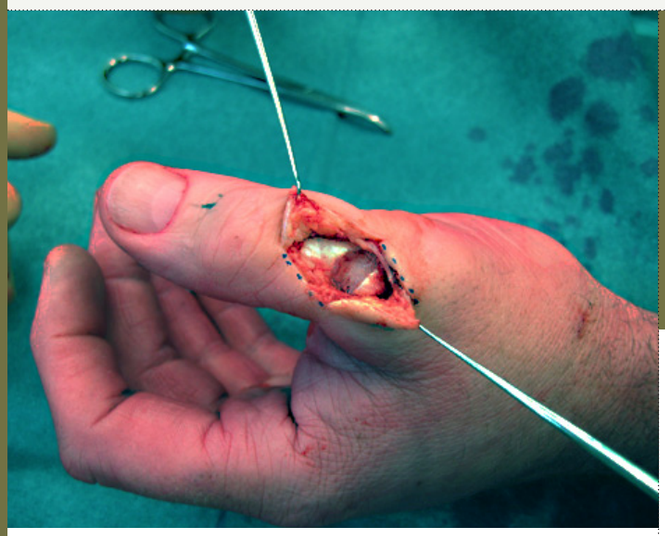
EXTENSOR TENDON REPAIR: THE FIGHT BITE

R O'Connor, V Shanbhag



Abstract

Introduction

Extensor tendon injuries are a recognised complication of 'fight bites.' This article aims to define the concept of the 'fight bite,' and how to manage patients who present with concurrent extensor tendon injuries. It also gives a step-by-step guide to extensor tendon repair and a series of single best answer questions to help Core Surgical Trainees focus their learning.

History and Pathology

The extensor mechanism of the fingers is complex, and has been divided into zones according to the site of injury. Injury to the tendon from a 'fight bite' occurs in zone V and results in loss of extension at the metacarpal phalangeal joint (MCPJ). The wound is often contaminated with foreign bodies, such as broken teeth, though extension may be maintained despite significant tendon damage.

Extensor Tendon Repair

In a consented and anaesthetised patient, the 'fight bite' wound should be thoroughly cleaned to prevent infection. The ends of the tendon must be handled carefully due to their relative thinness and sutured together using the modified Kessler technique. The hand should then be placed in a volar back slab in the position of safe immobilisation, and the wound checked after 48 hours.

Conclusion

Whilst there are other approaches to managing extensor tendon injuries and 'fight bites', the one described offers Core Surgical Trainees a safe and reliable method that provides good outcomes and minimises post-operative complications.

Keywords

Extensor tendon injury; extensor tendon repair; fight bite; hand injury; Kessler technique.

Case Vignette

A 23-year-old male attended the A&E department following a night out during which he consumed 16 units of alcohol. He was involved in a fight with a group of males and punched someone, but could not remember any further details. He complained of right hand swelling and was unable to move one of his fingers.

On examination his right hand was swollen and bruised with a 4mm wound over the head of the middle finger metacarpal. He could not extend the finger at the metacarpal phalangeal joint (MCPJ). An X-ray showed a radio-opaque fragment in the wound but no acute bony injury.

How would you manage this patient as a Core Surgical Trainee?

Introduction

Hand injuries are common, accounting for 1.36 million attendances to Accident and Emergency (A&E) departments in the UK each year (1). Within this group 20% require input from a hand surgery specialist. Injury to the extensor tendons of the fingers is one such injury that is referred, and Core Surgical Trainees will likely encounter these patients during their training.

A common mechanism by which the extensor tendons are injured is from damage incurred by the so-called 'fight bite.' The aim of this article is to describe the practicalities of managing these injuries from presentation to discharge.

The 'Fight Bite'

'Fight bites' occur when the teeth from one person puncture the skin overlying the dorsum of the metacarpal heads of another when one strikes the other. They are not bites but forceful penetrating injuries caused by contact between a tooth and clenched fist (Figure 1). The tooth often pierces deeper than expected and enters the bone underneath, through or near to the MCPJ. They affect young males during fights or sporting activity and are complicated by infection in 10% of patients (2). Given its prominence when the fist is clenched the middle finger is most commonly affected.

EXTENSOR TENDON REPAIR: THE FIGHT BITE

R O'Connor, V Shanbhag

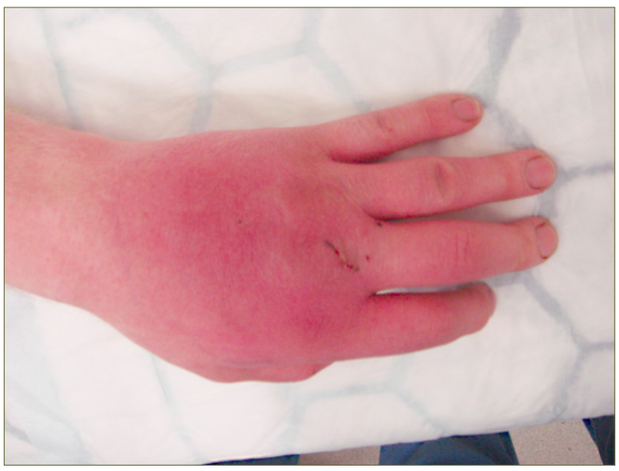


Figure 1: A 'fight bite' to the dorsum of the left middle finger MCPJ with cellulitis.

Any combination of skin, extensor tendon, joint and bone may be injured since they are all superficially placed. Furthermore foreign bodies such as tooth fragments, which will be demonstrated on appropriate X-rays, may contaminate the wound. In this situation, microorganisms from the tooth are prevented from draining because the penetrated layers of the finger slide differentially over each other during extension sealing the spaces between them. Additional movements of the tendon transmit the inoculum caudally along the tendon sheath. Consequently, the apparent minor nature of the injury hides its potential for harm, leading to under-treatment from the unwary with rapidly devastating results.

History and Pathology

The extensor tendons of the fingers originate from their corresponding muscle bellies in the forearm. The extensor digitorum communis (EDC) tendon supplies each finger, whilst the extensor indicis proprius (EIP) and extensor digiti minimi (EDM) tendons assist with extension of the index and little fingers respectively. Extension of the thumb is accomplished by the extensor pollicis longus (EPL), extensor pollicis brevis (EPB) and to a lesser extent the abductor pollicis longus (APL) tendons. The dorsal interosseous branch of the radial nerve innervates all muscles that extend the digits at the MCPJ.

Extensor tendon injuries were divided into 'zones' by Kleinert and Verdan in 1983 (3) (Figure 2). A 'fight bite' may damage the extensor mechanism as the tendon passes through Zone V over the MCP joints (4). Here the tendon is maintained in its central position by the radial and ulna sagittal bands that originate from the volar plates of the MCPJ. Injury to these bands result in subluxation of the tendon from its glide path.

When the tendon is divided completely no extension of the finger occurs. However with partial division extension remains possible, though may be difficult due to pain inhibition.

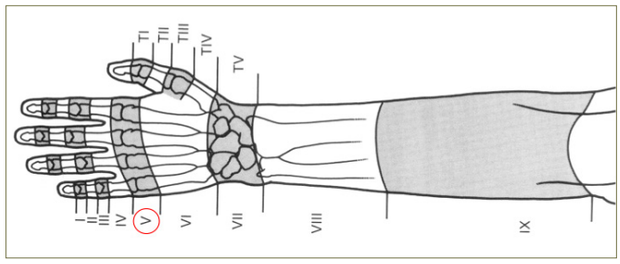


Figure 2: Extensor tendon zones with zone V over the MCPJ highlighted (3).

Indications for Wound Exploration and Tendon Repair

The Wound

Whether there is partial or complete extensor tendon division, a wound contaminated by foreign bodies or extending beyond subcutaneous tissue warrants exploration. Under local anaesthetic remove visible debris and irrigate the wound with normal saline or aqueous Betadine. This will identify injuries to underlying structures, penetration into the joint and cleans the wound.

The wound should be left open and a non-adhesive sterile dressing applied. Broad-spectrum antibiotics with anaerobic cover are necessary as microorganisms from the oral cavity contaminate the wound.

The Tendon

Partial tendon injuries, where <50% of the tendon has been divided, do not need to be repaired as finger extension is preserved. The wound however does need to be explored and the joint washed out as stated above. Splinting the finger in extension using a volar back slab for six weeks allows the tendon to heal. Complete division or injuries where >50% of the tendon has been severed require repair to restore extension.

Consent

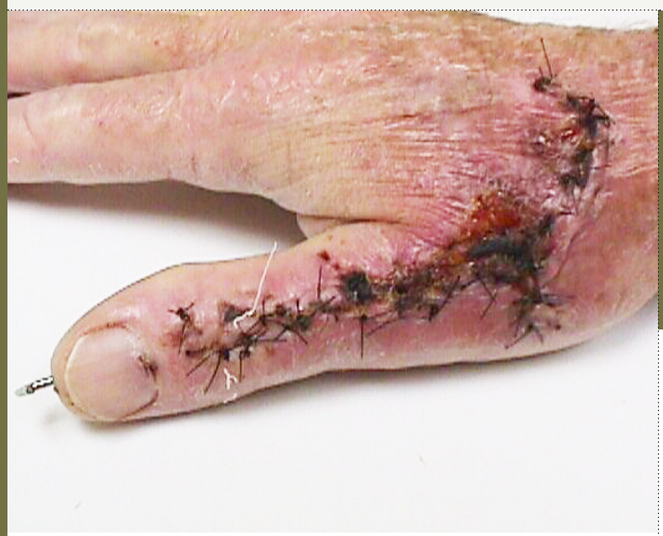
The risks specific to extensor tendon repair are:

- *Repair failure*
- *Numbness affecting the dorsum of the digits due to damage to the dorsal branches of the radial and ulna nerves*
- *Stiffness from adhesions*

The general risks of surgery include bleeding, infection, wound breakdown and scarring.

EXTENSOR TENDON REPAIR: THE FIGHT BITE

R O'Connor, V Shanbhag



Operative Technique

Examine and document the pre-operative neurovascular status of the affected hand.

Preparation and Draping

Extensor tendon repair may be performed under general, regional or local anaesthetic. To reduce bleeding a tourniquet should be placed on the arm and inflated to 100mmHg above the systolic blood pressure.

The skin should be prepared to the level of the tourniquet using an appropriate antiseptic solution. The arm should be isolated using sterile drapes placed above the elbow and the hand rested on an arm board. This creates a sterile operative field whilst permitting free movement of the hand.

Technique (5)

- Extension of the 'fight bite' is often necessary to achieve adequate exposure, but avoid longitudinal incisions as they predispose to contracture formation. Instead use oblique incisions, especially when crossing the skin creases over the MCPJ.
- Explore the wound to identify damaged structures or metacarpal head fractures, and remove foreign bodies.
- Irrigate the wound with 1L of normal saline at least.
- Often there is a rent in the extensor mechanism leading to the joint, so this and its capsule should be explored.
- Debride any inflamed synovium, and tag its remains together loosely with 5-0 resorbable sutures, but do not make it watertight.
- Locate the two free ends of the extensor tendon, which will be a few millimetres apart.
- Extensor tendons are thin, with a thickness of 1.5-1.8 mm, so should be handled carefully to avoid shredding. Appose the free edges by hyperextending the MCPJ rather than pulling them with forceps.
- To repair the tendon there are many methods to choose from, but the number and size of sutures crossing the repair site will govern the overall strength. Typically a modified Kessler technique using a 4-0 non-resorbable suture that crosses 4-6 times will convey sufficient tensile strength (6).
- Once repaired ensure the tendon moves freely by gently flexing and extending the finger at the MCPJ.
- The wound may be closed with resorbable or non-resorbable 4-0 sutures.
- Clean and dry the wound and cover it with a non-adhesive dressing.
- Place the hand in a volar back slab in the position of safe immobilisation, where the wrist is in slight extension and the fingers flexed at the MCPJ's and extended at the inter-phalangeal joints (Figure 3).
- The patient should attend for a wound check after 48 hours either on the ward or in theatre depending on the amount of infection. Intravenous antibiotics should be continued until the second look.
- Repeated trips to theatre are required to eradicate fulminant contamination and patients need to be warned of this on admission.

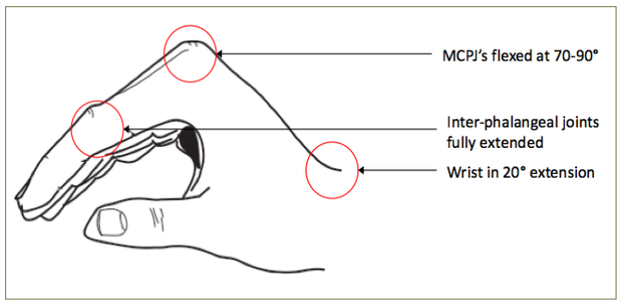


Figure 3: The position of safe immobilisation (POSI or Edinburgh positions).

Post Operative Care

Protection of the repair through immobilisation must be balanced against the risk of peri-tendinous adhesions. The volar back slab should remain for three weeks; thereafter the finger should be allowed to move under the supervision of Hand Therapists to prevent stiffness. They can make a splint that permits small amounts of flexion and extension at the MCPJ. In so doing the tendon glides 3-5mm along its path, enough to prevent adhesion formation (6). Such 'early motion' protocols decrease post-operative complications and expedite recovery times (7).

The technique of extensor tendon repair described is one of many. Other methods and aftercare regimens exist that are equally effective. The choice of treatment is individual to the surgeon and should be tailored to each patient.

EXTENSOR TENDON REPAIR: THE FIGHT BITE

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Questions

1. The nerve supply to the extensors of the fingers at the MCPJ comes from:

a) The median and radial nerve
b) The median and ulna nerve
c) The radial and ulna nerve
d) The radial nerve alone
e) The median nerve alone

2. Concerning 'fight bite' injuries, the extensor tendon is most likely injured as it passes through:

a) Zone I
b) Zone II
c) Zone III
d) Zone IV
e) Zone V

3. The nerve(s) most likely damaged during extensor tendon repair are:

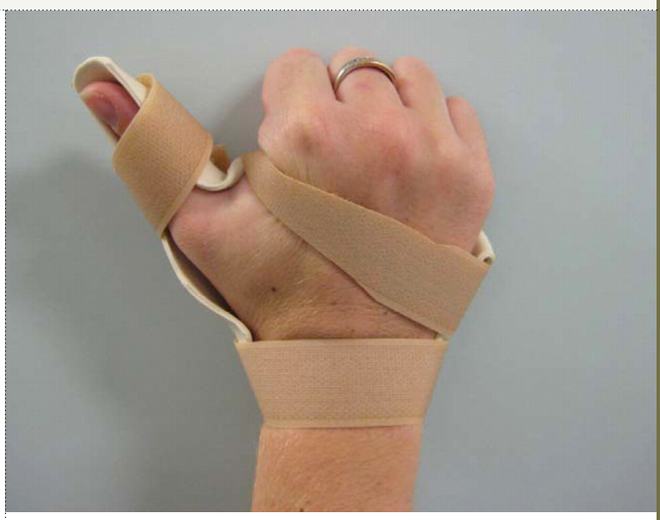
a) Palmar radial and ulna nerves
b) Dorsal radial and ulna nerves
c) The radial and ulna digital nerves
d) The dorsal interosseous nerve
e) The sympathetic nerves

4. Which of the following is NOT a risk factor of extensor tendon repair:

a) Adhesion formation
b) Tendon rupture
c) Wound breakdown
d) Chronic regional pain syndrome
e) Bleeding

5. In the position of safe immobilisation (Edinburgh position) the:

a) The wrist is extended and the fingers flexed at the MCPJ's and extended at the inter-phalangeal joints
b) The wrist is extended and the fingers flexed at the MCPJ's and inter-phalangeal joints
c) The wrist is in neutral and the fingers flexed at the MCPJ's and extended at the inter-phalangeal joints
d) The wrist is flexed and the fingers flexed at the MCPJ's and extended at the inter-phalangeal joints
e) The wrist is in neutral and the fingers extended at the MCPJ's and inter-phalangeal joints



Answers

1. d
2. e
3. b
4. d
5. a

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BLOOD TRANSFUSION

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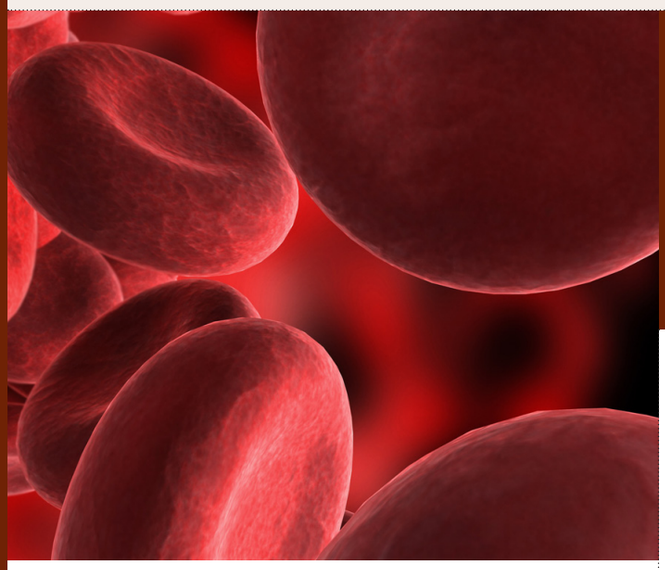

Abstract

Anaesthetists will frequently administer transfusions to patients both in the theatre and non-theatre setting. Knowledge on when to transfuse and the products to deliver is invaluable.

In this article we discuss the blood grouping system and how blood typing is carried out. We also discuss the blood products available and when they are used, including their use in massive transfusion. Finally we discuss the potential complications that can arise from transfusion of blood products.

Keywords: *transfusion, blood products*

Clinical Vignette

A 76-year old male presented to the emergency department with acute onset abdominal pain, radiating into his back. On initial assessment he was found to be peritonitic. Observations showed him to be tachycardic and hypotensive, which was temporarily responsive to fluid resuscitation. A CT scan revealed a leaking abdominal aortic aneurysm. Six units of cross-matched red blood cells, four units of fresh frozen plasma and platelets were requested. He was immediately taken to theatre for a laparotomy and repair of the aneurysm. During the procedure he required transfusion of two units of group specific red blood cells, six units of fully cross-matched packed red cells, six units of fresh frozen plasma, two units of platelets and cryoprecipitate. He was then taken to the intensive care unit where he made a good recovery. He was extubated on the third day post-operatively. No further transfusion was required during his hospital stay.

Blood Groups

The ABO blood grouping system was first described by Landsteiner in 1901, following his discovery of naturally occurring antibodies in blood plasma (1). Over the past 100 years the ABO grouping system has remained the most clinically important system out of the thirty major blood group systems that are recognised by the International Society of Blood Transfusion (1).

ABO System

The ABO blood system is a one that all humans can be typed into. The four groups within this system are A, B, AB and O. An individual's blood type is dependent on antigens that are present (or absent) on the surface of red blood cells, and their associated anti-A and anti-B immunoglobulin M (IgM) antibodies (2). These antibodies are not present at birth, but develop by six months to one year of age following sensitization to environmental substances such as food, bacteria and viruses (2). The ABO blood grouping system is demonstrated in table 1.

Recipient Type (Antigen)	Antibodies Present	Donor Type	Percentage Present In UK (%)
A	Anti-B	A, O	42
B	Anti-A	B, O	8
AB	None	A, B, AB, O	3
O	Anti-A, Anti-B	O	47

Table 1: ABO Blood Grouping System (2)

Rhesus System

This system was first described 60 years ago, and is the second most clinically important blood system in transfusion medicine after the ABO system (3). An individuals Rhesus status is dependent on the presence or absence of a Rhesus-D (Rh-D) antigen complex on the surface of red blood cells, making them either Rh-D positive or Rh-D negative (3). The associated Rh-D antibodies are immunoglobulin-G antibodies (IgG). A patient who is Rh-D positive will not have anti-D antibodies in their blood. As the production of these antibodies is not dependent on environmental sensitization, an individual who is Rh-D negative may not necessarily have anti-D antibodies either (3). In Obstetric practice, the Rhesus blood grouping system is extremely important. If a Rh-D negative mother bears a Rh-D positive infant, following fetomaternal transfusion of blood, Rh-D antibodies are readily formed. These can cross the placenta, causing destruction of fetal red blood cells and subsequently haemolytic disease of the newborn (2). As a result of this, anti-D immunoprophylaxis is administered to Rh-D negative mothers during pregnancy and delivery (2).

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Blood Typing Methods

The main principals behind the methods for blood typing have not changed over past years. Blood typing involves serology with red cell agglutination (1). Blood that is issued from blood bank can be group and screened or cross-matched. In an emergency situation, O-negative blood can be issued.

Group and Screen

Group and screening identifies the ABO and Rhesus-D group of a patient. This is done through monoclonal typing reagents (anti-A, anti-B, anti-A+B and anti-D) (2). The patient's serum is tested against red cells that carry the antigens A, B and AB, and then exposed to an antiglobulin reagent, which detects cell bound antibodies (3). The red cell units that do not have the red cell antigen can be selected (2). Group and screened blood is available within 20 minutes.

Cross Matching

Cross-matched blood takes 40 minutes to issue. A sample of the donor blood is mixed with the patient's serum. If the blood is compatible then it will remain suspended, however if the sample is not compatible the donor red blood cells will agglutinate by antibodies in the recipient's serum. This can be seen by examination under a microscope (2).

Emergency Situations

In life threatening situations O-negative blood is issued. It is the universal donor. O-negative blood does not have an ABO or Rh-D antigen complex on the red cell surface, so on transfusion it will not initiate production of anti-A, anti-B or anti-D antibodies.

Blood Products and Indications for Use

There are a number of blood products available for transfusion and various indications for the use of each one.

Red Blood Cells (Packed Cells)

Content

This consists of red cells that are separated from whole blood and stored at 1-6°C. They are collected in citrate-phosphate-dextrose (CPD), spun down to remove the plasma, and resuspended in saline-adenine-glucose-mannitol (SAG-M). They can be stored for up to 42 days (4).

Clinical Use

Red blood cells are administered when a patient's haemoglobin (Hb) level drops to a certain level, or when a patient becomes symptomatic with a low Hb. In emergency situations with ongoing bleeding, red blood cells are transfused. Several studies show transfusion to be an independent risk factor for increased morbidity and mortality (5, 6) however perioperative mortality has been demonstrated to be inversely correlated with Hb concentration. This rises from 7.1% to 61.5% as the haemoglobin concentration reduces from 10g/dl to 6g/dl (7). Generally, transfusion of red blood cells is not usually indicated until Hb levels fall to 7.0g/dL (8). However, in patients with pre-existing cardiovascular disease, the risk of death associated with low preoperative Hb levels is more pronounced (9), so transfusion is considered at Hb levels of 8.0g/dL.

Fresh Frozen Plasma

Content

Fresh frozen plasma (FFP) is isolated from single whole blood donation or by plasmapheresis. Red blood cells, leucocytes and platelets are removed, leaving coagulation factors. It is frozen within eight hours and stored at −30°C (10). It has a shelf life of five days when it has been thawed at 1°C to 6°C.

Clinical Use

FFP is given to patients who have abnormal coagulation results, associated with ongoing haemorrhage, massive transfusion, or disseminated intravascular coagulation. It is also administered prophylactically prior to invasive procedures or operations on patients with deranged clotting. It may be given to reverse the effects of warfarin (vitamin K and recombinant factor VII are also sometimes needed), to replace single coagulation factor concentrates or in patients with underlying liver disease (2). It is also used in patients with thrombotic thrombocytopenic purpura in conjunction with plasma exchange (2). There is very little evidence supporting the best practice on FFP transfusion, particularly in the emergency setting. Prophylactically, the decision to administer FFP is often made on laboratory results (10).

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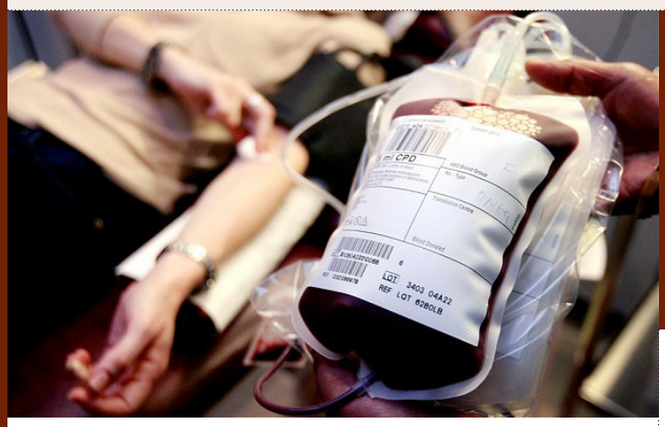

Platelets

Content

Platelets are either isolated from whole blood or collected by apheresis. Platelets have a short shelf life of 5 days, and are stored, agitated, at room temperature. Platelets are not cross-matched prior to transfusion, but are tested for bacteria.

Clinical Use

Like with FFP, platelets are administered in emergencies associated with massive transfusion, typically when a patient has lost one blood volume, or if laboratory tests show dilutional thrombocytopenia or evidence of disseminated intravascular coagulation (2). Platelets may be transfused prophylactically to maintain levels above >50 x 109 l-1 prior to invasive procedures or surgery. Sometimes, levels greater than >100 x 109 l-1 may be required, for example in procedures involving the brain or eye. Platelets are also transfused in patients with bone marrow failure who have just received chemotherapy to maintain a level of >10 x 109 l-1 (2).

Cryoprecipitate

Cryoprecipitate contains clotting factor VIII, factor XIII, fibrinogen and von Willebrand factor. It is prepared through controlled thawing of fresh plasma at 1°C to 6°C and precipitation of higher molecular weight proteins. It may also be transfused as a concentrated source of fibrinogen (10).

Clinical Use

The use of cryoprecipitate is mostly dependent on fibrinogen levels. In massive transfusion, or in patients with disseminated intravascular coagulopathy it is administered when fibrinogen levels fall below 1.5gl-1 (2). It is given to patients with dysfibrinogenaemia associated with bleeding and in patients who are bleeding following thromboytic therapy (2). Cryoprecipitate is not used in patients with global coagulation factor deficiencies, such as in liver disease as it is not a source of all coagulation factors (10).

Other Products

There are a number of other products administered in patients with ongoing bleeding. These include recombinant factor VII, fibrinogen concentrate and tranexamic acid. Recombinant factor VII and fibrinogen concentrate are given on haematology advice and tranexamic acid is becoming more widely used both electively and in trauma patients.

Complications of Transfusion & Management

Complications of blood transfusion can be classified in multiple ways. Broadly, they can be divided into immunological and non-immunologcial reactions, or immediate and delayed reactions. (11)

The main complications of transfusion are discussed below:

Haemolytic Transfusion Reactions

Haemolytic transfusion reactions occur in 1 per 40,000 transfused units of packed red blood cells. More commonly (3-4%), nonhaemolytic febrile reactions and minor allergic reactions take place.

Haemolytic transfusion reactions can occur immediately after administration of transfusion or up to one to two hours later. It is an immunological reaction due to ABO incompatibility, occurring when recipient antibodies react against antigens on the donor red blood cells. This incompatibility is often due to administrative error when blood products are checked and transfused (12). In the more severe reaction, there is rapid intravascular haemolysis of the donor red blood cells resulting in haemoglobinaemia, haemoglobinuria, disseminated intravascular coagulation, renal failure and complement-mediated cardiovascular collapse.

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Transfusion Related Acute Lung Injury (TRALI)

TRALI occurs secondary to the transfusion of plasma containing blood components and has an incidence of 1 per 625 transfused patients (13). It is characterized by acute respiratory failure, hypoxaemia and non-cardiogenic pulmonary oedema, which often occurs within six hours of transfusion (14). It can be confused with acute respiratory distress syndrome or circulatory overload (14). It is thought to be secondary to either an immunological reaction in which donor antibodies react against recipient leucocyte antigens, or a non-immunological response when inflammatory molecules released from cell degradation, accumulating when the blood is stored (13). The immune response is often after transfusion of FFP and platelets and in 70% of cases the patient will require ventilation. 6-9% of these cases are fatal (14). The non-immune form occurs after transfusion of stored platelets and erythrocytes and has lower mortality rates associated with it (14).

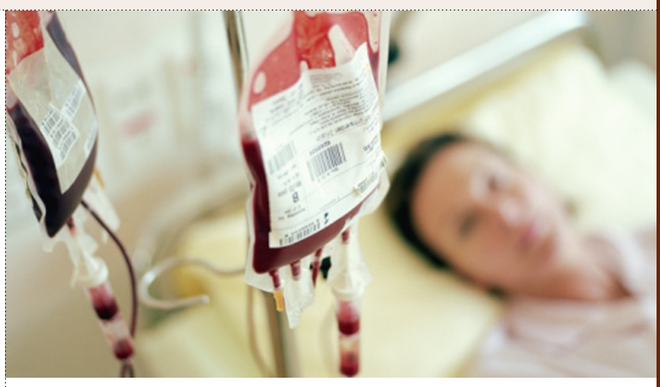
Transfusion Related Graft Versus Host Disease (TA-GVHD)

This is a rare, but usually fatal condition. It is a result of transfusion of viable T cells present in blood products that are not rejected by the transfusion recipient. This is seen in immunodeficient individuals or in cases where the donor and recipient share a common HLA haplotype (15). Clinical features include skin rash, fever, diarrhea, vomiting, hepatitis and pancytopenia secondary to bone marrow failure. It presents within 1-2 weeks after transfusion and is diagnosed by a skin biopsy (16). TA-GVHD is prevented by gamma irradiation of cellular blood components, thereby inactivating T cells. This however will also reduce the viability of some of the red cells, decrease their storage time and increase potassium levels (13, 16). Irradiated blood is used in recipients of allogenic or autologous bone marrow transplantation, patients with congenital immunodeficiency syndromes and, patients with Hodgkin's disease or neoplastic disease receiving intensive chemotherapy. It is also used in intrauterine transfusions and transfusions from relatives or HLA selected platelet donors (13, 16). Treatment includes high dose systemic corticosteroids and antithymocyte globulin.

Delayed Non-Immunological (Infection)

The overall risk of transfusion transmitted infections is very low. Bacterial contamination is the most frequent infectious risk from transfusion, but rates are declining (17). Donor selection and improved screening methods, including serological and nucleic acid testing (NAT) assays have reduced the risk of transmission of pathogens including human immunodeficiency virus (HIV) or hepatitis virus (17, 18). Risk for transmission of HIV is 1/2, 600, 000, for Hepatitis B virus is 1/6, 500, 000 and for Hepatitis C virus is 1/1, 700, 000 (17).

Other complications of transfusions to be aware of include delayed haemolytic transfusion reactions, febrile non-haemolytic transfusion reactions (immediate or delayed), anaphylaxis, urticaria, citrate toxicity, hypothermia, dilutional coagulopathy and congestive cardiac failure.



Massive Transfusion

Massive transfusion is defined as the replacement of more than 50% of a patient's blood volume in less than 10 minutes (11) or the transfusion of greater than 10 units of packed red cells within 24 hours of admission (19). Currently most guidelines suggest FFP to be administered dependent on coagulation results, however in massive haemorrhage waiting for laboratory results causes delay in transfusion and coagulopathy is known to increase morbidity and mortality. A number of studies have shown improved survival in trauma patients who receive massive transfusions when higher ratios (approaching 1:1) of fresh frozen plasma: packed red blood cells (FFP:PRBC) are given (19, 20). This ratio is recommended in trauma patients with massive bleeding and haemorrhagic shock, not in scheduled surgery. There is ongoing research into this.

Complications

Massive transfusion is associated with a number of complications. The lethal triad is coagulopathy, hypothermia and acidosis.

Coagulopathy is secondary to dilution of clotting factors and platelets through crystalloid resuscitation and their absence of these in packed red cells. The dilution will exacerbate acidosis and interstitial oedema (21).

Acidosis is often secondary to hypoperfusion, and it will further impair coagulation secondary to reduced activity of clotting factors and platelets and degradation of fibrinogen (21).

Hypothermia increases the risk of further uncontrolled bleeding and death. This increases the risk of further uncontrolled bleeding and death. Hypothermia will further exacerbate coagulopathy secondary to reduced coagulation factor activity and induction of fibrinolysis (21).

Other complications include hyperkalaemia (secondary to lysis of stored red cells), hypocalcaemia (due to citrate toxicity) and volume overload.

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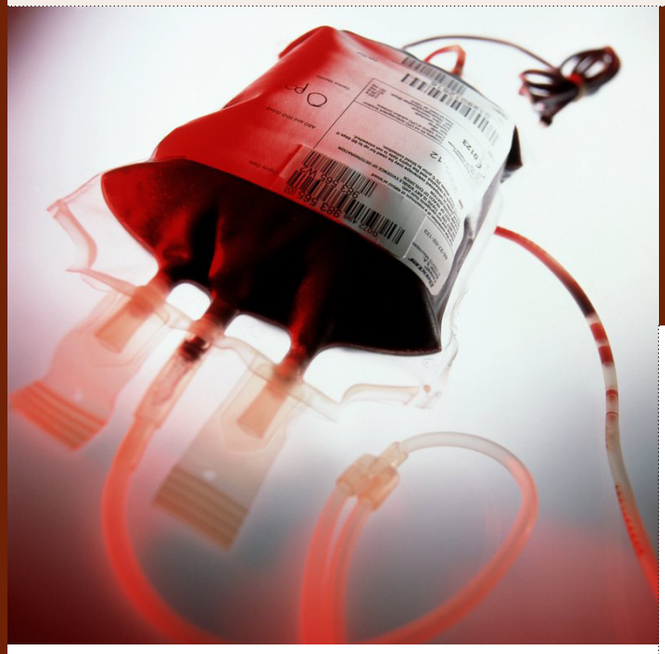

Conclusion

Transfusion is a practice commonly delivered to surgical patients. There are number of products that can be transfused, and knowledge of when to use each one is necessary for optimal care of the patient. There are serious complications that can occur following blood transfusion and awareness of these allows for safe patient care.

MCQs

1. Prior to transfusion of a blood product, which one of the following pieces of information is not required to be checked?

a. Patient name
b. Patients hospital number
c. Expiry date of blood product
d. Patients address
e. Blood product number

2. Which one of the following transfusions is likely to cause a haemolytic transfusion reaction?

a. Group O blood administered to a group AB recipient
b. Rh-negative blood administered to a Rh-positive recipient
c. Group A blood administered to a group A recipient
d. Group B blood administered to a group O recipient
e. Group O blood administered to a group B recipient

3. Which of the following clotting factors is not contained within cryoprecipitate?

a. Fibrinogen
b. Factor VIII
c. Factor XIII
d. Von Willebrand factor
e. Factor V

4. Regarding the storage of blood products, which of the following has the shortest shelf life?

a. Platelets
b. Packed red cells
c. Fresh frozen plasma
d. Cryoprecipitate
e. Factor VII

5. An 88-year old lady is on the trauma list for a Dynamic Hip Screw. During the procedure she requires transfusion of three units of packed red cells. Which of the following is not expected to be a complication of such a transfusion?

a. Hyperkalaemia
b. Transfusion related acute lung injury
c. ABO incompatibility
d. Hypothermia
e. Coagulopathy

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Answers

1. d)
Prior to transfusion of a blood product, the following details must be checked. The name, date of birth and hospital number on the patients wristband should be cross checked against the details on the blood product. Then the blood product identification number, blood group and expiry date should be checked against the label it is attached to.

2. d)
If group B donor blood is given to a group O recipient, anti-A and anti-B immunoglobulins on the recipients blood will act against donor red cells resulting in a haemolytic transfusion reaction. Group O Rh-negative blood is the universal donor, as it lacks antigens on the red cell surface.

3. e)
Cryoprecipitate is obtained from fresh frozen plasma prepared from whole blood. It contains fibrinogen, von Willebrand factor, factor VIII and factor XIII. Cryoprecipitate is often administered when fibrinogen levels fall below 1.5.

4. a)
Platelets have a short shelf life, of only 5 days. They are stored agitated at room temperature. Packed red cells can be stored for up to 42 days. Fresh frozen plasma and cryoprecipitate can be stored frozen, for up to one year.

5. b)
Transfusion related acute lung injury is a complication of transfusion of the plasma containing products of blood.

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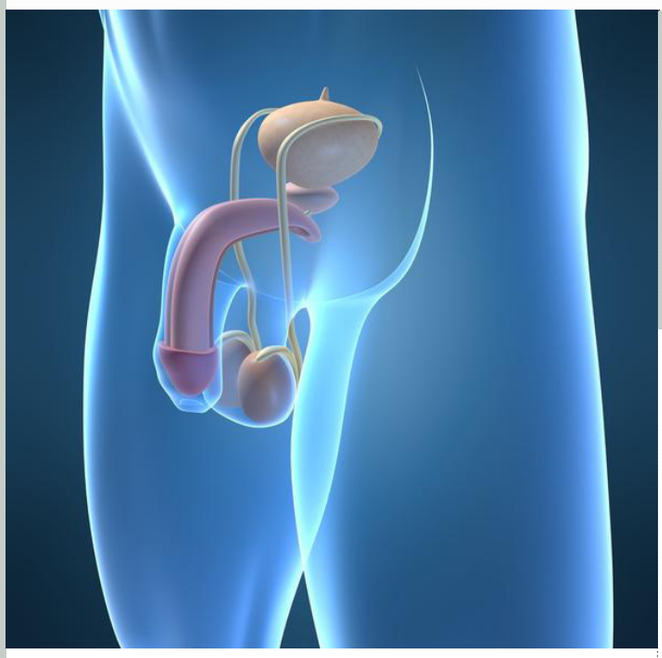
REVIEW OF HYDROCELES FOR CORE SURGICAL TRAINEES

F Clough, N Bedi, M Cumberbatch



Abstract

Hydrocele is the most common non-acute and painless swelling in men, and it is defined as an abnormal collection of serous fluid between the visceral and parietal layers of the tunica vaginalis testis (1, 2). Its diagnosis is usually clinical, but it is essential that both a thorough history and scrotal ultrasound scan are carried out in order to rule out other testicular pathology(3). Most cases of hydrocele are idiopathic and it is usually treated by open hydrocelectomy via a scrotal incision. The 2 most common techniques include Lord's plication technique developed in 1964 or excision hydrocelectomy known as Jaboulay's technique. There is currently no consensus on technique choice and with current practices, complication rates including recurrence of the hydrocele should be minimized to below 5%(4).

Keywords: *hydrocele, scrotal swelling, Lord's, Jaboulay's technique.*

Case Vignette

40 year old male comes into SAU with a scrotal swelling. He is concerned it may be a cancer, as it has increased in size since he first noticed it. On examination the swelling in unilateral, the ipsilateral testis is not palpable and there is luminescence when using a pen torch.

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How are you going to manage this patient as the on call SHO?

Answer

Both hydroceles and testicular tumours are usually heavy and painless. Although the diagnosis of hydrocele can be made clinically with luminescence, all cases where the presentation of testicular swelling is idiopathic and the patient has a nonpalpable testicle should undergo ultrasonography in order to rule out underlying solid testicular mass.

If the US Scrotum shows only a hydrocele and it is large, persistent and symptomatic, then the patient is best served by undergoing a hydrocelectomy, performed via a scrotal approach. It is also possible to manage hydroceles conservatively if symptoms are not worrisome. Another alternative to surgery is aspiration of a hydrocele, however aspiration carries a high recurrence and infection risk. In children under 12 years old an inguinal approach may be considered if there is the suggestion of a communication via a patent processus vaginalis or hydrocele of the cord.

Introduction

Hydroceles are defined as an abnormal collection of serous fluid between the visceral and parietal layers of the tunica vaginalis testis. Hydrocele is the most common non-acute, painless swelling of the scrotum in men and is believed to occur in 1% of the adult male population(1, 2). Hydrocele development may be due persistent developmental connections along the cord or an imbalance between absorption and production. Its diagnosis is usually clinical but must be followed up by scrotal ultrasonography to rule out other causes of testinal pathology. Hydrocele may be idiopathic (primary) or acquired (secondary). The most common secondary causes include post-scrotal operations (varicocelectomy and inguinal hernia repair), testicular trauma, torsion, epididymo-orchitis, varicocele, hernias and tumours (3). The standard procedure for hydrocele repair is via scrotal incision and open hydrocelectomy via either Lord's plication technique (eversion) or Jaboulay's method (excisional). (5)

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Anatomy

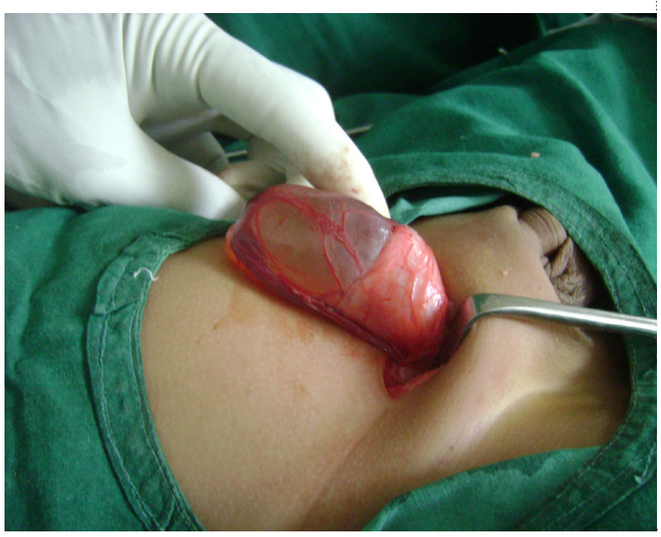
The testicle is covered anteriorly and laterally by the visceral layer of the tunica vaginalis. The parietal and visceral layers of the tunica vaginalis are normally contiguous, hydroceles form in the potential space between these layers. (6)

During fetal development, the testis develop from the gonadal ridge and descend towards the scrotum drawing with them a layer of parietal peritoneum, the processus vaginalis, which develops within a layer of undifferentiated mesenchyme known as the gubernaculum which helps aid descent into the scrotum and allows the creation of the potential space into which the testis may descend. (7)

The processus vaginalis usually obliterates before the fourth month of life forming a layer over the testis. In females the formation of the labia has the same peritoneal remnant known as the canal of nuck. However, failure of the obliteration of the processus vaginalis can lead to the development of a hydrocele. This may allow a natural communication to form between the peritoneum and the scrotum and the passage of peritoneal fluid within the scrotum. (7)

It is estimated that a patent processus vaginalis exists in 80-95% of male newborns, 60% at one year of age, 40% at 2 years and 15-30% thereafter. Where a fluid collection forms between the layers of the tunica vaginalis, this is known as a vaginal hydrocele, whereas an extension of the communication through the deep inguinal ring and into the peritoneum is known as a congenital hydrocele. (8)

Acquired hydroceles are often associated with a disturbance of the balance between fluid production and outflow in the tunica vaginalis. This is associated with inflammation, testicular trauma, tumors, torsion of testis, defective lymphatic drainage(9) and post-operatively for surgery of varicoceles or inguinal hernias. (10, 11). In developing countries hydrocele is the most common presentation of lymphatic filariasis associated with infection of Wuchereria bancrofti, a mosquito-borne parasite (12).



Classification

The classification of hydrocele can be made either due to a primary or secondary aetiology, or it can be made on the basis of the anatomical extension of the hydrocele.

Primary Hydrocele - *idiopathic.*

Secondary Hydrocele - *post scrotal surgery or inguinal hernia repair, trauma, testicular tumours (seminoma, teratoma, sertoli cell tumour, leydig cell tumour, lymphoma), epididymo-orchitis, syphilitic orchitis, viral orchitis, lymphoedema, TB of epididymis.*

Anatomical Classification

Vagina — *fluid accumulates in the vaginalis sac surrounding the testis but does not extend up into cord.*

Encysted hydrocele of the cord — *Fluid accumulates around the spermatic cord and a mass appears around the ductus deferens. The sac has no communication with the peritoneal cavity, patient complains of "3 testis". Testis traction test is done to detect that it is attached with the cord. Treatment is excision of the sac.*

Infantile — *An intermediate situation between vaginal and spermatic cord hydrocele. The processus vaginalis is obliterated at the deep ring and so there is no communication with the abdomen, but remains patent in both the cord and the scrotum. Treatment is eversion of the sac.*

Congenital/communicating hydrocele — *the sac communicates with the peritoneal cavity and is filled with peritoneal fluid. The proximal part of the processus vaginalis has not obliterated. Patients complain of swelling in the scrotum in the evening and becomes normal at morning. A cough impulse is present and there is often cross-fluctuation but it is not possible to reduce the swelling due to a 'bottle neck' or 'inverted ink bottle' effect, whereby fluid can't come out when squeezed. Treatment by incising the skin over the inguinal canal at its medial end, the cord is isolated and the neck is separated from the sac.*

Abdominoscrotal Hydrocele

This is an uncommon condition, associated with communication of a scrotal hydrocele with the abdominal cavity through the inguinal canal. It is confirmed by diagnostic abdominal ultrasound and treated surgically.

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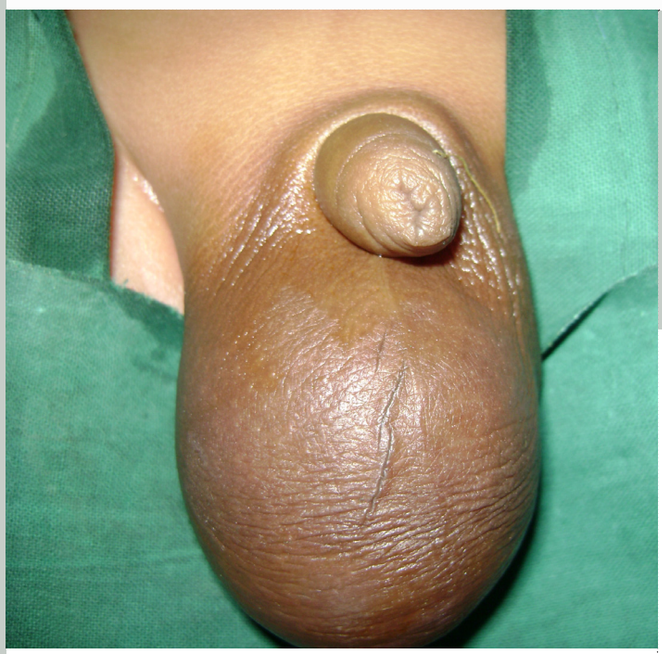

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Hydroceles in infants of less than 24months are usually observed as the majority of cases of patent processus vaginalis spontaneously resolve during this period. However, early surgical exploration in infants is indicated if there is evidence of an inguinal hernia or suspicion of underlying testicular pathology (15)

Complications such as infection or testicular damage are rare, but there is a risk of enlargement of the fluid collection and formation of hernias later in life. (16)

The risk of non-intervention includes scrotal enlargement and the potential for formation of hernias. While hydrocele is considered a benign condition, an abdomino-scrotal hydrocele may affect testicular morphology and cause atrophy, and in adults may be associated with disruption of spermatogenesis. (1, 17)

If the hydrocele shows signs of communication such as frequent fluctuance in size, this points to significant exchange of fluid between the hydrocele sac and the peritoneal cavity and an earlier intervention may be indicated. (1)

Diagnosis

Patients will typically complain of a painless non-acute swelling within the scrotum that appears larger in the evening than in the morning. Examination will show a fluctuant mass which typically transilluminates. Hydroceles can be distinguished from hernias, on palpation, by the narrowing of the fluid filled sac neck at the external inguinal ring without extension into the inguinal canal, therefore you “can get your fingers above” a hydrocele. (13)

Hydrocele is typically diagnosed by ultrasound showing an anechoic fluid collection in the tunica vaginalis. It is important to assess the scrotal anatomy, identifying whether there are any signs of testicular torsion or subtending solid testicular masses, the size of the hydrocele and whether there is abdominal extension.

Management

Indications for Treatment

Hydroceles can be managed conservatively, but symptomatic hydroceles should be considered for surgical repair. Symptoms may include swelling or a feeling of heaviness, and less commonly pain or discomfort usually associated with secondary pathology, but patients can also report anxiety, sexual underperformance and reduced self esteem. (14)

Investigations

Whilst not an absolute requirement, pre-operative ultrasound should be carried out to exclude other causes of testicular pathology including malignancy and epididymitis. Failure to clearly delineate the testis, tenderness on palpation or internal shadows on transillumination may be indications for further investigation:

- *Duplex sonography to investigate chronic testicular torsion (18)*

- *Serum alpha-fetoprotein and Beta HCG to rule out teratomas or other germ cell tumours.*

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Types of Operative repair

Scrotal exposure is preferred for hydrocele testis, with subsequent surgical method choice made either from hydrocelectomy with eversion and excision of the hydrocele sac or hydrocele surgery with plication of the hydrocele sac. This approach should be avoided where underlying malignancy is suspected. (19)

During scrotal approaches care must be taken to not injure the vas or epididymis. A running hemostatic suture around the line of excision can help haemostasis. Electrocautery fulguration of the edge of the excised tunica vaginalis promotes scarring and decreases recurrence while decreasing operative time. Excision of redundant tunica vaginalis (with or without eversion) and suturing of the reflected tunica behind the epididymis can make the post-operative examination of the testis more easy and reliable. (4)

Where there is open processus vaginalis, communicating hydrocele, spermatic cord hydrocele or if other testicular pathology is suspected, then an inguinal approach is necessary. This involves high ligation of the processus vaginalis within the internal inguinal ring and excision of the hydrocele and is often the standard procedure for paediatric hydroceles. (17, 20)

Scrotal Approaches

Jaboulay's operation – *The scrotal skin is grasped with one hand to stretch the skin and a small transverse incision is made on the anterior aspect of the scrotum, and using diathermy, blunt and sharp dissection down to the parietal later of the tunica vaginalis, the sac is exposed completely through the wound. The hydrocele fluid is then drained and excess sac is excised leaving a margin of 1-2cm. The testis and epididymis are examined for underlying pathology and then the edges of the tunica are then everted and sewn together behind the spermatic cord with a 3-0 suture. The tunica may continue to produce fluid, but surrounding tissue such as the Dartos muscle will reabsorb this, so that it does not accumulate. (4, 21)*

Lords plication – *a small incision is made into the scrotum to lift out the testis, the hydrocele is incised and drained, and the sac is then plicated (reduced) with several evenly-spaced interrupted sutures to the junction of testis and epididymis. (5) When tied, these stitches obliterate the parietal tunica vaginalis and provide haemostasis. This is believed to result in less risk of haematoma and a more speedy surgery because the hydrocele is not delivered out intact and therefore does not require sac dissection. (22) A modification of this technique involves making a fenestration to allow permanent internal drainage by making a cruciate incision in the tunica vaginalis and folding back and suturing the edges to themselves. This technique however, is associated with a high recurrence rate. (16)*

The recurrence rate should be below 5% with either technique but there is evidence which suggests that an excision hydrocelectomy may be the most effective technique. Excision hydrocelectomy is considered the procedure with the lowest recurrence rate, whereas Lord's technique has the lowest complication rate. (4, 23, 24)

For simple hydroceles or patients unfit for surgery, sclerotherapy also offers an alternative but with higher failure and recurrence rate. This involves scrotal aspiration and subsequent sclerotherapy of the hemiscrotum using tetracycline or doxycycline solutions. As well as higher recurrence rate, there is also a greater incidence of pain and epididymal obstruction. This should therefore only be addressed as a last resort and in men where fertility is not a consideration. (25)

Complications of Surgical Repair

The major complications of hydrocelectomy include bleeding, haematoma, infection and injury to surrounding scrotal tissues. This might involve damage to the epididymis or vas deferens with infertility. (26) Recurrence of the hydrocele after hydrocelectomy should be below a figure of 5% with current techniques.

Conclusion

Hydrocele can be classified anatomically or by aetiology, and the commonest form is idiopathic followed by post-operative hydrocele. Diagnosis is usually clinical, but ultrasound and appropriate history taking is necessary to rule out more insidious testicular pathology, whereupon an inguinal exploration is mandated. Where there is no solid mass, idiopathic hydroceles should be removed by surgical hydrocelectomy via scrotal incision. Currently there is no widespread view to support preferential use of excision (Jaboulay's) versus tunica vaginalis eversion (Lord's procedure).

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Urology

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REVIEW OF HYDROCELES FOR CORE SURGICAL TRAINEES

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MCQs – Adolescent hydroceles

1. What are the layers of the tunica vaginalis?

a. intima
b. parietal
c. visceral
d. albuginea
e. external

2. If the patient claims that his hydrocele fluctuates in size, what does this indicate?

a. an additional indirect inguinal hernia
b. imbalance in the normal fluid production and reabsorption
c. patent processus vaginalis
d. postural dependence
e. previous scrotal surgery

3. Most hydroceles are idiopathic in aetiology, what is the second most common cause.

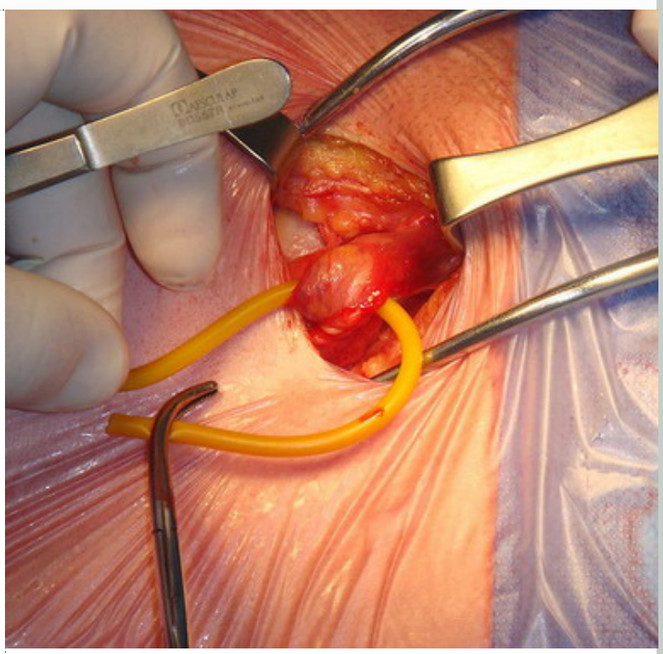
a. Trauma
b. Malignancy
c. Vasectomy
d. Inguinal hernia repair
e. Scrotal varicocelectomy

4. Which of the following is not a possible complication of a Lord's or Jaboulay's technique hydrocelectomy?

a. Testicular atrophy
b. Scrotal haematoma
c. Ilioinguinal or genitofemoral nerve injury
d. Hydrocele recurrence
e. Secondary cryptorchidism

5. Which of the following is true of a Lord's vs Jaboulay's technique hydrocelectomy?

a. Lord's hydrocelectomy involves plication of the parietal tunica vaginalis
b. Jaboulay's hydrocelectomy achieves better haemostasis
c. Lord's hydrocelectomy involves excision of the hydrocele sac using diathermy
d. Jaboulay's hydrocelectomy is preferred for small, simple hydroceles
e. Lord's hydrocelectomy involves eversion of the hydrocele sac, placing the fluid releasing surface in contact with the scrotal wall.



Answers

1. b, c

2. c

3. e

4. c (cryptorchidism may occur secondary to heavy scarring, the named nerves are not affected by a scrotal approach)

5. a

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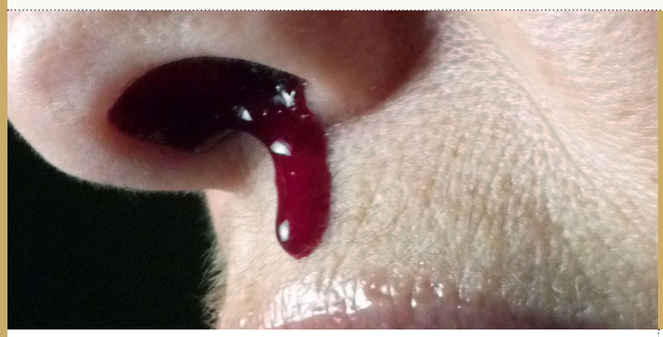
EPISTAXIS

P Kulloo



Epistaxis
Otorhinolaryngology & Neck Surgery

Abstract

Epistaxis is a common ENT emergency which can be life-threatening when severe. Patients presenting to the emergency department are often managed initially by junior doctors who have little training in ENT. This article reviews the basics of the assessment and current management strategies of patients with epistaxis as well as practical tips of what to do before getting senior help.

Keywords

Epistaxis, Nosebleed, Nasal Packing.

Case Vignette

A 50 years old lady presented to the Emergency Department (ED) with sudden onset epistaxis. The epistaxis initially started on the right but subsequently was bilateral. She denied any history of trauma. She was known to have hypertension and her medications were bendroflumethiazide and aspirin. She had no family history of bleeding disorders and she never had epistaxis previously. On examination, she had a blood pressure of 116/68 mmHg and a heart rate of 105 beats per minute. Since she was actively bleeding in the ED, she was cannulated and blood tests sent. The ED doctor packed her nose with bilateral Merocel© packs and referred her to ENT. The initial blood investigations were: haemoglobin 118 g/L, Prothombin time (PT) 13 s, Activated Partial Thromboplastin time (APTT) 28 s.

Although the epistaxis had initially slowed down with the Merocel© packs, it became heavy again after the patient had a vigorous sneezing bout on the ward. The ENT doctor placed both anterior and posterior packs bilaterally to stop the bleed. This was kept in place overnight. On the following morning ward round, the patient complained that there was blood coming in her mouth intermittently at night but had not informed anyone. On examination, she was haemodynamically stable, there was no anterior epistaxis but there was blood trickling down slowly in the oropharynx. Repeat bloods showed haemoglobin of 98 g/L and normal clotting. Following discussion with the consultant on call, the patient was taken to theatre for endoscopic sphenopalatine artery ligation. Post-operatively, the haemoglobin was 90 g/L and the patient was transfused 2 units of blood. She had bilateral rapid rhino© nasal packs placed in theatre. These packs were removed 24 hours post-operatively since she did not have a further bleed during this time. She was then discharged.

Introduction

Epistaxis is defined as bleeding from the nose. It is very common. American data report that approximately 60% of the population have at least one episode of epistaxis in their lifetime. (1) However, only 6% seek medical attention because of this complaint. (2) The age distribution is bimodal, with peaks in young children (2-10 years) and older individuals (50-80 years). (3)

Aetiology

About 80% of all cases of epistaxis are spontaneous, idiopathic bleeds without any precipitant or causal factor. (4) Other causes of epistaxis can be divided into local and systemic as shown in the table below. (5, 6)

Local causes	Systemic causes
Idiopathic	Coagulopathy (ITP, DIC)
Trauma (nose picking, fractures, foreign body)	Drugs (warfarin, clopidogrel, aspirin)
Inflammatory (rhinitis, sinusitis)	Haematological conditions (haemophilia, leukaemia)
Neoplastic (tumours of the nose, sinuses and nasopharynx)	Genetic disorders (Hereditary Haemorrhagic Telangiectasia (HHT))
Iatrogenic (nasal surgery, FESS, septoplasty)	Autoimmune (Wegener's granulomatosis, sarcoidosis)
Nasal sprays/medications	NB: Hypertension may make a nose bleed more severe but does not *cause* epistaxis

Figure 1: Causes of epistaxis (5, 6)

Anatomy

An understanding of the anatomy of the arterial supply of the nose is essential for appropriate management. The nasal septum is supplied by branches of the internal and external carotid arteries which anastomose extensively. The upper part of the nose is supplied by branches of the internal carotid artery (anterior and posterior ethmoidal arteries) and the rest from branches of the external carotid artery (sphenopalatine, greater palatine and superior labial arteries).

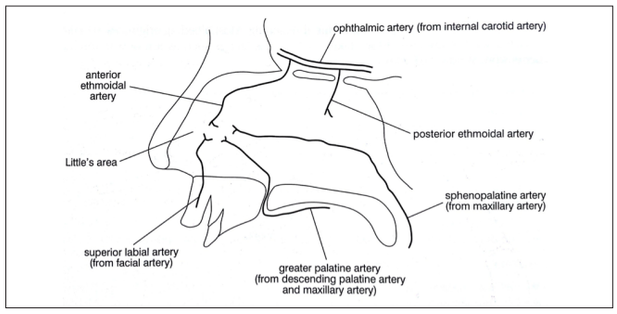


Figure 2: Blood supply of the nose (7)

EPISTAXIS

P Kulloo

It is estimated that 80-90% of epistaxes originate from the Little's area on the anterior nasal septum which contains the Kiesselbach's plexus of vessels. (8) Less commonly, epistaxis originates from branches of the sphenopalatine artery in the posterior nasal cavity. (8)

Classification

Epistaxis is commonly classified into anterior and posterior according to the site of the bleeding vessel. The plane of the piriform aperture is the anatomical landmark used. (4) Bleeding from a source anterior to this plane is defined as anterior epistaxis and bleeding from a source posterior to the plane is defined as posterior epistaxis.

This is useful clinically because it guides management. For instance, pinching the nose will not control a posterior epistaxis and therefore a method, which would achieve haemostasis in the posterior nasal cavity, would be required.

Presentation

Patients report bleeding from the nose or blood coming in the mouth. They may have obvious precipitating factors such as nasal trauma or surgery. They may present during an acute episode or following a previous episode of epistaxis.

Clinical assessment

Clinical assessment varies according to presentation. If a patient presents acutely with epistaxis, assessment, alongside management, should follow standard ALS or ATLS protocols. However, if the patient is not actively bleeding and is haemodynamically stable, a thorough history and examination should be undertaken.

History

The following points should be covered in history: (6, 9)

- *Side of bleeding*
- *Bleeding from the nostril or blood coming in the mouth (anterior vs. posterior bleed)*
- *Onset, duration, frequency*
- *History of trauma (including nose picking)*
- *Other nasal symptoms – nasal obstruction, discharge, anosmia*
- *Associated otalgia or facial pain may suggest nasopharyngeal carcinoma*
- *Past medical history, particularly asking for hypertension, coagulopathies, previous episodes of epistaxis and whether cautery/surgery was required*
- *Past surgical history – previous nasal surgery*
- *Medications, particularly asking for warfarin, aspirin, clopidogrel*
- *Allergies (particularly peanut allergy as Naseptin cream contains peanut oil)*
- *Family history (hereditary conditions, e.g. HHT)*
- *Smoking and alcohol history (increased risk of malignancy)*

Examination

Protective measures, such as wearing a gown, gloves and goggles, should be taken before starting examination. Using a headlight and a nasal speculum, anterior rhinoscopy is performed to look for anterior bleeding points and masses. Bleeding points which have stopped normally look like red dots on the nasal septum. If no bleeding point is seen, nasendoscopy should be performed to look for a posterior bleeding point or masses, particularly nasopharyngeal tumours. Unilateral epistaxis in the absence of an obvious bleeding point should always raise the suspicion of a nasopharyngeal carcinoma especially if the patient is from southern China.

Investigations

Investigations are not usually required in the outpatient setting. However, for all severe epistaxis cases, blood tests should include Full Blood Count, Urea and Electrolytes, Coagulation screen, Group and Save or Cross-Match.

Radiological investigations in the form of CT or MRI should be performed to fully evaluate a possible sinonasal neoplasm if an intranasal mass is seen on examination. Angiography can also be performed in refractory epistaxis to identify the bleeding vessel before embolisation. (10)

Management

Management of acute epistaxis, as for other emergencies, follows the ABC (airway, breathing, circulation) approach of the ALS or ATLS (for trauma cases) algorithm. The aim is to arrest the bleeding and treat the underlying cause whilst simultaneously providing adequate resuscitation.
The initial management is outlined in the figure below.

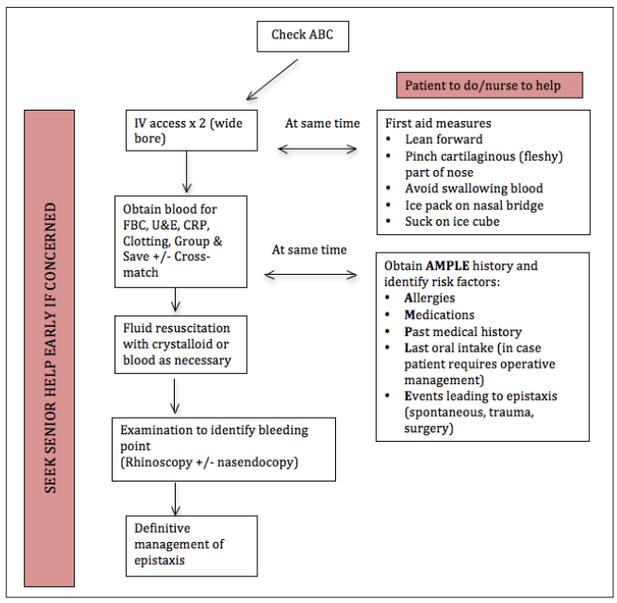


Figure 3: Overview of management of acute epistaxis

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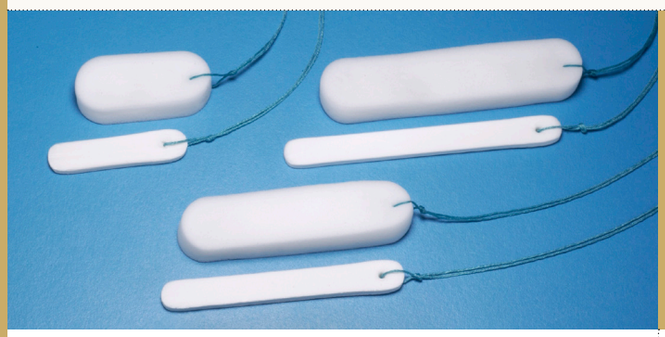

The definitive management of epistaxis is focused on identifying the bleeding vessel and achieving haemostasis with the least invasive method. There is a stepwise approach to the methods used to control epistaxis as shown below. (4)

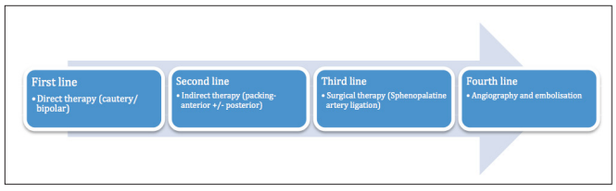

Figure 4: Stepwise approach to the definitive management of epistaxis (4)

Conservative

Epistaxis often resolves with first aid measures. These include:

- *Patient sat up with head bent forwards to minimize aspiration*
- *Pinching the fleshy, cartilaginous part of the nose for at least 10 minutes*
- *Ice pack on nasal bridge or sucking on ice cube*

Although the use of ice as a first aid measure for epistaxis is widespread in the ENT community, studies have shown that placing an ice pack on the nose or the neck has little effect on blood flow to the nasal mucosa. (11) However, ice placed in the mouth has been shown to significantly decrease blood flow in the nasal mucosa blood flow by up to 23%. (12) This is particularly important in children who can be encouraged to suck on ice lollies. Moreover, Naseptin cream, containing 0.1% chlorhexidine and 0.5% neomycin cream, has been shown to be an effective treatment for recurrent epistaxis in children. (13) It can therefore be given to the patient after the bleeding has stopped to be applied topically in the nostrils for a period of about one week.

Cautery

Cautery is indicated when there is mild bleeding not responding to conservative measures and the bleeding point can be seen on anterior rhinoscopy or nasendoscopy. Commonly used cauterisation methods are chemical (silver nitrate) or electrical (bipolar diathermy). Cautery is usually done under local anaesthetic for adults and under general anaesthetic for young children. The local anaesthetic of choice is co-phenylcaine which contains lidocaine and phenylephrine.

It serves two purposes: to anaesthetise the nasal mucosa and to vasoconstrict blood vessels, thus reducing the chance of brisk bleeding washing away the silver nitrate. There is a choice of 75% and 95% silver nitrate sticks. 75% is preferable to 95% as it is more effective in the short term and causes less pain. (14) Moreover, only one side of the nasal septum should be cauterised at any time as bilateral cautery may leave the septal cartilage with no blood supply, resulting in a septal perforation.

Nasal packing

Nasal packing is indicated when bleeding is not controlled by cautery or it is too severe to attempt cautery. There are two types of packing: anterior and posterior nasal packing. As the names suggest, anterior nasal packing is for anterior epistaxis and posterior packing for posterior epistaxis. There are several commercially available anterior nasal packs. The three most commonly used are:

- *Nasal tampon such as Merocel©*
- *Inflatable nasal pack such as Rapid Rhino©*
- *Ribbon gauze impregnated with BIPP (bismuth iodoform paraffin paste)*

Both Rapid Rhino© and Merocel© have the same efficacy for haemostasis but Rapid Rhino© causes less pain than Merocel©. (15)

For posterior nasal packing, a Foley catheter is usually used. It is introduced through the nose along the floor of the nasal cavity until the tip is just visible behind the soft palate. It is then inflated with 7-10ml of air or water and pulled gently anteriorly to rest against and occlude the posterior choana (Figure 5). It is typically secured using an umbilical clamp.

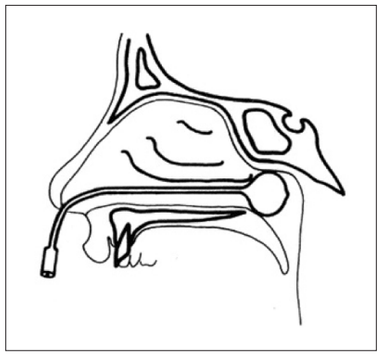

Figure 5: Posterior packing with inflated Foley catheter (16)

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Usually when a posterior nasal pack is used, the anterior nasal cavity is also packed with ribbon gauze impregnated with BIPP or vaseline. It is essential to prevent alar necrosis which can result from pressure of the Foley catheter on the anterior nose. A simple technique has been described as shown below. (17)

Figure 6: The catheter is secured in place using an umbilical cord clamp with a swab, which has been knotted and interposed between the clamp and the alar rim. (17)

Although there is reported risk of infective complications due to prolonged use of nasal packs such as otitis media, sinusitis and toxic shock syndrome, they are rare. Traditionally, patients with nasal packs for more than 24 hours were given antibiotics to prevent infective complications. However, there is increasing evidence to suggest that prophylactic antibiotics are not required. A recent survey showed that only 37% of ENT UK clinicians use prophylactic antibiotics if nasal packing remained in place for more than 24 hours. (18) A recent case-controlled study of 149 patients found no evidence of infective complications and recommended not to prescribe prophylactic antibiotics routinely in patients with nasal packs for spontaneous epistaxis. (19)

Medical

Management of epistaxis in anticoagulated patients or patients with haematological disorders requires close collaboration with the haematology and medical teams. Correction of clotting problems, for instance using Vitamin K or Fresh Frozen Plasma, will facilitate the efficacy of local therapy for epistaxis. Tranexamic acid also has been suggested in refractory epistaxis but is contraindicated in patients with pre-existing thromboembolic disease. (4) Choudhury et al. suggested the algorithm below for the management of anticoagulated patients with epistaxis. (20)

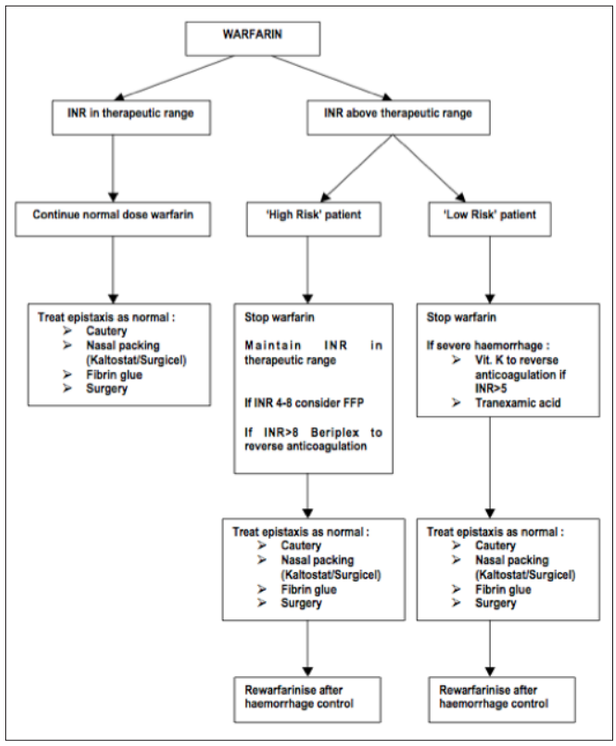

Figure 7: Algorithm for management of patients with epistaxis on warfarin (20)

Surgical management

Surgical management is indicated if the methods described above fail. There are three main types:

- *Ligation techniques*
- *Septal surgery*
- *Embolisation*

Ligation techniques

Ligation should be performed as close to the bleeding point as possible. The hierarchy of ligation is: (4)

- *Sphenopalatine artery*
- *Internal maxillary artery*
- *External carotid artery*

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Sphenopalatine artery ligation, clipping or diathermy is usually performed endoscopically. Internal maxillary artery ligation is performed through the posterior wall of the maxillary sinus via a Caldwell-Luc approach and external carotid artery ligation is performed via an open approach of the neck. (6)

Anterior and posterior ethmoidal arteries have only a small contribution to the nasal blood supply and are therefore ligated as adjuvant treatment to the above arterial ligation or if there is a confirmed ethmoidal artery bleed as in ethmoidal fractures. (4) Ligation of the ethmoidal arteries is performed via a medial orbital incision (Lynch/Howarth). (5)

Septal surgery

When the bleeding point is behind a septal deviation or spur, septal surgery in the form of septoplasty or submucosal resection (SMR) is required to obtain access to the bleeding point. (4) It is also suggested that while raising the mucoperichondrial flap in septoplasty or SMR, the blood supply to the septum is disrupted and haemostasis is achieved. (21)

Embolisation

Embolisation under angiographic guidance has been shown to be effective for prolonged and life-threatening epistaxis. (4, 10) Once the bleeding vessel has been identified on angiography, a fine catheter is inserted into the internal maxillary artery circulation and particles such as micro-coils are used to embolise the vessels (4). Although embolisation is as effective as ligation techniques, complications may be more frequent (4). Complications include skin necrosis, paraesthesia, groin haematomas and cerebrovascular accident. (4, 10). Embolisation may also be performed pre-operatively in, for example, juvenile angiofibroma. (4)

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Other treatments

Additional treatments have been used to control epistaxis in Hereditary Haemorrhagic Telangiectasia (HHT). These include topical oestrogens, coagulative lasers and septal dermoplasty in addition to the methods described above. (4, 6)

Questions

1. The most common cause of epistaxis is:

A. Idiopathic
B. Nose picking
C. Hypertension
D. Nasopharyngeal carcinoma
E. Anticoagulants

2. A patient with refractory epistaxis has an endoscopic procedure where an artery is ligated. The artery is most likely to be the:

A. Superior labial artery
B. Anterior ethmoidal artery
C. Sphenopalatine artery
D. External carotid artery
E. Ascending pharyngeal artery

3. The upper part of the nasal septum is commonly supplied by:

A. Superior labial artery
B. Internal carotid artery
C. External carotid artery
D. Sphenopalatine artery
E. Ascending pharyngeal artery

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4. Which of the following is not used in the treatment of epistaxis?

A. Laser
B. Oestrogens
C. Bipolar diathermy
D. Tranexamic acid
E. Sodium bicarbonate

5. Which of the following packs is most likely to cause alar necrosis if not secured properly?

A. Foley catheter posterior pack
B. Merocel
C. Rapid rhino
D. BIPP
E. Vaseline-impregnated gauze

Answers

1. A: About 80% of all cases of epistaxis are spontaneous, idiopathic bleeds without any precipitant or causal factor.

2. C: Endoscopic sphenopalatine artery ligation is the procedure of choice for intractable epistaxis.

3. B: The upper part of the nasal septum is commonly supplied by the internal carotid artery via the anterior and posterior ethmoidal branches.

4. E: Laser and topical oestrogens are used in HHT. Bipolar diathermy is used as electocautery. Tranexamic acid is used as adjuvant therapy in severe epistaxis.

5. A: The umbilical clamp, which is used to secure the Foley catheter, if not properly padded, can cause excessive pressure on the ala of the nose resulting in necrosis.

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POSTERIOR URETHRAL VALVES

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Posterior Urethral Valves
Paediatric Surgery

Abstract

Posterior Urethral Valves (PUV) are congenital obstructing membranous folds found within the lumen of the male urethra. With as many as one third of boys with PUV progressing to renal insufficiency, it remains an important cause of morbidity and is one of the few genuinely life threatening congenital urinary tract abnormalities. This article reviews the embryology, pathophysiology and early and late management and includes an illustrative case report with imaging.

Key Words

Posterior, Urethral, Valves, Urinary, Obstruction.

Background

Posterior Urethral Valves (PUV) are congenital, obstructing membranous folds found within the lumen of the male urethra. The condition was first described in detail in 1919 by Hugh Hampton Young, an American Urologist (1). Although references to the condition being found at autopsy can be found in the literature dating back as far as 1717, Young et al made the first clinical diagnosis in a living patient and were first to publish a classification system for the disease. Pathological sequelae of this distal urinary obstruction can include bladder neck thickening, detrusor muscle hypertrophy, hydroureter, hydronephrosis, vesicoureteric reflux, bladder diverticulae, poor renal growth, renal failure and occasionally urinary ascites. These are all consequences, direct or indirect, of a high pressure urinary system. Additionally, the decreased fetal urine output during development leads to oligohydramnios and since amniotic fluid is essential for normal lung development, pulmonary hypoplasia can occur. With as many as one third of boys with PUV progressing to renal insufficiency (2), it remains an important cause of morbidity and is one of the few genuinely life threatening congenital urinary tract anomalies.

Epidemiology

A diagnosis of PUV is suspected in as many as 1 in 1250 male fetuses at antenatal ultrasound scanning (3). However there remains a significant termination rate, up to 46% (4), and the quoted incidence of PUV within western populations varies from 1 in 4,700 to 1 in 12,500 live male births (5-7).

Classification

Despite several attempts to re-classify the condition, Young's original classification remains the popular choice (1). He described three subtypes of PUV, although the second type is no longer considered a variant of PUV and there are now only two commonly accepted variations:

- *Type I (90 – 95%): "In the most common type there is a ridge lying on the floor of the urethra, continuous with the verumontanum, which takes an anterior course and divides into two fork-like processes in the region of the bulbo-membranous junction. These processes are continued as thin membranous sheets, direct upward and forward which may be attached to the urethra throughout its entire circumference. It is generally supposed that the valves have complete fusion anteriorly, leaving only an open channel at the posterior urethral wall. Yet the fusion of the valves anteriorly may not be complete in all cases, and at this point a slight separation of the folds exist."*

- *Type III (5 – 10%): "There is a third type which has been found at different levels of the posterior urethra and which apparently bears no such relation to the verumontanum. This obstruction was attached to the entire circumference of the urethra, with a small opening in the centre".*

Aetiology

It is generally accepted that there is no fixed genetic basis underlying the formation of PUV and no specific inheritance pattern (8). Proposed embryological explanations include an abnormality of development during formation of the urogenital sinus (9), an abnormality arising from the plicae colliculi diverging from the distal verumontanum at around 11 weeks gestation (10), or an abnormal remnant of the receding Wolffian ducts which has migrated posterolaterally (11). Such theories are many and varied but as yet there is no agreement as to the true embryogenesis of the condition.

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Presentation

Between 40 and 60% of PUV are diagnosed antenatally using ultrasound scanning (12). The diagnosis should be considered in any male fetus where there is bilateral hydroureteronephrosis with a distended bladder. Identification of the "keyhole sign" (a thick walled bladder with dilated posterior urethra) should raise suspicion of PUV and if there is also increased echogenicity of one or both kidneys and oligohydramnios, the diagnosis becomes almost certain. Between 15 and 40% of fetuses with obstructive uropathy (of any cause) will have either a significant co-existing anomaly or a karyotype abnormality (13). It is therefore important, if PUV is suspected, to offer a detailed anomalies scan and to discuss options for fetal karyotyping. A number of techniques have been used, with limited success, to predict renal outcome (including fetal urinary osmolality and electrolyte levels, urinary microproteins, urinary amino acids as well as simply amniotic fluid volume) but as yet there is no sensitive test for predicting pulmonary hypoplasia.

Those cases not detected antenatally will often present in the neonatal period with urinary sepsis. Symptoms may include fever, vomiting, poor feeding and failure to thrive. Clinical examination will detect a distended, easily palpable bladder and often palpable hydronephrotic kidneys. Occasionally the diagnosis is not made until later in childhood. In these cases the boys may be straining to void, or may present with symptoms resulting from poor bladder emptying such as urinary frequency, dribbling, incontinence or recurrent UTI. In these late presenting cases, the renal function is generally better preserved (13).

Investigations

The Micturating Cystourethrogram (MCUG) is the gold standard investigation for confirming diagnosis. This will also demonstrate the degree (if any) of vesicoureteric reflux (VUR). The bladder is filled, via a catheter, with radiopaque fluid and X-ray pictures obtained whilst the baby is voiding. Where obstructing valves are present, the posterior urethra will be dilated with a prominent verumontanum, the anterior urethra collapsed and the bladder wall trabeculated (see image 1). Bladder diverticulae may be present and VUR will be seen in up to 72% of cases with around half of these being bilateral (see image 2) (14). Renal ultrasound scan may demonstrate a thickened bladder neck and bladder wall with dilatation of the upper renal tracts. In some cases the baby will be too small or too unwell to undergo early MCUG and in these cases the priority is to establish adequate bladder drainage, stabilise the baby with meticulous attention to fluid and electrolyte balance and await MCUG when clinical condition allows.

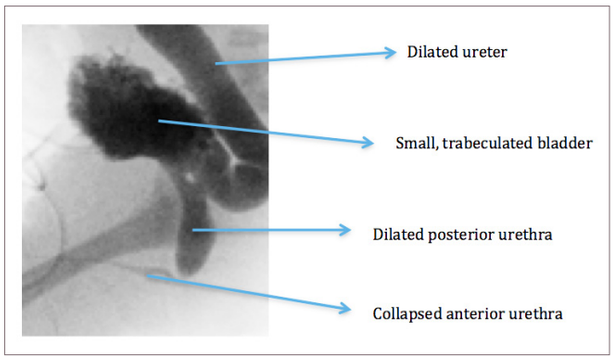

Image 1: MCUG, demonstrating classical features of PUV.

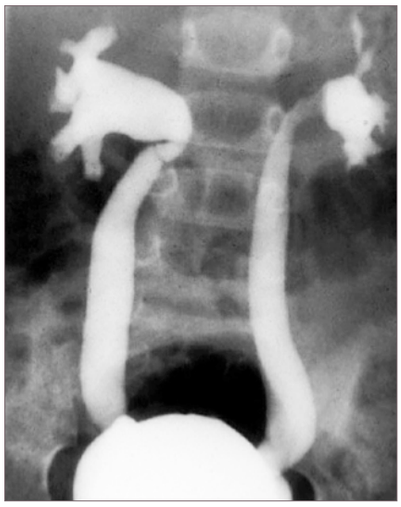

Image 2: MCUG, demonstrating bilateral VUR.

Blood tests have an important role in assessing the degree of renal damage. Serum creatinine, urea (blood urea nitrogen) and electrolytes should be measured and monitored closely if abnormal. It should be remembered that in the first two days of life, the effects of the functioning maternal kidneys will still be evident and therefore blood tests should be interpreted with caution during this period. Urine cultures should be sent at the first sign of clinical deterioration and followed up meticulously.

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Although blood tests will give an idea of the overall metabolic work being done by the kidneys, it is important for the urologist to know how much of this useful function is being contributed by each individual kidney. This "split function" is expressed as a percentage for each side (normal being 50/50 +/- 5%) and can be ascertained by performing a dimercaptosuccinic acid (DMSA) nuclear medicine scan (see image 3). If there is concern about obstruction of either ureter, additional information regarding the efficiency of drainage of each kidney may be gained with a mercaptoacetyltriglycine (MAG3) scan. By monitoring the split function over time, it will be apparent if either kidney undergoes significant deterioration and requires intervention. Additionally, if one kidney is contributing no useful renal function then this is worth knowing in order that removal can be considered if it is thought that stagnant urine within that system is contributing to recurrent infection, or the damaged renal tissue itself contributing to hypertension. However, a grossly dilated ureter may be used to augment the bladder at a later date if required, so the decision to excise should not be made in haste.

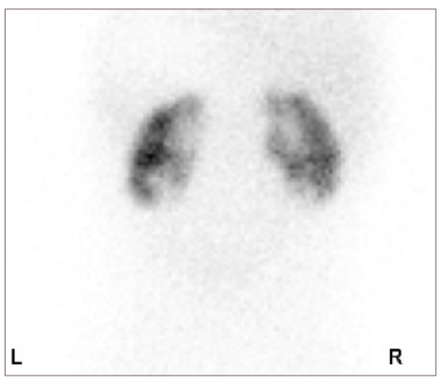

Image 3: DMSA scan. Note the bilateral patchy renal uptake of tracer, suggesting bilateral renal scarring (in this case secondary to recurrent UTI).

Management

Antenatal placement of a vesicoamniotic shunt may reverse the oligohydramnios but has a high complication rate and has not been shown to improve long term outcome (15, 16). Fetoscopic ablation of the valves using laser technology has been tried experimentally but there is no long-term data to support routine use.

At birth (or as soon as the diagnosis is made) the priority is to establish effective bladder drainage with a urethral catheter. A feeding tube may be easier and safer than a foley catheter in the first instance, eliminating the risk of urethral injury occurring as a result of inadvertent inflation of the balloon within the dilated posterior urethra. In most cases urethral catheterization can be achieved but if this is not possible then a suprapubic may be required. Prophylactic antibiotics (usually trimethoprim 1 – 2mg/kg once daily) should be initiated and continued if there is VUR or recurring infection.

Meticulous care is needed in managing fluid and electrolyte balance and early involvement of a Paediatric Nephrologist is recommended. If renal impairment is severe, dietician involvement is helpful and a special renal feed may be required. If there is lung hypoplasia, respiratory failure may develop quickly after birth requiring supplemental oxygen, CPAP (continuous positive airway pressure) or even intubation and mechanical ventilation.

When the baby is stable, elective endoscopic valve ablation can be performed. This can be done using either a cold knife or electro-cautery. Excessive use of electrocautery should be avoided, as the most common complication of this procedure is stricture formation (2). Blood pressure and serum creatinine should be measured on an annual basis throughout childhood.

In the longer term, bladder dysfunction is common as a result of poor bladder compliance, reduced bladder sensation and polyuria secondary to renal failure. Achieving continence can be a significant problem. Urodynamic studies may be undertaken to assess the type of bladder dysfunction and appropriate management initiated based on these. Anticholinergics may be useful where there is bladder overactivity and alpha-blockers can be used to relax the bladder neck leading to improved emptying. Ultimately if complete emptying cannot be achieved with regular toileting and medications, clean intermittent catheterization (CIC) can help to improve bladder function and achieve social continence.

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In cases where there is significant renal failure or respiratory failure, or if the child is born preterm with a low birth weight, early surgical resection of the valves may not be feasible. In this scenario formation of a vesicostomy – where the bladder is opened on to the anterior abdominal wall and drains directly in to the nappy – is a sensible option. This provides very low-pressure drainage and protects the upper urinary tracts from further pressure related damage. Resection of the valves then becomes an elective procedure, which can be planned when the child is well enough. Should the renal function improve, the vesicostomy can eventually be closed, with or without bladder augmentation.

Even with optimal management, many of these boys will develop end stage renal failure and up to 20% will ultimately require renal replacement therapy (13). Renal transplant can be safely carried out in these cases, but unless ongoing bladder dysfunction with poor emptying is addressed, the graft will be at risk (17, 18).

Clinical Case

During an otherwise uneventful first pregnancy for patient A, routine 30 week ultrasound showed a male fetus with a grossly dilated bladder, bilateral hydroureteonephrosis, dilated renal pelvises and minimal amniotic fluid volume. Parents were counseled about the likely diagnosis of PUV. Appearances remained unchanged by 38 weeks but fetal growth was poor and elective induction was undertaken.

At birth, apgar scores were 8 at 1 minute, 9 at 5 minutes. Weight was on the 2nd centile. The bladder was easily palpable on clinical examination. Significant respiratory distress developed in the first hour of life, requiring intubation and mechanical ventilation for 4 days to achieve satisfactory oxygenation. Care was taken to ensure meticulous fluid and electrolyte balance, with correction of hypokalemia and metabolic acidosis. Broad spectrum antibiotics were commenced.

A suprapubic catheter was inserted to optimize bladder drainage. Renal ultrasound scan confirmed bilateral tortuous and dilated ureters with pelvicalyceal dilation, in keeping with a picture of bladder outlet obstruction. MCUG confirmed a grossly dilated posterior urethra with grade 5 VUR (see image 4). Creatinine was raised from birth and continued to climb, peaking at 350 on day 6 of life. Following two confirmed urinary tract infections (UTI) despite prophylactic antibiotics, and persistent poor renal function, a vesicostomy was fashioned on day 28 of life (see image 5). Renal function remained poor but stabilised following this.

Image 4: MCUG, confirming diagnosis of posterior urethral valves.

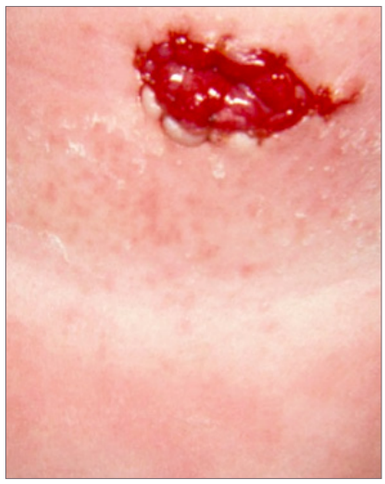


Image 5: Vesicostomy.

Renostart® feeds were commenced, largely via nasogastric tube to reduce the work of sucking. Weight gain remained poor and a feeding gastrostomy was sited at 3 months. Vomiting was frequent and imaging suggested gastro-esophageal reflux. This continued to interrupt weight gain despite maximal medical therapy and at age 10 months a fundoplication was undertaken. Following this there was some progress with weight gain. He is now 18 months of age, weight gain is satisfactory and creatinine remains stable. He is very likely to require renal replacement therapy at some stage during childhood but is currently managing without.

POSTERIOR URETHRAL VALVES

K Maguire, CP Driver

Posterior Urethral Valves
Paediatric Surgery

Multiple Choice Questions

1: During embryogenesis, the human kidneys arise from which primitive germ layer?

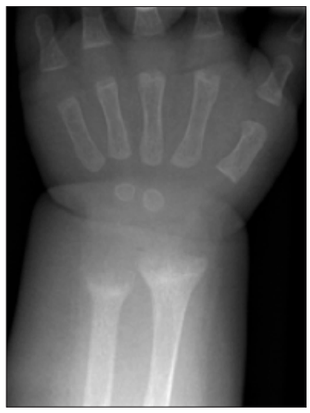
a. Endoderm
b. Amnion
c. Ectoderm
d. Mesoderm
e. Primary yolk sac

2: Trimethoprim is commonly used for long-term prophylaxis in children at risk of recurrent UTI. What is its primary mechanism of action?

a. It is a beta-lactamase antibiotic, which inhibits production of peptidoglycan cross-links by binding to DD-peptidase. Without the ability to create these strong cross-links the bacterial cell wall is weakened and will rupture due to osmotic pressure.
b. It blocks the synthesis of folic acid by susceptible organisms by binding to dihydrofolate reductase, preventing reduction from dihydrofolate to tetrahydrofolate (the active form of folic acid). Since folic acid enzymes are required for amino acid synthesis, bacterial protein synthesis cannot continue in the absence of folic acid.
c. It is a macrolide antibiotic, which inhibits bacterial protein synthesis by binding to bacterial 50S ribosomal subunits. This binding inhibits peptidyl transferase activity and interferes with translocation of amino acids during translation and assembly of bacterial proteins.
d. It has high affinity for penicillin-binding proteins (PBPs) within the bacterial cell wall, particularly PBP Ib and PBP III. By binding to these proteins, is inhibits bacterial call wall synthesis.
e. It is an aminoglycoside antibiotic, which directly inhibits bacterial protein synthesis by binding to the 30S ribosomal subunit.

3: Look at this wrist X-ray of the baby from the above case study. Given what you know of his history, what is the diagnosis?

a. Acute distal radius fracture
b. Paget's disease
c. Osteosarcoma
d. Ricketts
e. Osteoporosis



4: The renin-angiotensin-aldosterone system plays a vital role in regulating blood pressure. The majority of renin is secreted from where?

a. Hepatocytes
b. Adrenal glands
c. Juxtaglomerular cells of the nephron
d. Anterior pituitary
e. Efferent arterioles of the nephron

5: Consider the Glomerular Filtration Rate (GFR) of a term infant. Compared with an adult, the infant's GFR will be:

a. The same, when corrected for body weight
b. The same, when corrected for body surface area
c. The same, when corrected for both body weight and body surface area
d. Less than an adult, even when corrected for body weight and body surface area
e. Greater than an adult, even when corrected for body weight and body surface area

POSTERIOR URETHRAL VALVES

K Maguire, CP Driver

MCQ Answers & Teaching Notes

1. The correct answer is mesoderm (answer d). As well as the kidneys, the mesoderm gives rise to cartilage, bone, striated and smooth muscle, gonads and spleen. The ectoderm gives rise primarily to the central and peripheral nervous systems, the epidermis, hair and nails, sensory epithelia of the eye, ear and nose as well as mammary, pituitary and subcutaneous glands. The endoderm gives rise to epithelial lining of the gastrointestinal and respiratory tracts, liver, pancreas, most of the urethra and the specialized epithelial lining of the urinary bladder.

These three germ layers all arise from the trilaminar embryonic disk. The amnion and primary yolk sac are extraembryonic structures, not germ layers, and do not contribute to organogenesis.

2. Trimethoprim blocks synthesis of folic acid (answer b). Penicillin would be an example of a beta-lactamase antibiotic. Erythromycin is a macrolide. Answer d refers to cefotaxime, a third generation cephalosporin antibiotic and gentamicin would be an example of an aminoglycoside.

3. Ricketts. There is osteopenia with marked cupping and fraying of the metaphysis. Ricketts can be caused by a deficiency of calcium, phosphate or vitamin D. Children with significant renal failure may be unable to regulate the amount of calcium and phosphate lost in urine, resulting in deficiency even if dietary supplements are given.

4. The majority of renin is secreted by the juxtaglomerular cells of the nephron in response to decreased sodium delivery to the distal tubules, a drop in renal arterial pressure or sympathetic nerve activation.

5. The answer is d. From 34 weeks post conceptual age until adolescence, gradual renal maturation results in a linear increase in absolute GFR (measured in ml/min). However even when corrected for body size (either by weight or surface area) GFR does not become comparable with adult values (90 – 140 ml/min/1.73m2) until around 12 months of age (19).

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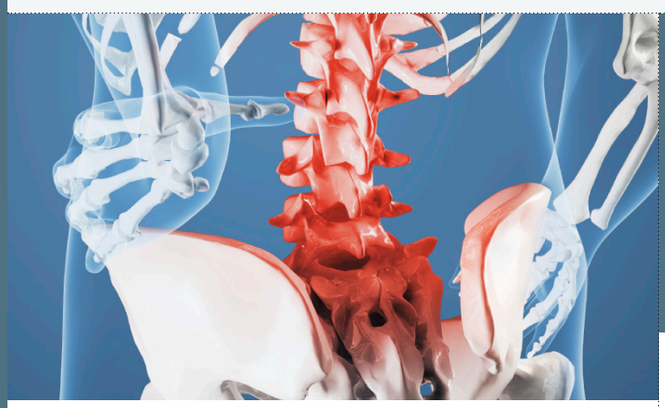
SPINAL INJECTIONS FOR THE CORE TRAINEE

RE Steele, AG Titchener



Abstract

Nerve root injections and caudal epidural injections are commonly performed by spinal orthopaedic surgeons and neurosurgeons; a working knowledge of these procedures is useful for the basic surgical trainee. Injections are performed both for diagnostic purposes and for amelioration of symptoms where a surgical alternative is not available or not appropriate. This article describes a step by step guide to these procedures.

Keywords

Injection, caudal, epidural, nerve, root.

History, pathology and investigation

The diagnosis of back and spinal pain is complex and challenging and many different anatomical structures may be involved. Spinal stenosis and nerve root entrapment both feature on the intercollegiate MRCS syllabus and core trainees should be familiar with the rudiments of diagnosis and management of these problems. Lumbosacral radiculopathy will affect 3-5% of the population during their lives (1). In the spinal outpatient department a full and thorough history and examination should be performed and documented. The features of spinal stenosis and myelopathy are outside the scope of this article but the core trainee should nevertheless have a good working knowledge of them. However in the context of nerve root injections, it is important to be familiar with the features of radiculopathy i.e. neuropathy in the distribution of one spinal nerve root level ('radix'=root). This may cause pain, sensory or motor symptoms and signs in the distribution of that root (1). It is important to consider and exclude pathology at other levels of the sensory or motor tracts.

Imaging is useful when diagnosing the cause of radiculopathy but is not mandatory prior to intervention; the literature is divided on this (2). Most consultants will obtain imaging; this clarifies the diagnosis for medico-legal purposes, and helps to exclude severe or malignant pathology. Pain film radiographs will show gross bony abnormality but a significant false negative rate for detection of both bony pathology and nerve root compression; many radiology departments do not recommend them as a first line investigation of low back pain. Magnetic Resonance Imaging (MRI) is generally the modality of choice; this provides good soft tissue assessment at a high resolution.

Where the diagnosis is unclear, or where a plexus or peripheral neuropathy is suspected electrodiagnostic tests may be helpful. Nerve conduction tests can help evaluate peripheral compression, and sensory or motor evoked potential studies can help clarify proximal lesions.

Nerve root injections can also be used as a diagnostic test in radiculopathy as well as a therapeutic option. The relief provided may not be permanent, but may allow time for a potentially self limiting problem such as intervertebral disc prolapse to resolve. This article will cover nerve root injections and caudal epidural injections which as a core trainee or junior registrar you may be asked to perform.

Indications and contraindications

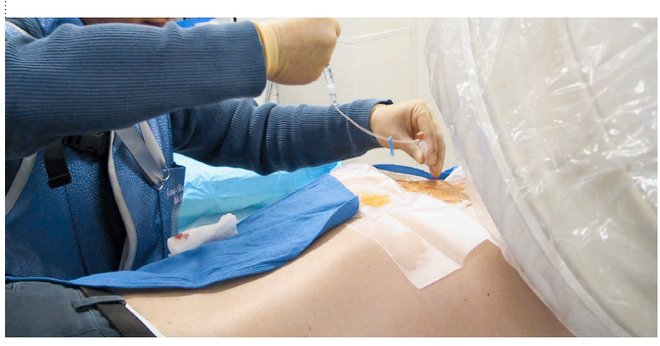
Contraindications for both types of injection include local or systemic infection which may seed to the injection site, concomitant anticoagulant or antiplatelet administration and uncontrolled diabetes mellitus (due to the systemic effects of the corticosteroid). For female patients the possibility of pregnancy should be considered when X-Ray guidance is used.

Nerve Root Injections

These are indicated for diagnostic purposes where a single nerve root pathology is suspected clinically or investigations are equivocal. They may also be useful as treatment for pain control where other treatments are contraindicated.

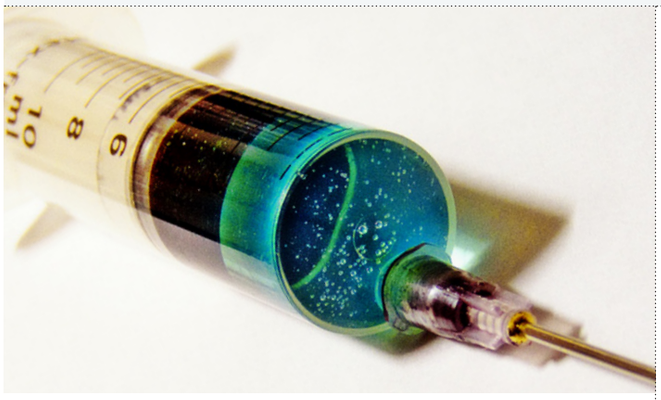
Caudal Epidural Injections

The efficacy of caudal epidural injections is controversial and there is debate in the literature about their use. However there is a body of evidence supporting their use and many consultants will expect their trainees to be or become competent in this procedure. They are indicated for low lumbar or sacral spinal pain



SPINAL INJECTIONS FOR THE CORE TRAINEE

RE Steele, AG Titchener



Gaining informed consent/explaining procedure to patient.

Nerve Root Injections

It should be explained that the injection is potentially both a diagnostic and therapeutic procedure as appropriate. Patients should be consented for the risk of infection, increased pain or a failure to resolve the symptoms, bruising, radicular numbness or weakness and allergy to the injection ingredients. The corticosteroid element may also interfere with glucose metabolism and hormonal cycles; this should also be considered. If the pain is to be improved then this may occur when the local anaesthetic starts to work, a window of increased pain my occur as this wears off and after 24-48 hours the corticosteroid will take effect and may work for a number of weeks according to the underlying pathology.

Caudal Epidural Injections

It should be explained that the injection is mainly a temporary therapeutic manoeuvre but may also be diagnostic. As for nerve root injection the patient should be consented for the risk of infection, increased pain or a failure to resolve the symptoms, bruising, radicular numbness or weakness and allergy to the injection ingredients. Spinal block or dural leak is also a risk. The same principles regarding effect of local anaesthesia and corticosteroid apply.

Equipment required.

Nerve Root Injections:

XRay / Image intensifier for guidance
Radiolucent operating table
10ml syringe
Spinal needle (20-22G)
5ml syringe and 24G needle for local anaesthesia
1% lidocaine 5mls for local anaesthesia
2.5ml syringe
2.5mls Iohexol (OmnipaqueTM), iodine based contrast medium.
10ml syringe
4mls 0.5% bupivacaine+40mg triamcinolone for root injection.
Gauze.
Simple dressing.

Caudal Epidural Injections:

5ml syringe and 24G needle for local anaesthesia.
1% lidocaine 3mls for local anaesthesia.
20ml syringe.
7mls 1% lidocaine+ 80mg triamcinolone+ 6mls 0.9% normal saline.
Spinal needle (20-22G) or long 18G needle for epidural injection.
Gauze
Betadine
Simple dressing.
Blood Pressure monitoring and resuscitation facilities.
If performed under xray guidance:
XRay / Image intensifier for guidance
Radiolucent operating table
2.5ml syringe
2.5mls Iohexol (OmnipaqueTM), iodine based contrast medium.

Draping and patient positioning (3).

Nerve Root Injections

Position the patient prone on a radiolucent table. Expose the spinal level in question and prepare the skin using either an iodine based solution or chlorhexidine. Drape an approximately 10x10cm area including the midline at the level required and 10cm laterally. Sterile precautions including gloves should be used but full mask and gown are not required.

Caudal Epidural Injections

We recommend positioning the patient prone with a pillow under the pelvis to improve access. Some practitioners position the patient in a lateral position with hips and knees flexed. The sacral hiatus and natal cleft are prepared using iodine based solution or chlorhexidine and draped in a sterile manner.

Procedure

Nerve root injections

The needle insertion site should be marked on a PA image. This should be at the level of the neural foramen in question approximately at the tip of the transverse processes for lumbar injections. 2-5mls of local anaesthetic should then be infiltrated at this site. Through this area a spinal needle should be advanced under image intensifier guidance until immediately lateral to the vertebral body at the level of the foramen (Fig. 1). The lateral image should then be verified and the needle manipulated in the axial plane as required until the tip lies in the centre of the foramen (Fig. 2). The PA view should then be checked again and 1ml of radiolucent water soluble dye injected. This should give a blush along the path of the spinal nerve (Fig. 3) and may highlight the epidural space within the spinal canal. Once verified, inject the local anaesthetic and corticosteroid solution, withdraw the needle and apply a simple dressing.

SPINAL INJECTIONS FOR THE CORE TRAINEE

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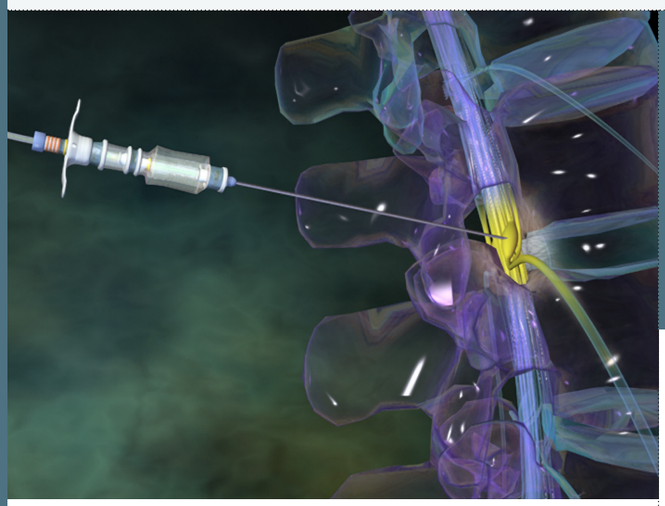

Caudal Epidural Injections

Palpate the sacral hiatus; this is most easily done by palpating the tip of the coccyx and then palpating proximally and in the midline until a dip in the underlying tissues is noted. Infiltrate 2-5mls of local anaesthetic to the skin. Using a long standard needle or spinal needle attempt to enter the hiatus at an angle to the skin of 30-45 degrees. If difficult, 'walk' the needle from distal to proximal until a give is felt as the needle enters the hiatus through the sacrococcygeal membrane. If performed under image intensifier guidance inject 1ml of radiolucent water soluble dye. This should highlight the epidural space (the solid black line seen dorsally in Fig. 4). If not intra-dural but in doubt about placement inject a further 1ml. On the image shown in figure 5 the dorsal extradural dye has become more prominent, and the dye is beginning to spread along the sacral nerve roots. Inject the local anaesthetic, corticosteroid and saline solution as above. Place a simple dressing over the injection site and ask the patient to now lie on the side that is most symptomatic for them. Monitor blood pressure and heart rate for 1 hour post procedure.

Record procedure in patients notes, detailing date, time, preparation used and ease of injection. It is important to state if the procedure was difficult and how much steroid was injected. If the procedure was difficult or if the patient was obese then a future injection may be advised under XRay guidance if required.

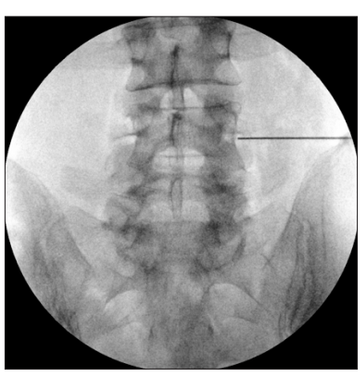

Fig. 1: Nerve root injection left L4 AP view pre-contrast.

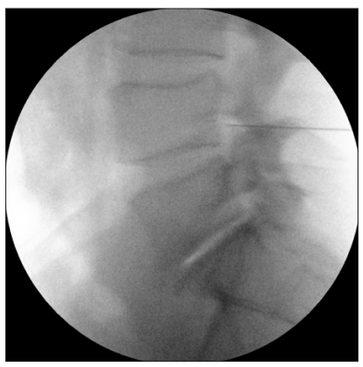

Fig. 2: Nerve root injection left L4 lateral view.

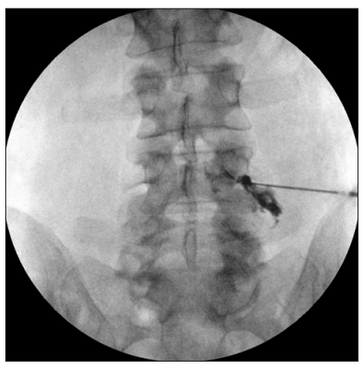

Fig. 3: Nerve root injection left L4 AP view post-contrast.

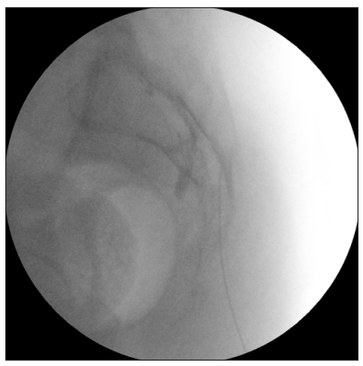

Fig. 4: Caudal epidural injection after 1ml Omnipaque.

SPINAL INJECTIONS FOR THE CORE TRAINEE

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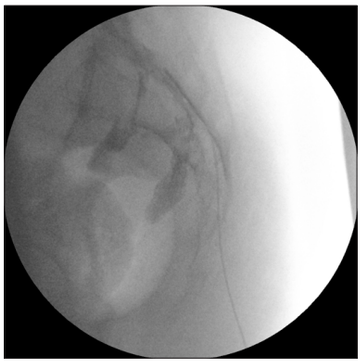

Fig. 5: Caudal epidural injection after 2mls Omnipaque.

Recording of complications and management of such

Generally, associated complications are minor and infrequent, occurring in less than 1% of image guided cases (4). They include pain and discomfort at injection site which can radiate down the legs, bleeding, epidural haematoma, infection, steroidal side-effects, allergy to preparation, dural puncture, post-dural puncture headache (6). Other less common but reported side-effects include nausea, vaso-vagal episodes, increased pain and even transient paraplegia (5).

The most common reported technical associated complication for caudal epidural is dural puncture (7). This is easily recognizable when performed under x-ray with use of contrast medium, less so if conducting it blind. If this were to happen, neither anaesthetic nor steroid should be injected at this level, the needle should be removed and re-positioned at an alternative level. Post procedure, the patient should have a 24 hour period of bed rest and oral fluids encouraged.

Infective complications maybe limited to localised swelling and erythema but can rapidly progress to epidural abscess formation and potentially meningitis although this risk is greater at cervical levels.

Questions

1) Relative contraindications to lumbar nerve root injection include:
a. Iodine allergy
b. Corticosteroid preparation allergy
c. Warfarin therapy
d. Opiate analgesia

2) Epidural injection has a greater risk of causing meningitis at which level?
a. Lumbar
b. Thoracic
c. Sacral/Caudal
d. Cervical

3) Lumbosacral radiculopathy will affect what proportion of the population duing their lives:
a. 1-2%
b. 3-5%
c. 5-7%
d. Over 8%

4) Nerve root compression is best diagnosed via which imaging modality?
a. Plain film XRay
b. MRI
c. Enhanced CT
d. Myelogram

Answers

1) C. This risks haematoma formation.
2) D
3) B
4) B. This gives excellent soft tissue resolution.

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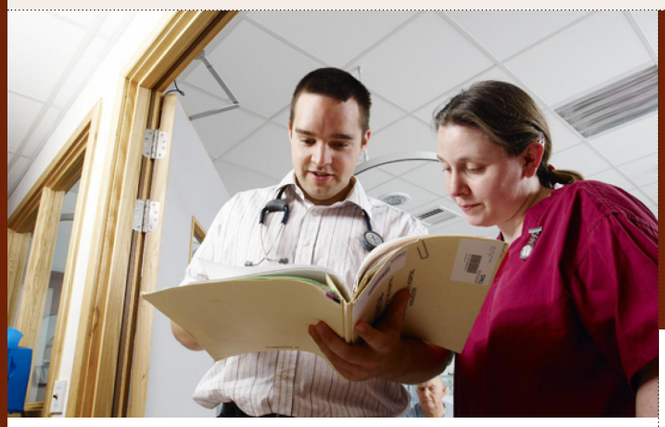
PROFESSION DEVELOPMENT IN TEACHING: HOW TO IMPROVE YOUR TEACHING PORTFOLIO

JS Nichols, L Cutler, RU Ashford, SC Williams



Profession development in teaching: How to improve your teaching portfolio
Current Training Issues

Introduction and Background

Recent developments in health service delivery are profoundly affecting postgraduate medical training. The reduction in junior doctor hours brought to a head by European Working Time Regulations, have catalysed a need to safeguard and improve the quality of the supervision received by trainees (1). In parallel with these service changes, emerging trends in medical education such as increasing accountability, professionalism and the pursuit of 'excellence' have come together in a number of high profile national policies and regulatory requirements. One of the consequences has been a call for the accreditation and professional development of those involved in postgraduate medical education.

However, to date there has been little national guidance on the competencies or training required of postgraduate medical supervisors. There were no agreed standards across the UK for appointing educational supervisors or for determining a minimum acceptable training. There has previously been no agreement on the continuing professional development needs of supervisors. The Academy of Medical Educators was therefore commissioned by the UK Departments of Health to help define training requirements for educational supervisors and to explore options for their future accreditation and performance review (2, 3).

The GMC's Generic Standards for Training remains the regulatory benchmark (4). The GMC has proposed a new process for recognition of trainers. Following initial consultation a phased process of implementation is planned based around the standards set out in The Academy of Medical Educators report from November 2010 (5) (2). A High Quality Workforce: NHS Next Stage Review also provides the basis for the continuous improvement of supervisory practice (6).

The General Medical Council's (GMC) Generic Standards for Training requires that "Trainers with additional educational roles must be selected and demonstrate ability as effective trainers". However, as Kilminster (7)and her colleagues have highlighted "Effective supervision of trainees involves skills that are different from other more general competencies expected of a teacher or trainer". Clinical supervision relates to day-to-day oversight of trainees in the workplace and is an activity that involves all clinicians that come into contact with trainees. The GMC defines a clinical supervisor as 'a trainer who is selected and appropriately trained to be responsible for overseeing a specified trainee's clinical work and providing constructive feedback during a training placement.

Educational supervision relates to the oversight of a trainee's progress over time. Educational supervisors are responsible for ensuring that trainees are making the necessary clinical and educational progress. Educational supervisors are responsible for producing a report for the Annual Review of Competence Progression (ARCP) panel. The GMC defines an educational supervisor as 'a trainer who is selected and appropriately trained to be responsible for the overall supervision and management of a specified trainee's educational progress during a training placement or series of placements. The Educational Supervisor is responsible for the trainee's Educational Agreement.'

Building a base of experience

Numerous opportunities to enhance your teaching portfolio exist in medicine. However, making space in your timetable for dedicated teaching as a trainee, or as a consultant can conflict with other recognised training needs.

In practical terms, clinical teaching - that is teaching and learning directly involving patients and their problems – is likely to form the largest part of ones teaching practice. This might include bedside teaching, small group sessions, or more formal lecture-style teaching. Most medical schools require clinical teachers to provide bedside teaching to small groups of undergraduates – contacting the local Undergraduate Education Lead will get advice about where to start. Other subspecialties may also give one the opportunity to teach – for example, an Orthopaedic Core Trainee delivering a session on hip fractures to a group of Ortho-geriatricians.

PROFESSION DEVELOPMENT IN TEACHING: HOW TO IMPROVE YOUR TEACHING PORTFOLIO

JS Nichols, L Cutler, RU Ashford, SC Williams

Most post-graduate teaching programmes also provide the opportunity to teach. MRCS teaching programmes may provide small group sessions with an "interactive" presentation. This can be combined clinical bedside-type teaching as well. In addition, the medical school provides access to the dissecting room at the University, and provides pro-sections for sessions on anatomy. When undertaking any teaching session, an "Observation of Teaching" or OOT form should be completed to provide feedback and evidence of the completed session. This can be completed by both a trainee and a trainer.

Nationally recognised teaching courses include those available at the Royal College of Surgeons. Training the Trainers: Developing Teaching Skills is useful to anyone delivering formal teaching. The Training and Assessment in Practice (TAIP) course is designed for programme directors and Assigned Educational Supervisors to help understand the training and assessment system, but all courses require a student faculty member to participate in simulated CBDs or to demonstrate developing an educational agreement with an educational supervisor. These courses can be valuable in developing ones teaching portfolio.

National courses such as ATLS or CCrISP can also provide the opportunity to improve your teaching portfolio. ATLS courses recommend candidates who they feel show potential to teach others. This is usually during small group sessions on the course, where you may have the chance to show you interact well with others, or teach more junior trainees unfamiliar skills. You must be at least ST4 to be recommended as an instructor and also demonstrate that you will teach in line with the ATLS principles.

If the course director recommends you become an instructor, you are required to complete a two day specific ATLS Instructor course, for which there may be a waiting list. You will then be required to teach on a course as an IC – Instructor Candidate. If this is completed satisfactorily you will then become a full instructor and must teach on 4 courses every 4 years.

The Instructor course and the experience of teaching on these courses will greatly enhance your teaching skills.

Many higher education institutions and hospitals across the country offer accredited qualifications in medical education. Consider whether you intend to complete a postgraduate certificate, a diploma, or Masters Degree. The answer will depend on ones personal circumstances and career direction. You may wish to study specific areas of medical education, whether they are specialty based (with specific programmes for surgeons, anaesthetists, and physicians, among others) or based on educational modalities (such as management in education, simulation, and education and technology). Many Universities (including the University of Leicester) offer Post-graduate certificates in Education (rather than medical education), often as part of their staff development programmes. These courses should offer accreditation through the Higher Education Academy. One also needs to decide between a face-to-face taught programme and a distance learning programme. The University of Dundee and the University of Cardiff, among others, run well established distance learning programmes.

Demonstrating teaching and educational achievement

In line with the recently published generic curriculum, Core Competencies for Doctors, an expectation at completion of training (i.e. on obtaining a CCT or CESR) is that doctors can demonstrate attainment of competence sufficient to enable to function satisfactorily as a clinical supervisor from the first day of their first consultant post (8). The Academy of Medical Educators report from November 2010 specifies exactly what is expected of supervisors, and provides an indication of the training that might support a new trainer (2).

This article will concentrate on continuing professional development as an educator. In order to be effective in this area one needs to show evidence that you are evaluating your own practice through trainee feedback, peer observation and 360 degree appraisals. It is important to show the action taken to improve practice on the basis of such feedback received. Programmes of educational development such as 'Training the trainers' should be undertaken. A Postgraduate Certificate or Masters in Education might be appropriate for some people.

Examples of relevant supporting evidence might include:

- *Courses or programmes undertaken, including face to face and online learning*
- *Appraisal documentation and other CPD records*
- *Results of 360 appraisal*
- *Certificates or qualifications obtained*
- *Results of peer review learner or professional observation of teaching*
- *Details of learning programmes, study schedules, timetables for trainees and undergraduates*
- *Records of other relevant activities undertaken, e.g. involvement in recruitment, training committees etc*

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For extending a teaching role beyond supervision in the workplace e.g. Training Programme Director, Undergraduate Tutor or university lecturer accreditation through the Academy of Medical Educators or Higher Education Academy should be sought.

Towards the future

One of the main challenges facing the NHS in the delivery of training is for the system to continue to deliver cost-effective high-quality training whilst maintaining competence and clinical quality, within current service and financial constraints. A possible solution to the issues is to devise innovative methods of delivery of learning. Through improvements in the effectiveness of training and the introduction of simulation based learning into the curriculum, it might be possible to compensate for this reduction in experiential training time.

In the age of social networking, trainees are becoming increasingly adept at using digital technology (9). The question still remains as to whether technology assisted learning can be used for selection into surgery, and whether simulation may have a role in the acquisition of skills or performance assessment. In 2006, Lord Darzi re-introduced the concept of simulation-based training for surgeons (10), and the Temple report (1)recommended increased investment in simulation to fully realise the benefits to training. There are numerous examples of successful use of simulation equipment ranging from simple procedural skills such as suturing to high fidelity team-based training (11-15).

Profession development in teaching: How to improve your teaching portfolio
Current Training Issues

Though tools have been available for almost a decade, the integration of such tools into training curricula has been patchy. Recent studies have shown that not only has simulation-based training improve performance subsequently on real cases, in terms of reduced time taken, fewer errors and decreased patient discomfort, but it also reduced the amount of time taken to achieve laparoscopic skills (12, 13, 15). Not only is simulation a more cost effective method of training, but it also leads to enhanced levels of patient safety and trainee confidence (10, 12, 13, 16).

In a study presented by Brennan at the "Surgical Simulation: Problems and Pitfalls with Pretending" conference at the RCSEd in Feb 2011, over 50% of trainees questioned did not have access to a simulator, and felt that ongoing barriers to their use were the lack of access to this type of equipment, lack of time and instruction. It is therefore desirable to ensure that such systems are easily accessible i.e. embedded in working area to allow access by the trainees during working hours. Time must be taken to help trainees, and oversee training.

Conclusion

This article is underpinned by the core professional values expressed in Good Medical Practice (General Medical Council 2001). The quality of the outcome of the interaction between a teacher and their student may be the most important measure of the interaction. In continuing professional development, it remains critical to meet the objectives laid out in the sub-specialty curriculum.

The curriculum clearly states what is required of you in Core Surgical Training: You are required to prepare appropriate materials to support teaching episodes, seek and interpret simple feedback following teaching. You are required to supervises a medical student, nurse or colleague through a simple procedure, and plan, develop and deliver small group teaching to medical students, nurses or colleagues. Where trainees struggle to see the relevance of such teaching, note that planning, time management and organisation are skills you will develop as a teacher, that most employers like to see evidenced. The employability bonus here is to discuss and reflect on the planning processes required for teaching, and to make the link to planning research, writing and to higher degrees.

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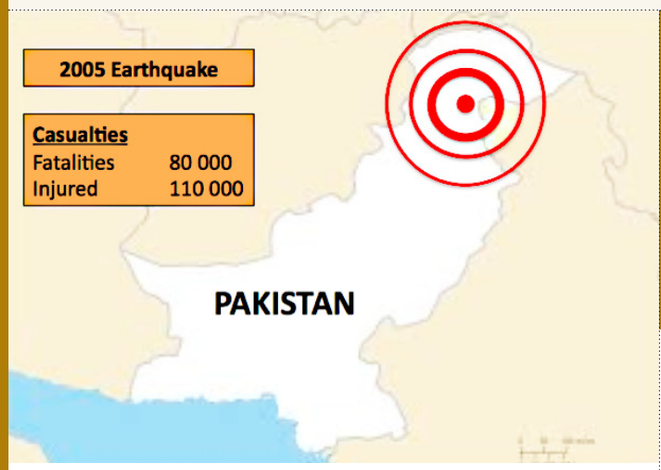
HEALTHCARE FOR EARTHQUAKE CASUALTIES: NORTHERN PAKISTAN

OA Mownah



On the 8th October 2005 an earthquake of devastating magnitude hit Northern Pakistan. Three months later the human cost stood at nearly 80,000 lives. The immediate crisis now centred on the hundreds of thousands of survivors displaced by the tragedy and housed in temporary relief camps. I had travelled to Northern Pakistan and spent a month in a large Relief Camp housing some 20 000 people.

I spent this time as a Medical Volunteer in a clinic facility provided by a charitable, non-governmental organization. Our clinic comprised two large tents, which generously afforded us a consultation and examination area, plus a storage space for medications, wound care products and other essential disposables.

The Medical Team was led by a General Practitioner, supported by 2 nurses, a Pharmacist and 2 medical students. Services we were able to provide included a Walk-In Centre, general clinic, wound care management and rehabilitation for those recovering from severe injuries.

My first impressions were firstly the cold weather and harsh environment. The earthquake had been followed by the typically harsh winter of this mountainous region. The climate was yet another challenge being faced by the survivors.

Lengthy queues formed outside our tent each morning, consisting of patients of all ages with varying ranges of baseline health. Ailments being reported varied from viral illnesses and respiratory tract infections to the more long-term problems faced by patients severely injured during the earthquake.

Healthcare for Earthquake Casualties: Northern Pakistan
Career Focus

Seeing and treating patients was initially daunting but with the sheer volume I was able to further my confidence. In addition I had the benefit of senior colleagues to call upon, which can never be understated.

Although relief work often takes place within austere environments with makeshift facilities, a carefully organized approach along with appropriate safeguards is crucial to ensure safe and effective care.

The overall experience was a demonstration of the difficulties faced when dealing with a large population with significant needs. The realities can be quite disheartening particularly when one sees the suffering of the very young and vulnerable.

One lasting impression came from the many victims of the earthquake whom had suffered horrific burns. With their immediate care delayed by the aftermath of the earthquake, patients had gone on to suffer the secondary complications of neglected burns.

Many were attempting to manage their daily lives with continual pain. Loss of function in burn-afflicted limbs was common, as well as the emotional and psychological burden of the ordeal. The resources available, such as dressings, were basic and had to be used sparingly. Our supply of simple analgesia had to be dispensed with care along with our small quantity of antibiotics. Infections, associated with healing burns, were routinely encountered.

HEALTHCARE FOR EARTHQUAKE CASUALTIES: NORTHERN PAKISTAN

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Healthcare for Earthquake Casualties: Northern Pakistan
Career Focus

Unsurprisingly with the nature of many earthquakes, orthopaedic injury was highly prevalent. Lack of access to early treatment had occurred with many victims in unreachable corners of the mountains.

Many long bone fractures were managed with crudely made splints with patients mobilizing with makeshift crutches. As a result complications were commonplace, including delayed or mal union. Significant misalignment of healed fractures had also occurred in many. There was a provision for some patients to undergo surgery at a hospital some distance away.

However, with the transport and other costs involved, this was a resource to be used sparingly. In a developing country such as Pakistan, funds originate mainly from charitable sources. Consequently the onus was on providing the more expensive treatments to the carefully selected few deemed to derive the most benefit.

When the month had almost passed I reflected on what was a demanding and occasionally exhausting insight into an unfamiliar side of healthcare. The challenge of attending to people who have suffered unimaginable losses was not something I had ever studied for. Unprepared as I was there was never a shortage of tasks for me to attend to.

Charitable experiences can be seen primarily as an effective way of offering your assistance to those suffering the consequences of such devastating events. Clearly the benefits to the trainee come secondary but nevertheless, these opportunities encourage the development of unique skills.

There are many charities and NGOs with informative websites which look to recruit the services of the medically-trained. On a cautious note, travelling to disaster-hit areas in today's world is not without its dangers.

It would be prudent to be aware of the latest security advice prior to setting off. This can be found from www.fco.gov.uk. Broadly-speaking however these experiences are safe and thoroughly worthwhile.

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