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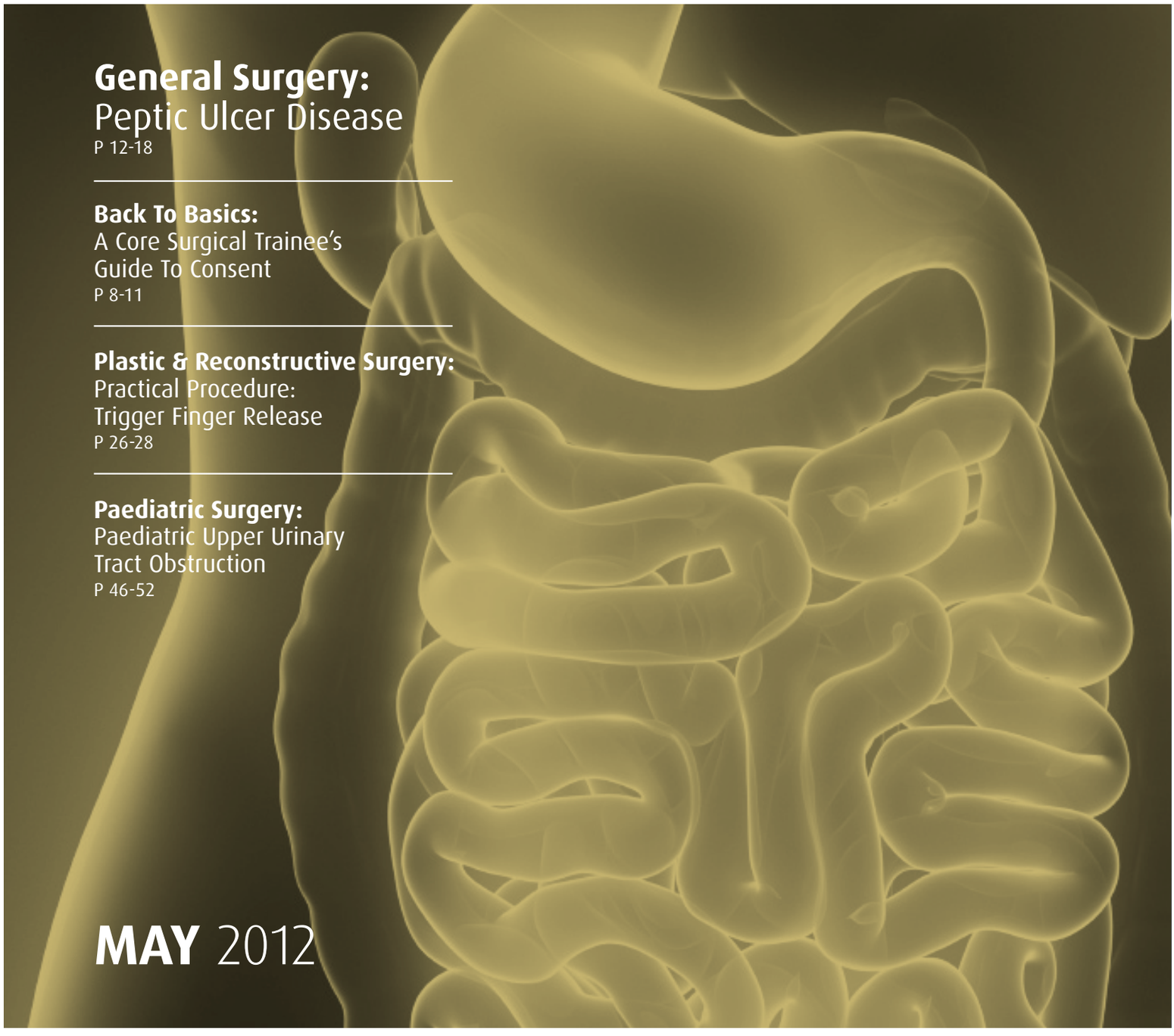
CORE SURGERY JOURNAL

Volume 2, Issue 3



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CORE SURGERY JOURNAL

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Thank you for considering the submission of an article to 'Core Surgery'. This is a new journal aiming to educate and inform junior surgical trainees about relevant 'core' subject topics. Each issue will cover a topic from selected subspecialty fields; General Surgery, Orthopaedics and Trauma, Plastic Surgery, Ear Nose and Throat Surgery, Neurosurgery, Urology, Paediatric Surgery and Intensive Care Medicine. Articles will be required to be broad enough to help with preparation for the intercollegiate MRCS examination but also focus on key hints and tips on becoming a higher surgical trainee. A list of core topics in each subspecialty has therefore been agreed by the editors based on a selection of key topics in the MRCS curriculum. Authors are advised to agree a topic with the editors before writing an article.

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

Submission of Manuscript

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.

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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Guidelines for the format of respective article types are as follows. All articles must contain an abstract of 150-250 words for indexing purposes and 3-5 keywords.

Case Based Discussions

Guidelines for the format of respective article types are as follows. All articles must contain an abstract of 150-250 words for indexing purposes and **3-5 keywords.**

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.

CORE SURGERY JOURNAL

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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.

MCQs / EMQs (All Articles)

Please note that all articles should be submitted **with five multiple choice questions (MCQs) or extended matching questions (EMQs)** attached, in the style of the Member of the Royal College of Surgeons (MRCS) 'Part A' examination. These questions should have answers and brief teaching notes/discussion included. Examples of the requirements for question style can be found here: **http://www.intercollegiatemrcs.org.uk/old/pdf/samplequestions_MCQ.pdf**

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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Acute Medicine

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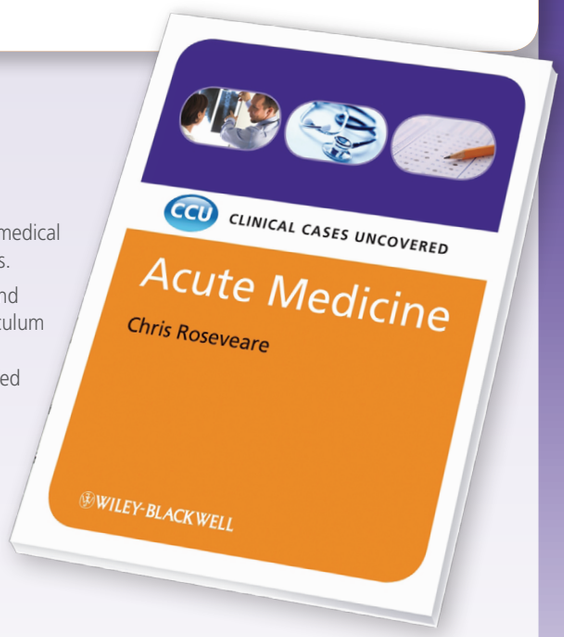

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WILEY-BLACKWELL

A CORE SURGICAL TRAINEE'S GUIDE TO CONSENT

KV Sigamoney

Abstract

It is important to obtain valid informed consent for any surgical procedure. There are 3 types of consent; expressed consent, statutory requirements, and implied consent. Consent should ideally be obtained by the doctor providing treatment. If this is not possible, the task should be delegated to a qualified health professional who has sufficient knowledge of the proposed procedure. Any patient who is competent and has the capacity to consent can consent for themselves. Relatives must not be asked to sign a consent form for a patient who is 18 or over. There are 4 types of consent forms (Forms 1 to 4) but different departments may also have different forms for certain procedures. While obtaining consent, patients should be informed sufficiently of the procedure, the involved risks and their right to withdraw or not consent. This will ensure that the consent is informed and valid and avoids any potential problems for the involved doctor in terms of providing information prior to the procedure.

Introduction

Definition of consent: Agreement to an action based on knowledge of what the action involves and its likely consequences (1).

Consenting a patient for a procedure appears to be a simple task until something goes wrong. For many of us, we go with experience and "fall into" obtaining consent on our own. We may have been to a teaching session, or have seen someone do it and begin doing it mostly because we have to and it is something that is needed. But, how do we do it in the right way? And what exactly do we need to tell patients?

A core surgical trainee's guide to consent
Back to Basics.

Types of Consent

Consent should always be ''informed consent''. Some types are as follows:

1. Expressed consent

This is where patients express their consent orally or in writing. Where the patient is able to do so, you should always gain written consent in cases where:

- A complex treatment or procedure is given or done and there are significant risks and / or side effects.
- Providing clinical care is not the primary purpose of the procedure
- The patient's employment, social or personal life may be affected significantly
- The treatment is for or part of research (1, 2).

2. Statutory requirements

Some statutes require written consent (eg. fertility treatment, termination of pregnancy). Follow the law in these areas (2).

3. Implied consent

This is where a patient apparently consents to what you intend to do. For example, if they give you their arm, they imply that it is okay for you to take their blood pressure. Be careful where this is concerned. You still need to explain what is being done to or for them (2).

Who obtains Consent

The doctor providing the procedure should consent the patient. If this is not possible, the task should be delegated to a person who is:

1. Suitably trained and qualified;
2. Has sufficient knowledge of the proposed investigation or treatment, and understands the risks involved;
3. Acts in accordance to the General Medical Council's guidelines to consenting (3).

Who can give Consent?

Anyone aged 16 or more can consent for themselves unless they are not competent to do so. If a child under the age of 16 has ''sufficient understanding and intelligence to enable him or her to understand fully what is proposed'' (Gillick Competent), then he or she will be competent to consent themselves (4). Their parents may want to countersign the consent. For patients who do not have the capacity to make an informed consent, a '2 doctor' consent form can be signed (Form 4). If their capacity is fluctuating, we must review and respect any decision made while the patient was competent.

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Advanced Statements

If treating a patient who has lost capacity to consent or refuse treatment, find out whether the patient has previously indicated preferences in an advanced statement. Respect any decision made when competent provided it applies to present circumstances and there is no reason to believe the patient has changed his or her mind. If this kind of statement is not available, the patient's known wishes should be taken into account (5).

Should family members be involved?

Although not directly making the decision (except for a child), it is always wise to discuss with any family member present or with anyone who has parental responsibility (if the patient is a child). The exception is if we are informed not to do so. However, relatives must not be asked to sign a consent form for a patient who is 18 or over (4).

What does the General Medical Council say about Consenting (Consent and the Law)

- A patient should be told of any possible significant adverse outcomes of a proposed treatment.
- A small but well-established risk of a serious adverse outcome is considered to be 'significant' and a patient should be warned of it.
- The fact that a person has a mental illness does not automatically mean that they lack capacity to make a decision about medical treatment.
- Patients who have capacity (able to understand, believe, retain and weigh the necessary information) can make their own decisions to refuse treatment, even if those decisions appear irrational to the doctor or may place the patient's health or their life at risk.
- An individual's capacity to make particular decisions may fluctuate or be temporarily affected by factors such as pain, fear, confusion or the effects of medication. Assessment of capacity must be time and decision-specific.
- A competent patient has the right to refuse treatment and their refusal must be respected, even if it will result in death.
- A competent pregnant woman can refuse treatment even if that refusal may result in harm to her or her unborn child.
- Patients cannot lawfully be detained and compulsorily treated for a physical condition under the terms of the Mental Health Act.
- A patient's consent to a particular treatment may not be valid if it is given under pressure or duress exerted by another person.
- With regards to a young person under the age of 16, they may consent themselves if:
  - They have sufficient maturity and intelligence to understand the nature and implications of the proposed treatment.
  - They could not be persuaded to tell their parents or to allow the doctor to tell the parents
  - Their physical or mental health is likely to suffer unless they received the advice or treatment.
  - A young person under the age of 16 with capacity to make any relevant decision is often referred to as 'Gillick Competent' (6).

Types of Consent Forms

There are 4 types of consent forms (for procedures) that are commonly used in surgical fields. There are other specific consent forms that should be filled for specific reasons, for example, for photography, research, bone graft etc. Always check with the relevant department.

Consent form 1 – patient agreement to investigation or treatment

This is the most commonly used consent form. It should be used when the patient is competent to retain, weigh and use the information given to make a decision. It is in no way a legal waiver, and may not be valid even though signed, if a patient did not receive enough information to make their decision. Patients may also change their mind after signing the form provided they have capacity to do so.

When not to use this form:

If a patient is 18 or over and is not legally competent to give consent, use Form 4. Relatives must not be asked to sign this form on behalf of an adult who is not legally competent. The same applies to Consent Form 3 (4).

Consent form 2 – parental agreement to investigation or treatment for a child or young person

This form is used to obtain consent to a child's treatment from a person with parental responsibilities. This applies to anyone below the age of 18. However, there is an overlap. If a young person is aged 16 or more, they can consent for themselves if deemed competent. Form 1 should be used in this case. If a child below the age of 16 and is competent to consent, again, use Form 1. For anyone under the age of 18, ask if the parent would like to countersign, there is space for in Form 1 (4).

Consent form 3 – patient/parental ageement to investigation or treatment (where conciousness is not impaired)

This form is used for adults or parents and young people to consent for procedures where the patient is expected to remain alert throughout and where an anaesthetist is not involved in their care (4).

A CORE SURGICAL TRAINEE'S GUIDE TO CONSENT

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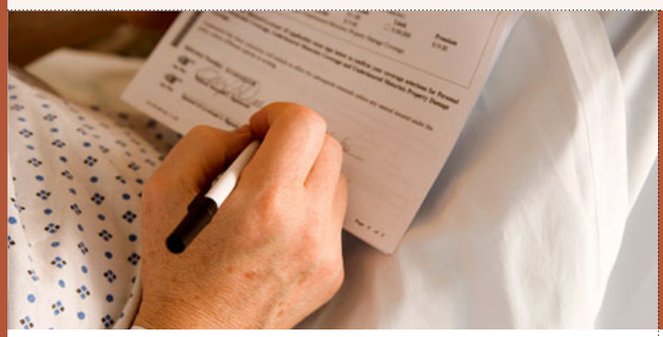


A core surgical trainee's guide to consent
Back to Basics.

Consent form 4 – form for adults who are unable to consent for investigation or treatment

Used for an adult (18 or over) patient where the patient lacks capacity to make an informed decision. The treatment must be in the patient's best interests taking into account the wishes or beliefs when competent, current wishes, general well-being and spiritual and religious welfare. In legal settings, or if there is legal involvement, it may be necessary to visit the Mental Health Act.

Capacity:

A patient lacks capacity if he or she is:

- Unable to comprehend and retain information material to the decision, and/or
- Unable to use and weigh this information in the decision-making process (4).

Before making the judgement, all steps to assist the patient in making his or her decision should be taken. Capacity is also time and decision-specific (6).

What the patient needs to know when giving consent

1. Details of the diagnosis and prognosis, and the likely prognosis if the condition is left untreated.
2. Uncertainties about the diagnosis including options for further investigation prior to treatment.
3. Options for treatment or management of the condition, including the option not to treat.
4. The purpose of the procedure and details of it including what they may experience.
5. How the patient should prepare for the procedure.
6. Common and serious side effects.
7. Any possible lifestyle changes that may be caused by the procedure.
8. Whether the proposed procedure is experimental.
9. Monitoring and re-assessment.
10. The consultant and the doctor doing the procedure.
11. Involvement of doctors in training or medical students and the extent of involvement.
12. A reminder that they can change their minds about the decision at any time.
13. That they can seek a second opinion.
14. Where applicable, details of any cost the patient may need to bear (7).

Reviewing consent

A member of the team must review the patient's decision close to the time of treatment, especially where:

1. Significant time has elapsed between obtaining consent and the start of treatment.
2. There have been changes in the patient's condition or any aspect of the proposed treatment.
3. New relevant information has become available about the procedure (8).

Best interests

Where a patient does not have capacity to consent and there are differences between opinions of his or her best interests, seek advice from senior colleagues or where appropriate seek legal advice. It may be necessary to apply to court. If this is done, inform the patient and his or her family or representatives of your decision (9).

Summary

There is a lot to know about consenting a patient. However, if we are aware of what it involves, the art of consenting can be mastered easily. Where a SHO is concerned, what needs to be done is:

1. Get the right patient, check patient details and procedure.
2. Assess capacity.
3. Get the correct consent form.
4. Inform the patient of the procedure and give the necessary information as mentioned above ("What the patient needs to know when giving consent''). Risks mentioned should include general risk and procedure specific risks.
5. Attain consent from the appropriate party, ask parent/ translator/ consultant to countersign where appropriate.
6. Review consent on day of procedure or nearer the time of the procedure.

A CORE SURGICAL TRAINEE'S GUIDE TO CONSENT

KV Sigamoney

MCQs

1. All of the following professionals can obtain consent from patients except:

A. A consultant performing the surgery
B. A senior house officer who has seen the procedure and understands the risks
C. A trained specialist nurse in the field and has good knowledge of the surgery
D. A house officer who does not know much about the surgery and has never seen it

2. If a patient of the age of 15 is Gillick competent wishes to give his or her consent, which form would you use?

A. Form 1
B. Form 2
C. Form 3
D. Form 4

3. A 10 year old boy has compartment syndrome of the left forearm. He needs urgent surgery and seems to agree to what you say. However, you do not feel that he is competent to give consent. His mother is not reachable and his aunt is with him. What form will you use?

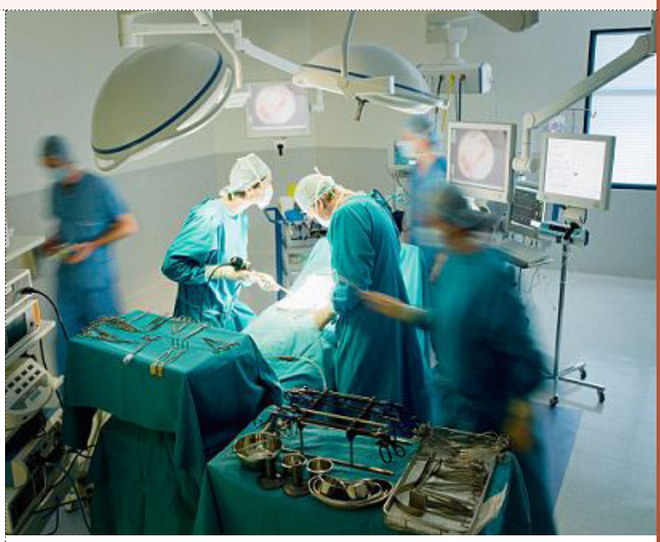
A. Form 1
B. Form 2
C. Form 4
D. None of the above.

4. A 60 year old patient would like to consent for a L5 spinal nerve root block. He does not require general or regional anaesthesia. Which form would you use?

A. Form 1
B. Form 2
C. Form 3
D. Form 4

5. A 30 year old patient with known Schizophrenia needs consenting for a hernia repair. His family says that he seems to understand what they say at times and at other times seem to be lost in his own world. What would be the most appropriate step to take?

A. Speak to his family and find out if he has expressed his wishes prior to this.
B. Speak to the patient and see if he is competent at the time of consent
C. Speak to your consultant and fill out a consent form 4.
D. He has a mental illness which does not indicate that he lacks capacity, therefore he can consent for his own surgery (Form 1).



Answers

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

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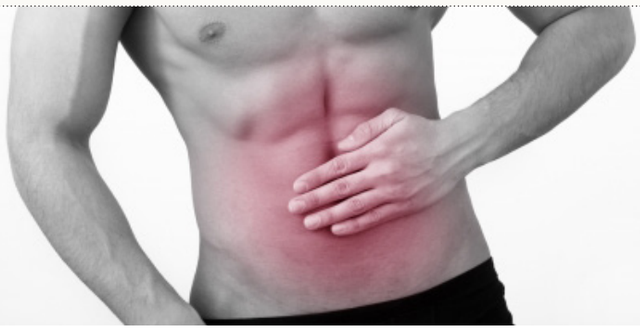
PEPTIC ULCER DISEASE

E Royston



Peptic ulcer disease.
General Surgery.

Abstract

A peptic ulcer is a breach in the mucosa of the gastrointestinal tract usually occurring in the stomach or duodenum. In the UK, infection with Helicobacter Pylori and use of NSAID's are the two most important causes. The common clinical features of peptic ulcer disease include epigastric pain, which may be precipitated by eating in gastric ulceration, or nocturnal. Over the past few decades with the advent of Histamine H_2-receptor antagonists, Proton-pump inhibitors, Cyclo-Oxygenase-2 selective anti-inflammatory drugs, and eradication of Helicobacter Pylori infection, the incidence of peptic ulcer disease and its complications has decreased(1). Elective surgical management of peptic ulcer disease is now infrequently required, but occasionally has a role in select patients. The commonest surgical emergencies in peptic ulcer disease are bleeding and perforation. In this review, the epidemiology, aetiology, pathogenesis and diagnosis of peptic ulcer disease is briefly outlined followed by a description of role of surgery in peptic ulcer disease.

KEYWORDS: peptic ulcer, perforation, H. pylori

Case study

A 56 year old man is referred to an upper gastrointestinal surgeon in outpatients clinic with complaints of post prandial epigastric pain radiating to his back. He takes regular Lansoprazole and its relieving effects have reduced over the last few weeks. He takes regular NSAIDs for arthritis and drinks four to six units of alcohol daily. Gastroscopy was performed showing a gastric ulcer, which was of benign aetiology and CLO positive. He was prescribed an eradication course of Amoxicillin and Metronidazole.

A month later he was admitted to hospital with severe epigastric pain and was haemodynamically unstable requiring a blood transfusion. An urgent gastroscopy showed an ulcer in a similar position showing stigmata of recent bleeding which was injected with adrenaline. He maintained his haemoglobin and was given a further course of H.pylori eradication therapy.

He clinically improved over the next three months and a check endoscopy showed a healed ulcer.

Epidemiology

It is estimated that up to 40% of the adult population suffer from dyspepsia in any one year(2). Gastric and duodenal ulcers account for approximately 15-25% of dyspepsia symptoms. Despite advances, peptic ulceration remains an important clinical problem largely because of the increasingly widespread use of non-steroidal anti-inflammatory drugs (NSAIDs) including low-dose Aspirin.

Although the prevalence of uncomplicated peptic ulcers is falling, hospital admissions for ulcer complications associated with NSAIDs are rising(3). The commonest ulcer complication is bleeding which accounts for approximately 70% admissions, although ulcer perforation has the highest mortality at around 15%(3). Both gastric and duodenal ulceration are commoner in men (M:F 3:1 and 5:1 respectively), but the difference is becoming narrower.

Pathogenesis

Traditionally ulcer formation has been put down to excess acid production associated with alcohol, smoking and high stress lifestyle. The discovery Of H-Pylori in the 1980s redefined the pathogenesis of peptic ulcers. It is now clear that infection of the gastric mucosa with H. Pylori is responsible for most of the observed changes in gastric acid secretion observed in peptic ulcers(4). Combined with impaired gastric protection associated with widespread use of NSAIDs, this is the major cause of peptic ulceration.

H. Pylori is a Gram negative spirochete bacteria which causes chronic, indolent inflammation by several mechanisms. H. Pylori can damage the mucosal defence system by reducing the thickness of the mucus gel layer, diminishing mucosal blood flow, and interacting with the gastric epithelium increasing acid secretion. See Figure 1.

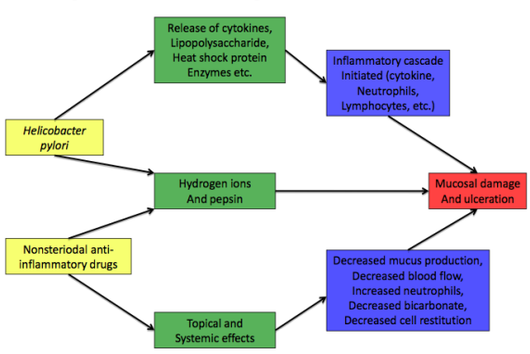


Figure 1: pathogenesis of pud.

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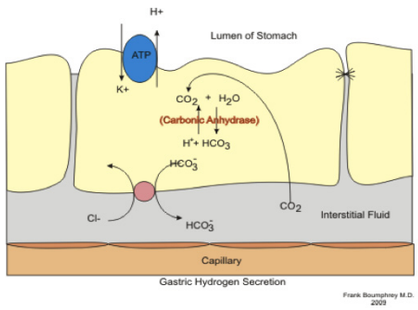


Figure 2: Pathophysiology of acid secretion.

NSAIDs are not only anti-inflammatory agents but also antipyretic, analgesic and anti-platelet agents. Unfortunately NSAIDs are associated with significant morbidity and mortality through the injuries they cause to gastric mucosa. They are known to cause topical mucosal injury but most significant is the post-absorptive effect of inhibition of GI mucosal Cyclooxygenase (COX) activity. Traditional NSAIDs are non-selective, inhibiting both COX-1 and COX-2. Controlled trials with COX-2 selective inhibitors (Coxibs) have demonstrated a reduction in risk of clinical peptic ulcers and their complications, although their use is still associated with higher risk of peptic ulceration when compared with placebo(5). The presence of H.Pylori infection increases the risk of upper gastrointestinal complications in NSAID users by two to fourfold, suggesting that all patients requiring regular non-steroidal anti-inflammatory drug therapy be tested for H.Pylori(6).

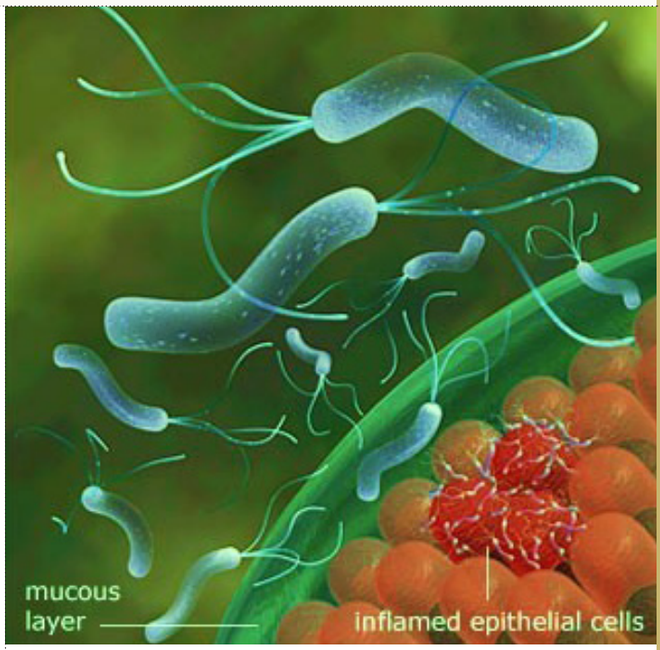
Whilst they are not major causes of PUD, the weight of evidence is that there is a causal relationship between both smoking and alcohol and the development of PUD (7-9). There is no convincing data that specific foods cause or perpetuate peptic ulcers(10). Other less common causes of ulcers include stress ulcers in hospitalised patients, other drugs including Bisphosphonates and Spironolactone, and secondary acid hypersecretory states as seen with Gastrinomas (Zollinger Ellison syndrome).

Clinical presentation of ulcers

Common presenting symptoms associated with ulcers include pain (post-prandial or hunger pain) and nausea which may be accompanied by vomiting, weight loss and later anaemia. Peptic ulcer disease can also be asymptomatic particularly in the elderly population, those with previous history of PUD, current smokers and those with a high BMI(11).

Conservative Management

Patients are initially medically managed in primary care. Persistent symptoms or suspicions of malignancy are then referred for specialist management. A gastroscopy is the mainstay of investigation focusing upon biopsies and testing for Helicobacter pylor. See figure 5. The development of potent anti-secretory agents (H2 blockers and proton pump inhibitors) and the treatment for Helicobacter pylori infection can eliminate most ulcer recurrences have essentially obviated the need for surgery in the elective treatment of this disorder (12).



Elective surgery

Elective surgery for peptic ulcers is based upon the reduction of acid secretion. FIGURE 1 shows physiology of acid secretion. Surgical approaches are based on interfering with these pathways in a variety of ways including vagotomy, antrumectomy and gastric resection. Surgical intervention also allows resection of non healing ulcers and multiple biopsies if malignancy is suspected.

Vagotomy terminates cholinergic stimulation of acid secretion and also inhibits the release of gastrin however this is at the expense of gastric motility. Antrectomy (resection of the gastric antrum) was until recently, among the most commonly performed procedures for duodenal ulcer disease. The simultaneous effects of vagotomy and antrectomy remove both the cholinergic and gastrin stimulus to acid secretion.

Gastric resection is occasionally performed in cases of gastric ulcer and distal gastric malignancies. The distal two-thirds of the stomach (body and antrum containing parietal and G cells), including the pylorus, is removed. The stomach remnant is anastomosed either to the duodenum known as Billroth I reconstruction. Or to the jejunum distal to the ligament of Treitz known as Billroth II reconstruction, see Figure 3. Roux-en-Y reconstruction can be performed to divert the bile away from the remnant, although this requires an additional anastomosis.

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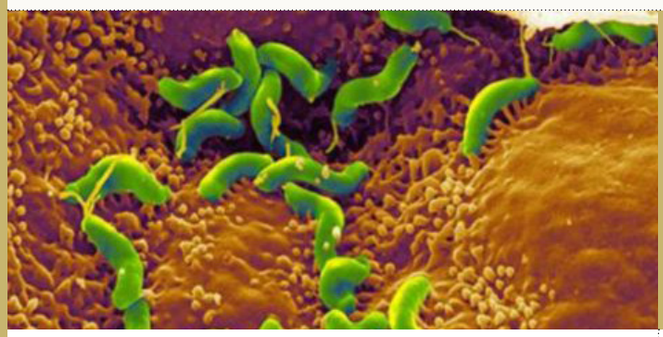

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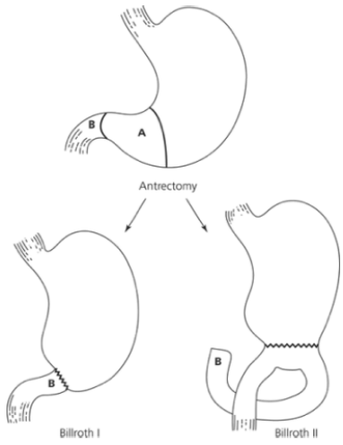

Figure 3: Gastric resection and reconstruction.

Elective surgery is associated with significant post-operative morbidity and a decision to operate accepts that the morbidity of ulcer disease is replaced by the morbidity of the operation. Post gastrectomy syndromes include post prandial diarrhoea, dumping syndrome, alkali reflux gastritis, early satiety and afferent/efferent loop syndromes(13). Approximately 20-30% patients will suffer from post-prandial diarrhoea or dumping syndrome, and although this may be transient it will be chronic and debilitating in around 5% of patients (14).

Emergency surgery in peptic ulcer disease

The commonest surgical emergency in PUD is uncontrolled bleeding. In the US this accounts for approximately 70% of emergency admissions followed by perforation(3). Mortality from ulcer complications remains high particularly in perforation. The decrease in hospitalisation from PUD means that surgeons are relatively less experienced in performing procedures required to manage these emergencies(15). Early surgical referral of patients developing ulcer complications cannot be overemphasised. If surgery is appropriate, it should not be delayed once the patient is appropriately resuscitated.

Bleeding ulcers

Hematemesis and/or melena are the common presenting signs of upper GI bleeding which is commonly from gastroduodenal or right/left gastric arteries. Rapid evaluation of hemodynamic stability in these patients and initiation of appropriate fluid resuscitation is the vital first step in management. Most patients with bleeding ulcers can be managed medically with fluids, PPIs and endoscopic intervention.

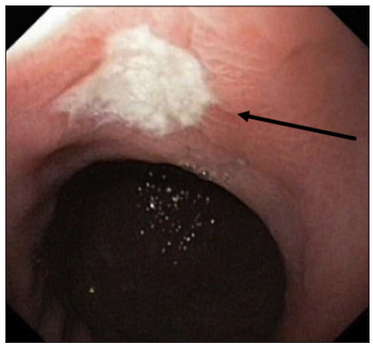

Figure 4 – Benign ulcer at the gastric body

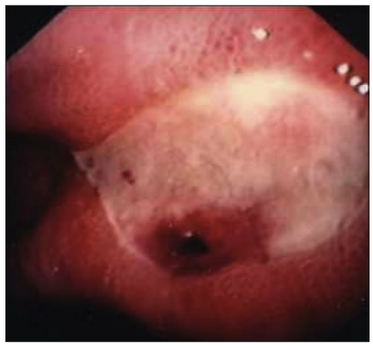

Figure 5: Adherent clot on the ulcer surface indicating high risk of rebleeding.

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Endoscopy

Upper GI endoscopy is the investigation of choice for acute upper GI bleeding as it allows both diagnosis and treatment of a bleeding point(16). Once a bleeding lesion has been identified, findings may be described using the Forrest classification see Table 1 (17). Endoscopic therapies to arrest bleeding include contact thermal devices, endoclips, argon plasma coagulation, fibrin sealants and adrenaline injections. See Figures 6 and 7.

Acute haemorrhage	
Forrest 1a	Arterial, spurting haemorrhage (80-90%)
Forrest 1b	Oozing haemorrhage (10-30%)
Signs of recent haemorrhage	
Forrest 2a	Visible vessel (50-60%)
Forrest 2b	Adherent clot (25-35%)
Forrest 2c	Haematin-covered lesion (0-8%)
Lesions without active bleeding	
Forrest 3	No sign of recent haemorrhage (0-12%)

Table 1: Forrest classification of upper gastrointestinal haemorrhage

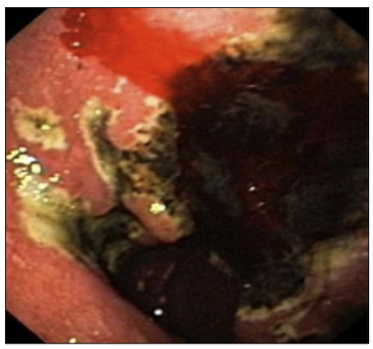

Figure 6: Actively bleeding duodenal ulcer

The International Consensus Upper Gastrointestinal Bleeding Conference Group recommended that all patients with UGI bleeds be risk stratified using a combination of endoscopic, clinical and laboratory information(18). Two commonly used risk scoring tools include the Rockall score and Glasgow Blatchford scores, see Table 2(19, 20).

Variable	0	1	2	3
Age	<60	60-79	>80	
Shock	Normal BP and PR	PR >100 Normal BP	BP< 100 sys PR> 100	
Comorbidities	Nil major		CHF, IHD, any other major	Renal/Liver failure, malignancy
Diagnosis	MWT, no lesion, no SRH	All others	Malignancy	
Hemorrhage stigmata	None of dark spot		Blood in UGIT, adherent clot, spurting vessel	

Table 2: The Rockall Score. Mild <3, Moderate 3-8, Severe >8

A meta-analysis in 2010 showed factors associated with re-bleeding include(21):

- Hemodynamic instability (systolic blood pressure less than 100 mmHg, heart rate greater than 100 beats per minute)
- Haemoglobin less than 10
- Active bleeding at the time of endoscopy
- Large ulcer size (greater than 1 to 3 cm in various studies)
- Ulcer location (posterior duodenal or high lesser gastric curvature)

Surgey for bleeding ulcers

Failure to stop the bleeding by endoscopy is the most important indication for emergency surgery. Other indications for surgery for a bleeding ulcer include;

1. Hemodynamic instability despite massive transfusion

2. Recurrent haemorrhage after a second attempt at endoscopic haemostasis. (Repeat endoscopy is a controversial area but a RCT comparing repeat endoscopy with surgery showed a second attempt at endoscopy has a reasonable chance of success and lower risk than surgery (22))

3. Giant ulcers >2cm diameter

For patients at high risk for surgery, radiological embolisation of the bleeding vessel is an alternative procedure. Guidance from the American college of radiology states that while both surgery and radiological intervention can be equally effective, embolisation is less likely to be effective in patients with coagulation disorders(23).

Surgical procedures for bleeding ulcers can be classified as either minimal or definitive. Under-running the ulcer, ligating bleeding vessels, and ulcer plication would be considered minimal surgery whereas the latter includes vagotomy and pyloroplasty or gastrectomy (24). The weight of opinion is that emergency surgery should be limited to simply gaining haemostasis using minimal (damage limitation) surgery rather than definitive procedures for ulcer prevention(25).

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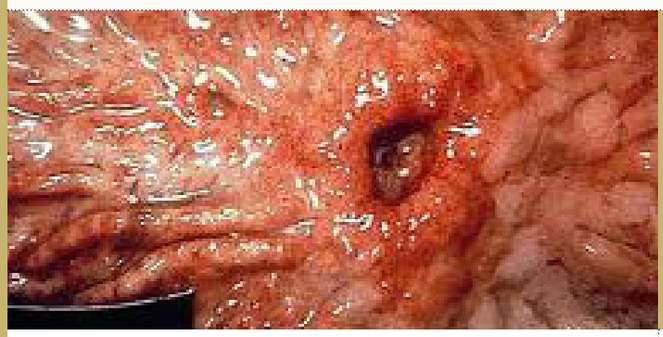

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Perforated ulcers

Abdominal pain is the commonest presenting symptom in ulcer perforation, and this should be suspected in patients with a history of ulcer disease who suddenly develop acute pain. The release of acidic digestive fluid into the peritoneal cavity may rapidly lead to the development of widespread peritonitis and shock if untreated. The severity of symptoms depends upon how much acidic fluid is released. Evidence shows that a delay in diagnosis and initiation of treatment of over 6 hours is associated with significantly worse outcome(26).

Investigation

The presence of free air is highly suggestive of perforated ulcer although 10 to 20% of patients with a perforation will not have free air visible on pre-op imaging(27).

- Plain X-ray is the first line investigation of choice. If free air is detected then no further imaging is required(27).

- CT is the second line investigation if the x-ray shows no free air and perforation is clinically suspected. Water soluble contrast should be used. In addition to free air, perforation may be suggested by free fluid, fat stranding, or contrast extravasation.

- A Contrast study is useful if a CT is not available. A gastroduodenogram using water soluble contrast (Gastrografin) will detect most perforations, however absence of a leak does not exclude a perforation which may have been walled off (28).

Management

In addition to adequate resuscitation, initial management of perforated ulcers includes insertion of NG tube, intravenous PPI therapy and broad spectrum antibiotics. Antibiotics should principally provide cover against the gram negative rods and anaerobes found in the GI tract. Co-Amoxiclav or a Cephalosporin and Metronidazole would be reasonable choices but antibiotics should be prescribed according to local protocols.

After initial management the important clinical decision is whether to operate. If the patient is stable or improving, medical management with close monitoring is reasonable due to the possibility of spontaneous sealing of the leak. If however the patient's status is deteriorating, urgent surgery is indicated.

Omental patching is the standard surgical procedure for perforated ulcers. It was first described in 1937, when Dr Graham of Toronto reported 51 cases of perforated duodenal ulcers successfully treated with an omental patch(29). A segment of omentum that will easily reach the perforation is positioned over the perforation and secured with several silk sutures tight enough to hold the omentum in place while avoiding omental necrosis.

Although omental patching was originally described for perforated duodenal ulcers, perforated gastric ulcers can also be repaired using this technique. Proximally located gastric ulcers are more likely to be malignant and should not be patch repaired if malignancy is suspected due to poor healing potential. For malignant ulcers, ideally a formal gastric resection should be performed if the patient is stable enough, although local ulcerectomy is acceptable in a less stable patient.

Patch repair can be performed as an open operation (commonly via upper midline incision) or laparoscopically. A meta-analysis in 2004 by H.Lau found that laparoscopic repair of perforated peptic ulcer conferred superior short-term benefits in terms of postoperative pain and wound morbidity. In patients without any of Boey's risk factors (major medical illness, preoperative shock, and longstanding perforation >24 hours (30)) it concluded a laparoscopic approach was as safe and effective as open repair(31).

Summary

Despite advances in ulcer prevention and medical treatment, ulcers are still a significant cause of morbidity. Infection with Helicobacter Pylori and use of NSAIDs are the two most important causes. The commonest surgical emergencies in peptic ulcer disease are bleeding and upper GI perforation. The decrease in hospitalisation from PUD means that the new generation of surgeons are relatively less experienced in performing procedures required to manage these emergencies. Adequate fluid resuscitation remains the vital step in acute management of ulcer complications, and any decision to operate should be made promptly to avoid increased morbidity.

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MCQs

True or false?

1) Regarding investigation and treatment of suspected perforated ulcers:
- Absence of free air on erect CXR rules out a perforation
- CT scan is a first line investigation
- A CT scan to confirm free air seen on an CXR is a useful investigation
- Free fluid and fat stranding on CT may be suggestive of perforation in the absence of free air

2) Indications for emergency surgery for bleeding ulcers include:
- Advanced age of patient
- Hemodynamic instability despite massive transfusion
- One failed attempt at endoscopic treatment
- Presence of a coagulation disorder

3) Regarding pathogenesis of peptic ulcers:
- Excessive consumption of hot drinks and spicy food is known to cause ulcers
- Smoking has no role in development of ulcers
- H.Pylori is a virus commonly associated with ulcer development
- Decreasing acid production is the key to treating and preventing ulcers

4) Medications useful in reducing the incidence of ulcer formation include:
- NSAIDs eg: Ibuprofen
- Aspirin
- Proton Pump Inhibitors eg: Omeprazole
- Histamine H2-receptor antagonists eg: Ranitidine

5) Regarding emergency surgery for perforated ulcers:
- Surgery is always indicated following confirmation of a perorated ulcer
- Prophylactic antibiotics should have good gram negative and anaerobic cover
- Patch repair is highly recommended for proximally located gastric ulcers
- Emergency surgery should always be performed with an open approach

Answers

1. F, F, F, T

Erect CXR is the first line investigation for suspected perorated ulcers. Free air, fat stranding, or contrast extravasation on CT may suggest perforation.

2. F, T, F, T

Massive transfusion in 12-24 hours increases the risk of developing coagulation disorders and is a poor prognostic sign. A second attempt at endoscopy has a reasonable chance of success and lower risk than surgery (22). Coagulation disorders should always be corrected prior to intervention.

3. F, F, F, F

H. pylori causes chronic, indolent inflammation by several mechanisms. The weight of evidence is that there is a causal relationship between both smoking and alcohol and the development of PUD (7-9). There is no convincing data that specific foods cause or perpetuate peptic ulcers(10).

4. F, F, T, T

Histamine H2-receptor antagonists and Proton pump inhibitors act to reduce acid secretion which is protective against development of ulcers. Unfortunately NSAID's and Aspirin are associated with significant morbidity and mortality through the injuries they cause to gastric mucosa.

5. F, T, F, F

After initial resuscitation, if the patient is stable or improving, medical management with close monitoring is reasonable due to the possibility of spontaneous sealing of the leak. If the patient's status is deteriorating, urgent surgery is indicated. Antibiotics should principally provide cover against the gram-negative rods and anaerobes found in the GI tract. Although omental patching was originally described for perforated duodenal ulcers, perforated gastric ulcers can also be repaired using this technique. Proximally located gastric ulcers are more likely to be malignant and should not be patch repaired if malignancy is suspected due to poor healing potential.

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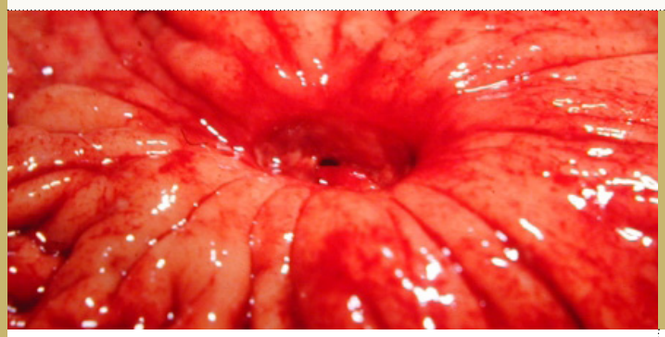

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HOW TO PERFORM MANIPULATION UNDER ANAESTHETIC AND INSERTION OF KIRSCHNER WIRES FOR PAEDIATRIC SUPRACONDYLAR FRACTURES

C Green

Abstract

Supracondylar fractures can be difficult to manage, due to their configuration, complication rate, and difficulty in achieving stability in some cases. Reduction is one of the key steps to ensure good outcome in displaced supracondylar fractures. Either a 'cross wire' configuration or lateral wire fixation can be used for stabilisation.

Keywords: supracondylar, K-wire, anterior interosseous nerve

Introduction

Operative intervention for supracondylar fractures of the humerus in children may be required in patients with a displaced fracture, and will be required in those with neurovascular injury. The previous article discusses the incidence, common mechanisms, and potential complications of this type of injury. This article aims to build on the topic of supracondylar fractures in children by discussing the steps of operative management of these injuries.

Pre-Operative Planning

Pre-operative planning is an essential step in the surgical treatment of any injury. A careful history and examination must be performed and documented, and appropriate Xrays need to have been performed to help you formulate a surgical strategy to treat the injury. Factors which will influence the management of an injury include the fracture pattern, extent of soft tissue injury, neurovascular status, and available equipment. Assessment for neurovascular injury is summarised in Table 1.

Nerve	How to Test
Median	Motor: Finger flexion Sensory: Index finger
Anterior Interosseous	Motor: "OK" sign
Radial (Superficial Branch)	Sensory: Dorsum of hand, web space between thumb and index finger
Radial (Deep Branch)	Observation: Wrist Drop Motor: Wrist dorsiflexion and finger extension
Ulnar	Motor: Finger abduction and adduction, wrist adduction Sensory: Little finger

Table 1: Neurological Examination of Peripheral Nerves of the Forearm and Hand.

Ensure that all members of the surgical team are aware of the plan for the operation with regards to anaesthetic, antibiotics, patient positioning, use of intra-operative radiology, and equipment required prior to the patient arriving in theatre.

Patient and Parent Counselling

You will need to consent the parents of the child in order to gain permission to proceed with the operation. You will need to inform them of how the procedure is performed, the benefits and risks of the operation, and alternative treatments.

The procedure you are consenting the parents for is "Manipulation under Anaesthetic (MUA) of the Supracondylar Fracture of the Humerus, plus or minus Kirschner wire (K-Wire) insertion, plus or minus Open Reduction". You will need to inform them that the fracture will initially require an attempt at closed reduction but if this fails or the fracture is unstable they may require insertion of percutaneous Kirschner wires to stabilise the fracture or open reduction and fracture site exploration if required. Open reduction and surgical exploration of the fracture site will most likely be required in the presence of neurovascular injury. If wires are inserted they will need to be removed approximately four weeks after the initial procedure, which for some children will require a second anaesthetic.

The aim of the procedure therefore is to reduce the fracture and stabilise it to encourage healing in an acceptable position. Benefits of the procedure therefore include the reduction of the fracture, prevention of deformity or growth disturbance, and stabilisation of an unstable fracture. Risks include stiffness, infection, neurovascular injury (especially a significant risk to the ulnar nerve) and mal- or non-union. To perform this procedure, the patient should be marked, consented and starved according to hospital protocol prior to arriving in theatre.

Theatre Setup

Prior to the operation you will need a theatre team which will consist of:

- **Surgeon**
- **Surgical Assistant**
- **Anaesthetist**
- **Anaesthetic Nurse**
- **Scrub Nurse**
- **Operating Department Practitioner (ODP)**
- **Radiographer**

Layout of the theatre requires enough space for the operating table, patient, staff, and equipment (Figure 1).

HOW TO PERFORM MANIPULATION UNDER ANAESTHETIC AND INSERTION OF KIRSCHNER WIRES FOR PAEDIATRIC SUPRACONDYLAR FRACTURES

C Green

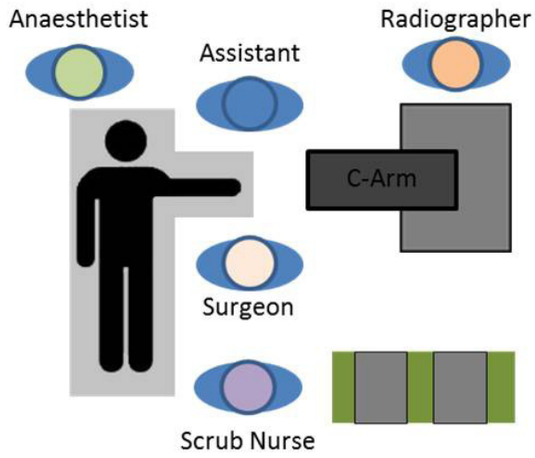

Figure 1: An example of Theatre set-up for Supracondylar Humerus fracture procedure.

The ideal set-up for the patient is for the patient to be in the supine position with the affected arm resting on the image intensifier or an armboard. The surgeon stands on one side of the arm with the scrub nurse by their side, and the assistant stands on the opposite side of the arm. The radiographer must be present at all stages of the procedure.

The Importance of Accurate Fracture Reduction

The most important factor in treatment of these fractures is obtaining adequate X-rays to determine satisfactory reduction of the fracture. During the procedure, the image intensifier can be moved to determine whether the fracture is reduced as opposed to moving the fractured humerus. Once reduction has been achieved, obtain an anteroposterior, lateral, and (if required) two oblique views to confirm the position of the fragments.

Reduction in the coronal plane is essential to prevent cubitus varus or valgus. Baumann's angle is measured using the anteroposterior (coronal plane) image to help assess the quality of reduction of the fracture (Figure 2). This is measured as the angle between the physis of the lateral condyle and the long axis of the humerus, and accurately predicts the "carrying angle" of the humerus once fixed. An acceptable range for Baumann's angle is 64-82 degrees (mean 73.6) in boys and 69-81 (mean 75.6) in girls (1). This should always be compared to the contralateral side; an increase of angle by more than 5 degrees is unacceptable and may lead to future deformity.

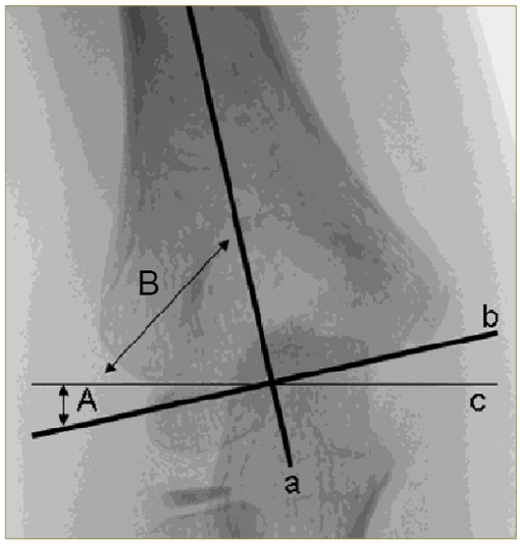

Figure 2 - Baumann's Angle. Key: a = Midline diaphysis of humeral shaft; b = Line perpendicular to midline; c = Line through physis of lateral condyle. Angle A is the original Baumann's angle. Angle B is now more commonly used.

How to Perform a Closed Reduction

First of all, ensure that the patient's details are correct and that all the staff and equipment necessary are present before manipulating. You will need:

- Image Intensifier and Lead Apron
- Sterile drapes
- Arm Tourniquet in case the fracture site needs open reduction or surgical exploration
- Trays: Soft tissue dissection and Wiring tray

Unless you are presented with a pale and pulseless limb attempt to manipulate the fracture prior to prepping and draping the patient. The bony landmarks may be difficult to define due to swelling but should be possible to do once the elbow is flexed. Compare the unaffected arm to define the desired elbow axes. Place the image intensifier underneath the injured arm of the patient and take initial images so that you know what the orientation of the fracture is.

By reducing the fracture, you are aiming to achieve anatomical reduction. This can be measured by the following:

- The radial epicondyle is located dorsally in relation to the medial condyle; this is to ensure that the distal fragment if not rotated prior to stabilisation.

HOW TO PERFORM MANIPULATION UNDER ANAESTHETIC AND INSERTION OF KIRSCHNER WIRES FOR PAEDIATRIC SUPRACONDYLAR FRACTURES

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· In the sagittal plane the trochlea and capitellum are in 30-40 flexion; if this angle is reduced then the child will lose a degree of elbow flexion once the fracture has healed.

· An equal Baumann's angle to the contralateral limb, usually approximately 73-76 degrees (1). If this is not corrected the patient may develop cubitus varus or valgus in future.

The reduction manoeuvre starts with gentle traction and counter-traction for at least one minute in order to free the proximal fragment from the anterior soft tissues. The aim is to restore length and then restore alignment. In Type II extension-type injuries without rotational deformity, the arm is placed in a hyper-extended position on traction and the forearm is supinated in an attempt to oppose the edges of both fragments. Counter-traction is provided by the assistant.

If you are finding this difficult, this may be due to the brachialis muscle being interposed at the level of the fracture site with the proximal fragment "button-holed" through it, therefore traction tightens the muscle around the fragment. To overcome this, grasp the proximal humerus and squeeze from proximal to distal in a sequential manner to "milk" the brachialis off the humerus (2). Avoid squeezing too hard on the medial aspect as this may damage the median nerve or brachial artery.

As you are applying traction, assess whether the distal fragment is displaced medially or laterally. Medial displacement suggests that the medial periosteum is intact, and likewise for lateral displacement. Hold on to the condylar fragment with your thumb and forefinger and manoeuvre it according to the following:

· Medial displacement is corrected by placing the forearm in pronation, apply a valgus force and laterally translate the condylar fragment. Maintain longitudinal traction throughout.

· Lateral displacement is corrected by placing the forearm in supination, apply a varus force and medially translating the condylar fragment. Maintain longitudinal traction throughout.

Once mediolateral displacement has been corrected, anteroposterior angulation and displacement of the fracture needs to be addressed. In extension-type injuries, the posterior periosteum is usually intact which is used to facilitate the reduction. Fractures in which the posterior periosteum is not intact (e.g. in some Type III fractures) are difficult to reduce in a closed manner. While maintaining traction on the forearm, flex the elbow to 120 degrees while pushing the distal fragment anteriorly and the proximal fragment posteriorly. This can be done by placing your thumb over the olecranon and pronating it while flexing the forearm. Now obtain X-rays of the elbow using the image intensifier in anteroposterior, lateral, and two oblique views to check the quality of the reduction. Keep the arm flexed at 120 degrees during Kirschner wire insertion as this is the most stable position for this fracture.

Adjuncts to Closed Reduction

If you are unable to reduce the fracture, an additional Kirschner wire can be used to assist with reduction. Tyler et al (2009) described a technique which used the Kirschner wire as a "joystick and traction pin". Make a 2cm incision over the medial epicondyle with the elbow extended and deepen the incision to the bone, identifying and preserving the ulnar nerve. Pass a 2mm Kirschner wire (or 1.6mm wire in small children) from medial to lateral under X-ray control, passing through the trochlea and capitellum, and through the skin of the lateral aspect of the elbow. Traction and rotation is then applied to reduce the fracture, and this wire is removed once the fracture is stabilised (3). An advantage of this technique is that the same 2cm incision can be used to insert a medial Kirschner wire through the fracture site after reduction; however as with any medial incision the ulnar nerve must be adequately protected to prevent injury to this structure.

Inserting Kirschner Wires to Stabilise a Supracondylar Fracture

Kirschner wire stabilisation is indicated in unstable supracondylar fractures. The insertion of two Kirschner wires is usually sufficient to maintain stability of the fracture. Wires are inserted either as two divergent wires into the lateral aspect of the distal humerus, or using one medial and one lateral wire or "cross-wires" (Figures 3 and 4). Although "cross-wires" are biomechanically more stable, insertion of wires into the medial aspect of the distal humerus is associated with a higher incidence of iatrogenic ulnar nerve injury and requires a mini-open incision to locate and protect the ulnar nerve prior to wire insertion. Skaggs et al (2001) found that the use of "cross wires" or two convergent Kirschner wires has no bearing on the final outcome (4).

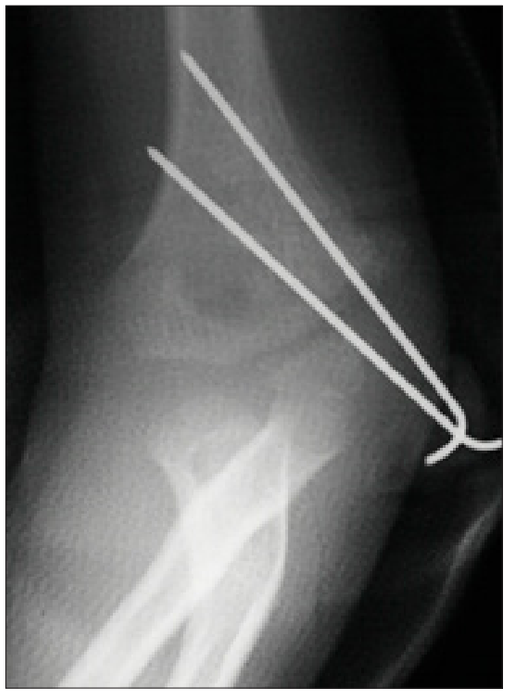

Figure 3: Lateral wire fixation of a Supracondylar Humerus fracture.

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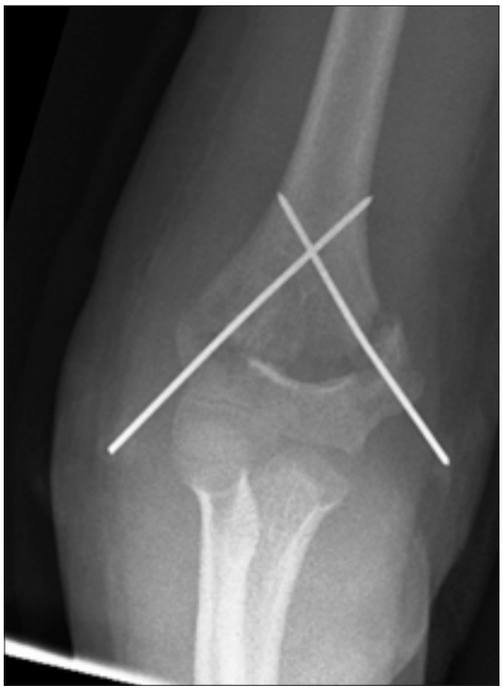

Figure 4: "Cross-wire" configuration for stabilisation of supracondylar fracture.

Determine the path of wire insertion by holding the elbow flexed at 120 degrees over the C-arm and hold a wire to the elbow. The first wire is inserted with the elbow flexed and held in pronation or supination according to the fracture pattern.

Wires inserted from the lateral aspect of the humerus should be inserted through the centre of the lateral condyle and directed at 30° to the long axis of the humerus. Mark the point of insertion once you have confirmed the entry point and make a stab incision using a scalpel to prevent damage to the soft tissues on wire insertion. Wires inserted through the medial aspect should follow a "mini-open" incision through which the ulnar nerve is identified and protected prior to insertion of the wire, and the wires are inserted through the medial epicondyle and directed anterolaterally. The ulnar nerve is isolated prior to Kirschner wire insertion as there is a 7.7-15% risk of injuring the nerve by inserting the wire percutaneously, especially when the elbow is hyperflexed (4, 5).

Open Reduction

This is required in the event of neurovascular compromise to the injured limb, or if closed reduction is unsuccessful which occurs in approximately 10-20% of all type III fractures (2, 6). A variety of surgical approaches have been advocated in the literature, for example the posterior, posteromedial and anterior approaches. A further procedure in which two incisions, one medial and one lateral, are made to explore the fracture site and which Kirschner wires can be inserted under direct vision whilst avoiding important structures such as the ulnar nerve on the medial aspect of the elbow. The posterolateral approach should be avoided as this may damage the vascularity to the elbow, supplied by the posteriorly located vessels.

A standard surgical approach is the posterior approach to the elbow joint. Small patients are placed in a supine position with the affected arm laid across their chest, and larger children can be placed in a lateral position with a support underneath the proximal humerus. All children will require a tourniquet. A midline incision along the posterior aspect of the upper arm is made, ending just medial to the tip of the olecranon. Dissection continues to the triceps. Identify and protect the ulnar nerve, which arises from between the long and medial heads of the triceps and lies posteriorly to the medial epicondyle. Options for continued dissection to the elbow joint include the Triceps splitting approach or the Triceps turndown (7). Following dissection, reduce the fracture and insert wires percutaneously under direct vision. Repair the wound in layers. Place the affected arm in an above-elbow cast for 3 weeks, remove the wires at this point and allow mobilisation of the elbow joint.

Another approach is the anterior cubital approach which can be used for exploration of the brachial artery, median nerve and brachialis muscle. The patient is placed in the supine position. A transverse incision is made across the antecubital fossa and bluntly dissecting the subcutaneous tissue to expose the brachialis muscle and anteromedial neurovascular bundle. Fracture haematoma is cleared and the deep tissues are inspected for damage (8). According to Ay et al (2005) the brachialis muscle was penetrated by the proximal humerus in 90% of Type III extension-type fractures, and "button-holed" in half of these cases. The fracture is then reduced and fixed.

Post-Operative Management

Ensure that intra-operative X-rays are taken to confirm reduction and fixation. The patient is then usually placed in an above-elbow backslab to protect the elbow and fixation. Once the patient returns to the ward you must ensure that the patient is reviewed to assess the neurovascular status of the injured limb. Test all nerves as before (Table 1) and compare the radial pulses of the injured and unaffected limb, and document all findings. Only allow the patient home if findings are normal.

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The "pink and pulseless", or "white and pulseless" limbs can occur even after surgical exploration and fixation. If there is any obvious threat to the peripheral circulation of the affected limb, exploration of the fracture site using an anterior approach is required. The management of the pink, pulseless hand is more controversial. Although several papers in the literature advocate an early surgical exploration especially in the presence of neurological deficit, with others advocating close observation. A review by Robb (2009) concluded that it is reasonable to observe patients with a pink, pulseless arm after surgical fixation for 24-48 hours and surgically explore the fracture if signs of worsening ischaemia develop, for example a new neurological symptom, increasing pain, or development of a pale hand (9).

Kirschner wires are usually left in situ for a total of four weeks. Ensure that the patient has appropriate follow-up according to local protocols; one example would be to review the patient at two weeks for removal of sutures and check X-ray, and at four weeks for removal of cast and wires and to encourage mobilisation to prevent stiffness of the elbow.

Summary

Supracondylar fractures can be difficult to manage, due to their configuration, complication rate, and difficulty in achieving stability in some cases. When it comes to operative management, ensure that the procedure is planned appropriately. Review the patient and their X-rays, formulate a surgical strategy, and ensure you have everything you need to hand. Although the supracondylar fracture can be difficult to treat, good results will be achieved with timely and appropriate management.

MCQs

1) Which of the following is not a recognised risk of reducing and fixing a supracondylar fracture of the humerus?

a. Injury to the radial artery
b. Injury to the ulnar nerve
c. Mal-union of the fracture
d. Injury to the median nerve
e. Stiffness of the elbow joint

2) Which of the following is not required in theatre when the operation is taking place?

a. Operating department practitioner
b. Runner
c. Radiographer
d. Recovery nurse
e. Scrub nurse

3) The following is correct with regards to the Baumann's Angle

a. This is the angle between the physis of the lateral condyle and the long axis of the humerus
b. This measures the carrying angle of the humerus
c. Baumann's angle is measured using X-rays taken in the anteroposterior plane
d. An increased angle of more than 5 degrees to the contralateral arm shows that reduction is unacceptable
e. Baumann's angle is higher in girls than boys

4) Which of the following structures are not at risk of damage with an open anterior approach to the elbow joint?

a. Brachialis muscle
b. Median Nerve
c. Brachial Artery
d. Ulnar nerve
e. Anterior Interosseous Nerve

5) Which of the following steps in the reduction manoeuvre for extension-type supracondylar fractures is incorrect?

a. Traction and counter-traction is placed on the arm for at least one minute.
b. Traction is applied with the arm in extension
c. Medial displacement of the distal fragment is corrected by forearm supination, applying a valgus force and laterally translating the fragment
d. If reduction is difficult, attempt to "milk" the brachialis muscle off the proximal fragment
e. Place your thumb over the olecranon and pronating it while flexing the forearm to 120 to force the distal fragment anteriorly

Answers to the MCQs

1) a) Injury to the Radial Artery

The brachial artery is susceptible to injury at this level of the arm, with the radial artery (a branch of the brachial artery) being too distal to the fracture site to be injured. All of the other complications listed have been documented to occur, along with radial nerve injury, ischaemic contractures of the forearm musculature, and heterotopic ossification.

2) d) Recovery Nurse

It is essential that the surgeon, assistant, scrub nurse, radiographer and anaesthetist are required in theatre during the operation. An operating department practitioner (ODP) is required to help with patient positioning and obtain further equipment if required. A recovery nurse is not usually required in theatre but it is essential that they are present and available for the immediate post-operative care of the patient.

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3) e) Baumann's angle is higher in girls than boys

An acceptable range for Baumann's angle is 64-82 degrees (mean 73.6) in boys and 69-81 (mean 75.6) in girls. These results are not significant. All other answers are correct.

4) d) Ulnar Nerve

The ulnar nerve is not usually at risk with this approach as it passes posterior to the medial epicondyle, but the fracture site must always be explored carefully. It is however at risk of damage from percutaneous Kirschner wire insertion unless a "mini-open" technique is employed. All other structures are at potential risk of damage with this surgical approach.

5) c) Medial displacement of the distal fragment is corrected by forearm supination, applying a valgus force and laterally translating the fragment.

After sustained traction and counter-traction in extension for at least one minute, the fracture is manipulated according to the type of fracture present. If the distal fragment is displaced medially, it is corrected by forearm pronation, valgus force, and laterally manoeuvring the fragment. If laterally displaced, the forearm is supinated, a varus force is applied, and the fragment is medially translated. The elbow is then flexed to 120 with the forearm pronated to maintain position.

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PRACTICAL PROCEDURE: TRIGGER FINGER RELEASE

S Hassan and M Wiener

Practical Procedure: Trigger Finger Release.
Plastic & Reconstructive Surgery.

Abstract

Trigger finger is a common and debilitating condition encountered by hand surgeons. In this paper we identify the important features to aid diagnosis and describe one method of surgical correction. A series of extended matching questions at the end will help guide your knowledge of this condition.

Keywords: trigger finger, flexor tendon, annular pulleys

History and Pathology

In order to understand the pathological basis of trigger finger we must first consider basic tendon anatomy. We shall consider only the flexor tendons.

Each finger is supplied by a flexor digitorum superficialis (FDS) tendon which lies palmar to the profundus tendon until it enters the flexor sheath then splits into two slips which pass on each side of the profundus tendon and rejoin each other before inserting into the proximal half of the middle phalanx. The flexor digitorum profundus (FDP) tendon inserts into the base of distal phalanx. FDP produces flexion at the distal interphalangeal joint (DIPJ), proximal interphalangeal joint (PIPJ) and metacarpophalangeal joint (MPJ), whereas FDS only produces flexion at the PIPJ and MPJ. The thumb is different as it has only two phalanges and one long flexor tendon. Flexion at the interphalangeal joint (IPJ) and MPJ are produced by flexor pollicus longus, which inserts into the base of the distal phalanx. Flexion at the MPJ also occurs via the action of flexor pollicis brevis.

Within the digits and distal palm, the tendons are wrapped in a fibroosseous tendon sheath, the flexor sheath. Within this sheath, the tendons are covered in a thin layer of visceral synovium. The inside of the sheath is similarly lined (parietal synovium) and between the two layers is a space that contains synovial fluid. This provides a gliding surface and aids nutrient transfer. The flexor sheath contains distinct thickenings known as pulleys. The purpose of these pulleys is to prevent the tendon pulling away from the bone on flexion (bow-stringing). There are 2 types of pulley which we must consider, the annular pulleys, numbered A1 to A5, which are shaped like rings, and the cruciform pulleys, numbered C1 to C3, which are cross-shaped. The A1, A3 and A5 pulleys originate from palmar plates of the MPJ, PIPJ and DIPJ respectively, whilst the A2 and A4 pulleys originate from the periosteum of the proximal and middle phalanges respectively. C1 is located between the A2 and A3 pulleys, C2 between the A3 and A4 pulleys and C3 between A4 and A5 pulleys.

Trigger digit is a condition that occurs when there is mechanical impingement on the retinacular pulley system usually at the level of the metacarpal head, resulting in tendon entrapment. The patient complains of painful catching and popping of the flexor tendon as they attempt to flex and extend the digit. As the condition worsens, the finger may become locked in flexion requiring passive repositioning into the fully extended position. Trigger digit can be primary, congenital or associated with other medical conditions, such as diabetes, gout and rheumatoid arthritis. Careful clinical examination will usually allow the diagnosis of trigger digit to be made. The patient will often be able to demonstrate the digit locking and the manoeuvre that they perform to release it. A palpable nodule can sometimes be found by palpating the tendon and asking the patient to flex and extend the digit. We shall consider the management of primary trigger finger.

Non-operative

Conservative treatment with steroid injection and / or splintage is effective in the majority of cases of primary trigger finger. Up to 80% of cases can be treated in this way, although a small number of cases will recur. The technique of steroid injection is important because it must be performed so that the steroid is injected into the sheath rather than the tendon itself. Injection into the tendon can result in rupture. Most clinicians would perform steroid injection to a digit on no more than two occasions to reduce the risk of tendon rupture. Failure of conservative management is an indication for surgical division of the A1 pulley (trigger finger release).

Operative

Gaining Informed Consent

The complications of trigger finger release are rare but must be fully explained to the patient. These include infection, scarring, stiffness, nerve, vessel or tendon injury, bow-stringing of the flexor tendon, recurrent or persistent triggering and complex regional pain syndrome. It is possible to perform percutaneous trigger finger release using local anaesthesia and a 19-gauge needle. This should only be performed by an experienced hand surgeon. The procedure of open trigger finger release can be performed as a day case under local, regional, or general anaesthesia.

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Equipment Recommended

- Sterile field
- Arm table
- Loupe magnification preferable
- Arm tourniquet set to 100mmHg above systolic pressure
- Lead hand
- Standard surgical instrument set specific for hand surgery
- Bipolar diathermy

Positioning and Draping

Following anaesthesia, the patient is positioned supine with an arm tourniquet to reduce bleeding in the surgical field. The hand and arm should be prepped up to the position of the arm tourniquet. The arm is draped with the hand and distal forearm exposed.

Relevant Anaesthetic Points

With a regional block in situ, the patient will not be able to feel the tourniquet cuff inflated and should not experience any discomfort as a result. The regional block will wear off several hours after the operation has finished, so the patient must be counselled to protect the arm from accidental injury until the anaesthetic has worn off. If local anaesthesia and an arm tourniquet are used, the procedure should be performed within 10-15 minutes to avoid patient discomfort from the tourniquet. Local anaesthetic is the preferred method in our unit, as it allows the patient to actively flex the digit to ensure resolution of locking.

Procedure

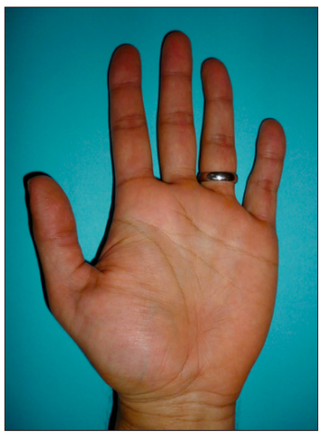

Figure 1: Volar aspect of hand. Note proximal and distal skin creases.

Surface landmarks identify the proximal end of the A1 pulley in each finger (see Figure 1). The proximal palmar crease corresponds to the A1 pulley in the index finger; the distal palmar crease corresponds to the A1 pulley in the ring and little finger, and a line midway between the two palmar creases overlies the A1 pulley of the middle finger (see Figure 2).

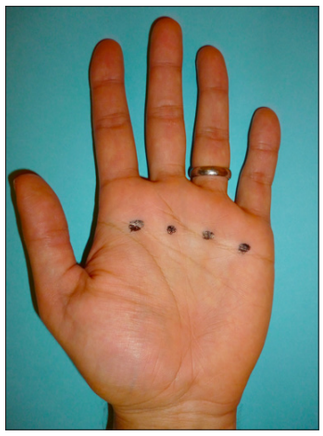

Figure 2: Ink dots mark approximate positions of proximal extent of A1 pulley in each ray. Note relationships with skin creases.

A short transverse incision of approximately 1cm at the appropriate site typically provides access to the A1 pulley (though some surgeons prefer oblique or zigzag incisions, as shown in Figure 3 – establish what is the preferred approach in your own unit). Placing the incision directly within the palmar crease itself may result in a painful scar and is best avoided.

Figure 3: Examples of planned incisions that might be used to approach the A1 pulley. Index ray: short transverse incision. Middle ray: oblique incision, which may be extended into a Bruner incision. Ring ray: zigzag incision.

A scalpel is used to incise skin and the palmar fascia until the underlying fat is exposed. Blunt dissection can then be used to identify and protect the digital nerves and vessels and expose the flexor sheath. The A1 pulley is identified and divided under direct vision with a scalpel. The finger should be flexed and extended to ensure that the tendon glides without restriction. Bleeding is cauterised using bipolar diathermy and the wound is closed with simple interrupted sutures. The hand is dressed with the digits free to mobilise, and post-operatively placed in a high arm sling to allow elevation.

PRACTICAL PROCEDURE: TRIGGER FINGER RELEASE

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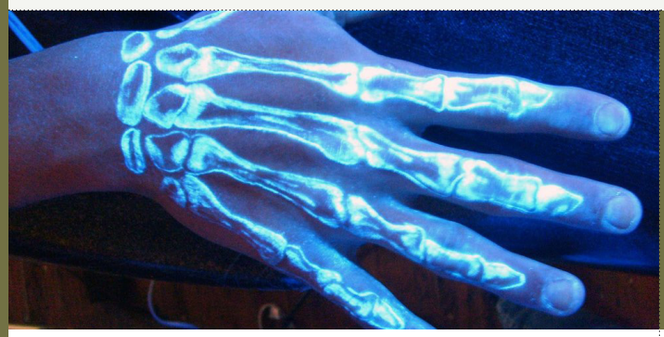

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The tourniquet can be released prior to wound closure or following dressings depending on the surgeon's preference. The total tourniquet time is recorded on the operation note.

Complications

A painful or tender scar is the most common complication of open trigger finger release. Bleeding and infection can occur. Inadvertent division of the A2 pulley can result in bow-stringing of the flexor tendons. Failure to identify and protect the digital nerves or vessels can result in accidental injury with neurovascular compromise. Recurrent triggering is rare but does occasionally occur. Complex regional pain syndrome can occur in any patient undergoing surgery to the hand.

Post-operative Management

The arm is elevated above the level of the heart for 48 hours. The patient is encouraged to mobilise the digits straight away. Simple analgesics should suffice for pain relief. Post-operative antibiotics are not routinely prescribed. A wound review should be arranged at approximately one-week following discharge.

Extended Matching Questions

1) The flexor digitorum profundus in the index finger attaches to the:

a) base of the proximal phalanx
b) base of the middle phalanx
c) base of the distal phalanx
d) volar plate of the middle phalanx
e) Cleland's ligament

2) The flexor digitorum superficialis in the index finger attaches to the:

a) base of the proximal phalanx
b) base of the middle phalanx
c) base of the distal phalanx
d) volar plate of the middle phalanx
e) Cleland's ligament

3) The A1 annular pulley of the middle finger can be located at the:

a) distal palmar crease
b) proximal palmar crease
c) inter thenar space
d) mid way between the distal and the proximal palmar creases
e) base of the proximal phalanx

4) The nerve supply of the flexor digitorum profundus to the ring finger is the:

a) radial nerve
b) median nerve
c) ulnar nerve
d) posterior interosseous nerve
e) anterior interosseous nerve

5) What is divided to release a trigger finger?

a) superficial palmar arch
b) palmar aponeurosis
c) annular pulley
d) cleland ligament
e) cruciform pulley

Answers

1) c 2) b 3) d 4) c 5) c

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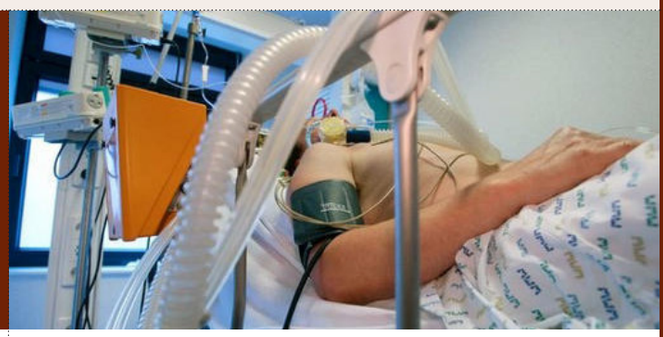
VENTILATION OF THE SURGICAL PATIENT

S Younie



Ventilation of The Surgical Patient.
Cardiothoracic & Critical Care.

Abstract

Mechanical ventilation is fundamental for general anaesthetics and plays a critical role in the management of respiratory failure in the surgical patient. Its use is becoming increasingly common outside the critical care environment and appreciation for its indications and the different therapies available is invaluable.

In this article we discuss invasive and non-invasive ventilation, when they are indicated and their merits. This article should provide a framework for the rationale behind different ventilation strategies and their use in specific surgical scenarios.

Keywords: ventilation, respiratory failure, CPAP

Clinical Vignette

A 63 year old male admitted for an emergency Abdominal Aortic Aneurysm repair 3 days ago has become increasingly dyspnoeic and is starting to desaturate in air. His arterial blood gas shows that he has a reduced PaO_2 of 10.4KPa. Post op pain was an issue and the patient had struggled to cough on day 2 post extubation, his chest X-ray reveals bibasal atelectasis.

He is started on continuous positive airway pressure (CPAP). His saturations improve to 99% and his PaO2 increases to 13KPa on 28% oxygen. Overnight the CPAP pressure is gradually increased to maintain oxygenation. The patient started to tire and became pyrexial, his $PaCO_2$ increased to 8KPa and he developed a respiratory acidosis. The patient was intubated and ventilated to support ventilation and allow suctioning of secretions. After 7 days his post-operative chest infection resolved and after weaning was extubated on day 10.

Non-Invasive Ventilation (NIV)

Non-Invasive Ventilation (NIV) can be applied at home or in high dependency settings and has become increasingly popular over the last twenty years(1). It offers ventilatory support without an invasive (Endotracheal) airway and is used for short-term reversal of acute respiratory failure(2) or chronic management of conditions such as Obstructive Sleep Apnoea and neuromuscular diseases affecting the respiratory system.

Application

A variety of interfaces can be used to provide NIV, most commonly as a tight fitting mask over the nose, mouth or head. Many of the ventilation modes used invasively can also be applied non-invasively; namely CPAP, Pressure Support Ventilation (PSV) and Bi-level Positive airway pressure (BiPAP).

Indications/Contraindications

NIV can be used to treat:

- Hypoxia
- Respiratory acidaemia
- Respiratory muscle weakness

The main contraindications specific to NIV are when immediate intubation is required to protect the patient's airway, they are summarised in table 1.

Contraindications	Complications
Respiratory arrest	Mask discomfort and skin abrasions
Respiratory failure secondary to reduced Conscious levels	Nasal congestion and dryness
Upper airway obstruction	Raised intracranial and intraocular pressure
Marked haemodynamic instability	Reduced blood pressure
Gastrointestinal bleeding	Gastric distension
	Aspiration pneumonia

Table 1

CPAP vs BIPAP

Continuous Positive Airway Pressure (CPAP) is applied throughout the respiratory cycle in patients with hypoxic respiratory failure (Type 1). Alveoli have a tendency to collapse and re-inflating collapsed areas of lung at the start of inspiration requires increased effort. CPAP prevents the alveoli from collapsing by a process called recruitment. CPAP improves oxygenation in 3 ways:

1. Recruitment improves oxygenation and reduces the work of breathing

2. Recruitment minimises intrapulmonary shunting of venous blood

3. Reduces the force of contraction required to empty the cardiac ventricles (afterload)

VENTILATION OF THE SURGICAL PATIENT

S Younie

Ventilation of The Surgical Patient.
Cardiothoracic & Critical Care.

Patients on Bi-level Positive Airways Pressure (BiPAP) ventilation cycle between two levels of Positive Airway Pressure, Inspired and Expired (IPAP and EPAP). EPAP has the same benefits as CPAP and, to augment inspiration, a higher Inspiratory Positive Airway Pressure (IPAP) is applied.

BiPAP is used in patients requiring ventilatory support where there is a respiratory acidosis secondary to hypercapnia alongside hypoxia (Type 2 respiratory failure). The mandatory rate can be adjusted to increase the removal of carbon dioxide and increase ventilation. BiPAP is useful in patients with chronic respiratory muscle weakness.

Use in Cardiogenic Pulmonary Oedema (CPO)

Respiratory failure secondary to Cardiogenic Pulmonary Oedema (CPO) is common and is effectively treated with NIV. The combination of pulmonary vascular congestion and interstitial alveolar oedema lead to hypoxaemic respiratory failure (Type 1), and eventually hypoxic and hypercapnic respiratory failure (Type 2) as patients tire.

NIV reduces the work of breathing, ventilation-perfusion mismatching and decreases ventricular afterload, improving cardiac output and symptoms in patients with volume overload. The positive intrathoracic pressure also re-distributes alveolar fluid to the interstitium of the lung and improves surfactant production and lung compliance.

CPAP is a first-line therapy in CPO patients with Type 1 and 2 respiratory failure, it reduces intubation rates, mortality rates and length of stay (3).

Post-operative respiratory failure

After surgery patients often develop basal alveolar collapse, in combination with poor cough, which predisposes them to post-operative acute respiratory failure.

They benefit from CPAP NIV, which reduces rates of re-intubation and improves oxygenation (4). Inspiratory support with BiPAP has some benefit in certain types of surgery, such as lung resection (5).

Use in Chronic Obstructive Pulmonary Disease

Reversible acute respiratory failure is commonly superimposed on COPD and NIV has well proven benefit in the management of Type 2 respiratory failure, leading to a reduction in mortality and rate of intubation(6).

Acute Lung Injury (ALI) and Acute Respiratory Distress Syndrome (ARDS)

ALI and ARDS reduce lung compliance and the associated inflammatory cascade reduces surfactant production, increasing the work of breathing. Whilst NIV reduces the rate of nosocomial infection (7) it has no proven impact on outcome in this patient group(8). Inappropriate use of NIV can in fact delay intubation and invasive mechanical ventilation, which is the definitive supportive treatment.

Sleep apnoea/hypoventilation syndromes

With the rise in obesity and diagnosis of Obstructive Sleep Apnoea (OSA) patients arriving for surgery with home NIV machines are becoming increasingly common. NIV is an important treatment modality for these patients (9,10).

Moderate or severe OSA leads to nocturnal episodic apnoea and hypoxia. This may present as daytime somnolescence, but can also lead to pulmonary and systemic hypertension and eventually heart failure. Nocturnal CPAP is proven to prevent these sequelae(9). General anaesthetic, sedatives and opioids will exaggerate symptoms and therefore CPAP should be available in the post-operative period. In some institutions these patients are observed overnight in critical care during the post-operative period.

Invasive Ventilation

History

Mechanical ventilation is now routine for patients under general anaesthesia or in critical care. The notion of positive pressure ventilation with use of an artificial airway was devised during the 1952 Copenhagen Poliomyelitis epidemic (11) and replaced the bulky negative pressure ventilators (“iron lungs”) in use at the time.

VENTILATION OF THE SURGICAL PATIENT

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Introduction

Conventionally invasive ventilation is the mode of respiratory support in critically ill patients with respiratory failure. Respiratory failure is caused by failure to oxygenate or ventilate. Failure to oxygenate is treated with supplemental oxygen and recruitment of alveoli with increased airway pressures to restore lung volumes. Failure to ventilate is characterised by a raised arterial carbon dioxide tension and is treated by increasing the rate and depth of breathing to increase the patient's alveolar ventilation.

Classification of Ventilators

Ventilators are used commonly in the operating theatre and in critical care. Operating theatre ventilators are relatively simple and are designed to deliver varying concentrations of oxygen, air and anaesthetic agents to patients.

Critical care ventilators support patients with respiratory failure to optimise gas exchange. They can support patients own respiratory efforts or provide full ventilation to facilitate weaning from the ventilator. There are 4 important variables that can be manipulated to offer respiratory support to critically ill patients:

1. Inspiratory control:

The amount of gas delivered during inspiration can be:

a) Volume controlled- flow ceases once the target volume is achieved
b) Pressure controlled- flow continues until a target pressure is achieved

2. Triggering is how the ventilator initiates inspiration. It can be set to a particular time depending on the desired breathing rate. Alternatively to allow patients to trigger their own breaths, ventilators detect changes in the pressure or flow of gas through the circuit and synchronise with the patient's own effort(12).

3. Cycling ends inspiration and starts expiration after a pre-set time or when the desired inspiratory volume has been achieved

4. Pattern

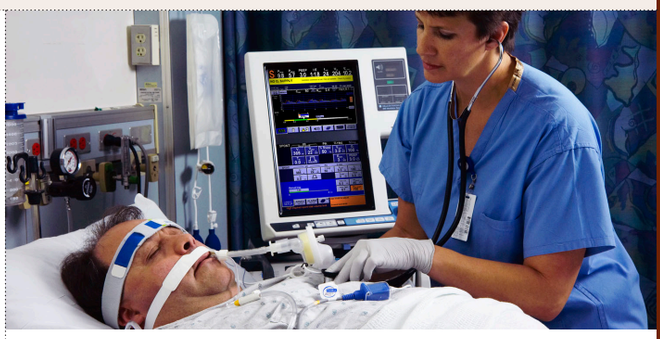
The ventilator can breathe for the patient in different ways:

a) Mandatory ventilation - in patients with no respiratory effort where the ventilator is the sole means of ventilation
b) Assisted ventilation - in patients that initiate breathing and trigger the ventilator, but need help to achieve sufficient gas exchange
c) Spontaneous - where no additional inspiratory support is needed

CPAP and PEEP

CPAP and PEEP are often used interchangeably in critical care. PEEP stands for Positive End Expiratory Pressure. CPAP is applied throughout the ventilation cycle to avoid collapse of the alveoli, however PEEP raises the pressure at the end of expiration and is used in intubated and ventilated patients.

CPAP can be used as the sole mode of inspiratory support in intubated patients with appropriate spontaneous ventilation to maintain recruitment without over distending and therefore damaging the alveoli.



Volume Controlled Ventilation

Volume-controlled mechanical ventilation is commonly used during operations as it enables delivery of accurate pre-set tidal volumes despite changes in the lung compliance during the operation (e.g. inflation of the abdomen during laparoscopic procedures).

Pressure Controlled Ventilation

Pressure-controlled mechanical ventilation maintains a pre-set fixed pressure throughout inspiration and because flow rate decreases throughout inspiration it can achieve the same tidal volumes as volume-controlled ventilation with lower peak pressures and therefore is used in patients that are difficult to ventilate. However the tidal volume achieved varies with lung compliance, so it is easy to over, or under-ventilate if lung compliance changes suddenly (e.g. inflation during laparoscopy). For this reason ventilation with this mode requires limits to be set on acceptable tidal volumes for the patient.

Patient-ventilator interaction

To facilitate weaning from invasive ventilation patient-ventilator interaction is required. There is a considerable difference between mandatory and spontaneous breaths. The patient is passive to pre-set ventilation parameters during mandatory ventilation, whereas a spontaneously breathing individual demands gas at a flow and rate of their own choosing. Assisted ventilation therefore requires a triggering device and a flow of gas to match the patient's peak inspiratory demand.

Synchronised Intermittent Mandatory Ventilation (SIMV) was developed to wean patients from mechanical ventilation. It allows patients to take spontaneous breaths from a separate low resistance circuit, without having to breathe through the resistance of the ventilator. The patient can breathe spontaneously while also receiving mandatory breaths if they are not meeting the target breathing rate. The number of mandatory breaths reduces as the patient's respiratory function improves.

Pressure Support Ventilation

Pressure support Ventilation is used to assist spontaneous breathing in ventilated patients and facilitate weaning. The amount of additional pressure support added to the patient's own effort is set above the PEEP to allow sufficient tidal volumes but prevent over inflation of the alveoli. Intubated patients require pressure support to breathe because an endotracheal tube offers far more resistance than our own upper airways (13).

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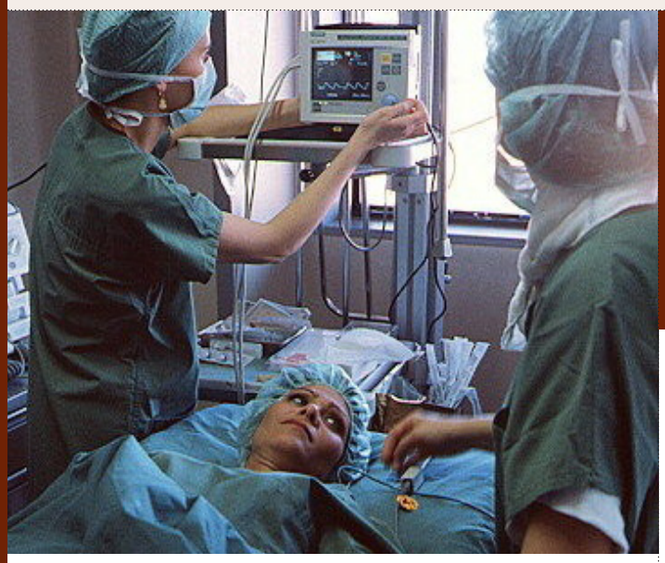

Biphasic Positive Airways Pressure (BiPAP)

Biphasic Positive Airways Pressure (BiPAP) achieves ventilation by cycling between two levels of airway pressure and if the patient triggers an inspiratory breath, pressure support can be added. This mode is well tolerated by patients and reduces the amount of sedation required to tolerate ventilation.

High Frequency Oscillator Ventilation (HFOV)

High Frequency Oscillator Ventilation (HFOV) is used when conventional ventilation has failed. It uses small tidal volumes at very high frequencies (100-300 breaths per minute) to maximise alveolar recruitment. The high mean airway pressures can lead to pneumothoraces and cause cardiovascular instability.

Extracorporeal Membrane Oxygenation (ECMO)

Ventilating patients for prolonged periods at high pressures causes lung damage (12). Unfortunately patients with Acute Lung Injury are most susceptible, but paradoxically require the most damaging ventilation settings due to their poor lung compliance. ECMO is reserved for patients refractory to conventional ventilation.

ECMO is a modified heart-bypass technology, where extracted blood is oxygenated and has carbon dioxide removed before returning to the circulation. This facilitates much lower ventilator pressures, allowing the lungs to recover.

Conclusion

Mechanical ventilation is essential for the treatment of respiratory failure. It can be delivered non-invasively in a variety of different settings and is becoming increasingly prevalent amongst surgical patients. Invasive ventilation is the mainstay of critical care ventilation and there are various settings that allow the patient to interact with the ventilator and facilitate weaning. Understanding these settings provides insight into the treatment of respiratory failure and will allows a more holistic view of critical care patient.

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MCQs

1. A patient that had a laparoscopic pancreatic necrosectomy 2 days ago is deteriorating on the high dependency unit. They are septic, have vomited twice in the last hour and appear more drowsy than earlier. Their arterial blood gas results on a non-re-breathable mask with 15L oxygen per minute are:

pH 7.26
Pa02 8.5 kPa
PaCO2 8.4 kPa
Base Excess -1.9
Bicarbonate 22.1 mmol/L

What is the immediate management?

a) Start CPAP and transfer to Intensive care for invasive monitoring
b) Start BiPAP and transfer to Intensive care for invasive monitoring
c) Prepare to intubate the patient
d) Organise an urgent CT scan
e) Insert a Nasogastric tube

2. A 47 year old patient with Obstructive Sleep Apnoea attends for Functional Endoscopic Sinus Surgery. They are on home CPAP, post-operatively they are finding their nasal CPAP uncomfortable. What is the best alternative:

a) Commence the patient on Non-rebreathable mask with 15 litres oxygen per minute to maintain oxygenation
b) Try nasal prongs as they may be better tolerated
c) Avoid oxygen because they may depend on hypoxic drive to breathe
d) Prescribe nocturnal sedation to allow them to get some rest
e) Change to face mask CPAP overnight

VENTILATION OF THE SURGICAL PATIENT

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3. Which of the following ventilation modes do not facilitate patient-ventilator interaction?

a) CPAP
b) Pressure support ventilation
c) BIPAP
d) HFOV
e) SIMV

4. Patient triggering:

a) Allows the patient to synchronise with the ventilator
b) Ends the inspiratory phase of breathing
c) Makes it harder to wean patients from the ventilator
d) Is possible with HFOV
e) Means the patient is ready to be extubated

5. Which of the following is not a complication of NIV:

a) Mask discomfort
b) Raised intraocular pressure
c) Gastric distension
d) Hypotension
e) Hypertension

Answers

1. c) This patient requires intubation to protect their airway as well as ventilatory support. They are likely to aspirate on NIV and it will only delay definitive management.

2. e) NIV is the only treatment that is appropriate to avoid apnoea overnight. These patients are often sensitive to opioids and they should be used with caution.

3. d) HFOV is very uncomfortable and requires high levels of sedation, the other modes all permit spontaneous patient breaths.

4. a) Triggering initiates inspiration and can be due to patient breaths allowing them to synchronise with the ventilator.

5. e) Hypertension is not related to CPAP, it often reduces blood pressure and treats hypertension associated with OSA. It can cause gastric distension, which is why nasogastric tubes should be used in patients requiring high inflation pressures.

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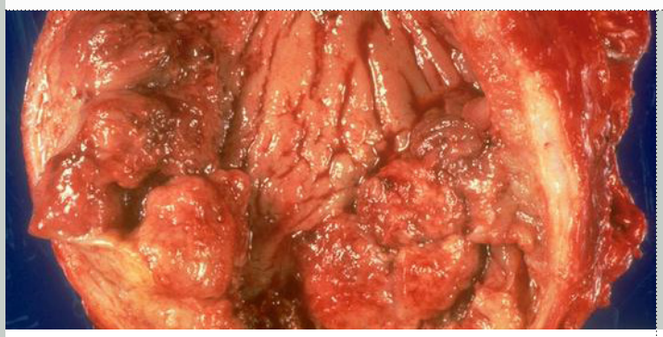
BLADDER CANCER: WHAT A SURGICAL TRAINEE SHOULD KNOW

A Gulamhusein



Bladder Cancer: what a surgical trainee should know. Urology.

Abstract

There are over 10,000 new cases of bladder cancer diagnosed every year in the UK. Urothelial carcinoma makes up 90% of bladder cancer cases. Significant risk factors include smoking, occupational exposure, male gender and increasing age. The most common presentation is that of painless visible haematuria followed by non-visible haematuria and a range of lower urinary tract symptoms. The mainstay of investigation comprises cystoscopy, renal tract imaging and tissue diagnosis. TNM staging and WHO grading is used to guide subsequent management options.

Superficial disease is treated with transurethral resection followed by intravesical chemotherapy. Within this group, those with histological high risk disease are offered radical cystectomy or intravesical immunotherapy if not fit for surgery. Patients with muscle invasive cancer are counselled with regards to radical treatment or best supportive care, the latter more relevant in advanced disease.

An understanding of diagnostic techniques and varied management options for bladder cancer is required. Of particular importance is the surgical trainees ability to identify presenting features necessitating further investigation.

Keywords: haematuria, cystoscopy, urothelial carcinoma

Case vignette

You are a CT1 in urology outpatients department. A 55 year old man has been referred to urology by his GP with painless visible haematuria. He is a smoker and otherwise normally fit and well. He denies any lower urinary tract symptoms, however describes an episode of urinary retention, which resolved spontaneously.

His renal function is normal and urinalysis showed no signs of infection. Examination of his abdomen, genitalia and prostate is unremarkable.

How would you investigate and manage this patient?

Epidemiology

In the UK, bladder cancer is the fourth most common cancer in males and eleventh in females, with over 10,000 new cases diagnosed every year (1). The estimated life-time risk of developing bladder cancer in the UK is approximately 1 in 40 for males and 1 in 108 for females (2). Bladder cancer is unusual in people below the age of 40 years, with the incidence rising steeply between age 40-60 years (3). At time of diagnosis approximately 70% of patients have disease confined to the mucosa or sub-mucosa (non-muscle invasive) and 30% with muscle invasive disease (4).

Aetiology

The bladder is a hollow, muscular viscus for storing urine situated in the lesser pelvis when empty. The ureters, bladder and superior urethra are lined with transitional epithelium. Over 90% of bladder cancers arise from this epithelium as urothelial carcinoma, previously known as transitional cell carcinoma (5). Squamous cell carcinoma followed by adenocarcinoma, are the next most common.

Risk Factors

- Tobacco smoking: There is a significant, well-established relationship between lifetime amount of tobacco smoking and the risk of bladder cancer. The incidence of bladder cancer in smokers is 2-5 times more than in non-smokers (3).
- Occupational exposure: Exposure to industrial carcinogens accounts for 20-25% of bladder cancer cases. Workers in rubber, dyes, plastics, leather and chemical industries are at particular risk.
- Age: Incidence rises dramatically after 40 years.
- Gender: Estimated male to female ratio for bladder cancer is 3.8-1.0. However, women are more likely to be diagnosed with primary muscle-invasive bladder cancer.
- Pelvic radiotherapy: With a long latent period, young patients receiving pelvic radiation should be followed up long term.
- Chronic bladder inflammation: Chronic urinary tract infections, bladder stones, long-term catheters and schistosomiasis. Bladder schistosomiasis (bilharzia) is associated with a five-fold risk of developing squamous cell carcinoma. It is the second most common parasitic infection after malaria (4).
- Drugs: Cyclophosphamide used for the treatment of lymphoproliferative diseases is a recognised cause of bladder cancer.

BLADDER CANCER: WHAT A SURGICAL TRAINEE SHOULD KNOW

A Gulamhusein

Classification

- Tumour, Node, Metastasis Classification (TNM) Figure 1, 2 (8)

TX	Primary tumour cannot be assessed
T0	No evidence of primary tumour
Ta	Non-invasive papillary carcinoma
Cis*	Carcinoma *in situ* (highly invasive/malignant potential)
T1	Tumour invades lamina propria
T2	Tumour invades muscularis propria T2a Tumour invades superficial muscle T2b Tumour invades deep muscle
T3	Tumour invades peri-vesical tissue T3a Microscopically T3b Macroscopically
T4	Tumour invades any of : prostate, uterus, vagina, pelvic wall, abdominal wall T4a Tumour invades prostate, uterus or vagina T4b Tumour invades pelvic wall or abdominal wall
NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1	Metastasis in a single lymph node 2 cm or less in greatest dimension
N2	Metastasis in a single lymph node between 2-5cm in greatest dimension, or multiple nodes <5 cm in greatest dimension
N3	Metastasis in a lymph node greater than 5 cm in greater dimension
MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

Figure 1

** CIS is a flat, high grade cancer confined to the mucosal layer. Although CIS is generally a precursor of cancer, in the bladder it is histologically explicitly malignant. At cystoscopy it appears red and velvety and is not always easily visualised (10).*

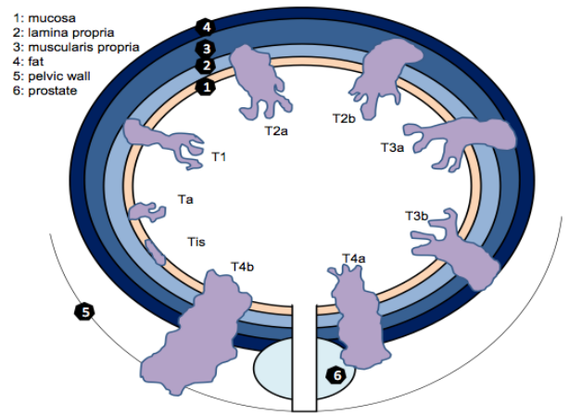


Figure 2: Tumour staging

- 1973 WHO Grading, Figure 3 (9)

Grade 1	Well differentiated
Grade 2	Moderately differentiated
Grade 3	Poorly differentiated

Figure 3

Presentation

The most common presenting symptom is painless visible haematuria (80-90% of cases) (10). 34% of patients over 50 years and 10% of patients under 50 years presenting with visible haematuria have bladder cancer (11). Non-visible haematuria is a better predictor of bladder cancer in the older patient.

Symptoms of dysuria, urgency or frequency are usually associated with urinary tract infection, however 20-30% of patients eventually diagnosed with bladder cancer suffer from these symptoms at presentation (4). Voiding difficulties are associated with more advanced bladder cancer. When these symptoms are atypical, persistent or refractory to antibiotic treatment a diagnosis of bladder cancer must be considered.

Patients with advanced disease may present with an abdominal mass, pain, anorexia, weight loss or lower limb swelling due to lymphatic or venous obstruction.

2 week referral guidelines (12):

- In patients of any age with painless visible haematuria.
- In patients who present with visible haematuria and symptoms of urinary tract infection, where infection is not confirmed.
- In patients aged 40 years and over who present with recurrent or persistent urinary tract infection associated with haematuria.
- In patients aged 50 years and over found to have unexplained non-visible haematuria.
- An abdominal mass thought to be arising from the urinary tract.

Diagnosis and Staging

Physical examination should include a complete abdominal examination with rectal and vaginal bimanual palpation. A pelvic mass can be apparent in patients with advanced disease.

Investigations

1. Urinalysis and urine microscopy and culture.

- Urine cytology: Examination of exfoliated cancer cells in voided urine or from cystoscopy and barbotage. Particularly useful in high-grade disease with 90% sensitivity in CIS detection (10). Without any treatment, approximately 54% of patients with CIS progress to muscle-invasive disease (13).

2. Imaging

- Ultrasonography: Non invasive and contrast free therefore frequently the initial modality of imaging used in primary assessment. It is useful in detecting renal hydronephrosis and masses in the bladder, however, a normal ultrasound does not exclude an intraluminal tumour.

BLADDER CANCER: WHAT A SURGICAL TRAINEE SHOULD KNOW

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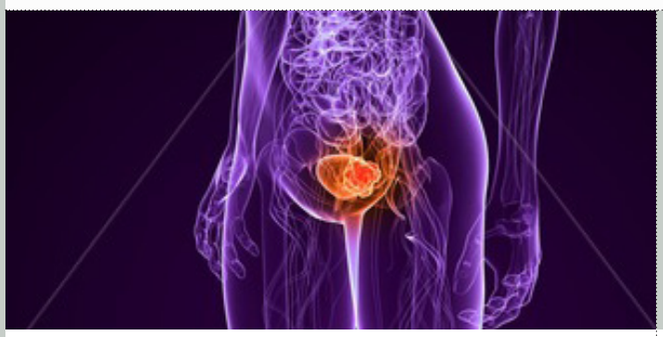
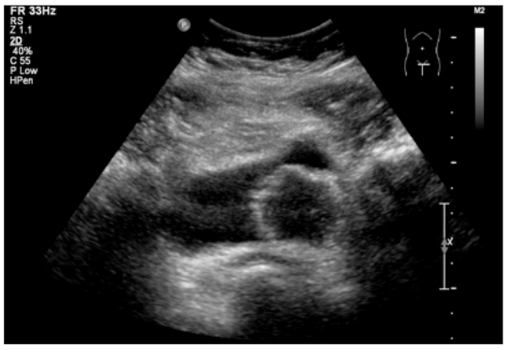


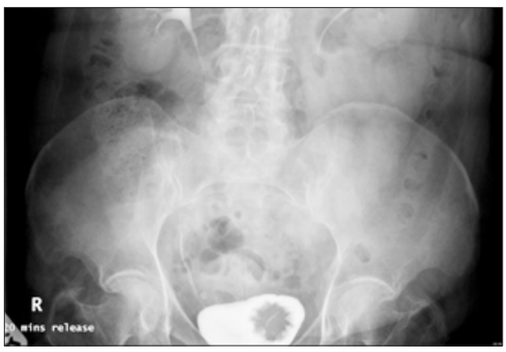
Bladder Cancer: what a surgical trainee should know.
Urology.



USS showing a bladder mass

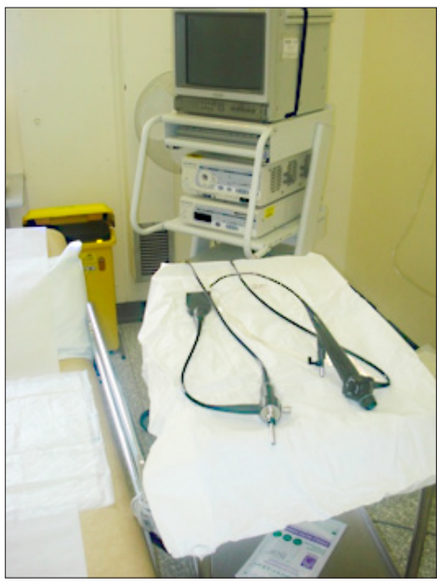
- Xray of Kidneys/Ureters/Bladder (KUB): Useful in checking for urinary calculi as a possible cause of haematuria. However sensitivity ranges from 44% to 77%, which is dependent on stone composition (14).

- Intravenous urography (IVU)/ Computed tomography urography (CTU): IVU is sensitive at demonstrating filling defects within the kidneys and ureters and therefore upper tract tumours. IVU and CTU are no longer performed as routine for detection of primary bladder cancer. The incidence of upper tract tumours increases in high grade disease. CTU is becoming more favourable as it also provides information on surrounding structures like lymph nodes and organs. Both are contrast studies, with CTU causing higher radiation exposure than IVU.



IVU showing bladder mass

3. Cystoscopy: Using a flexible instrument guided by white light is the gold standard diagnostic instrument. The site, size, number and appearance of the lesion is recorded, as well as any mucosal abnormalities (4). Fluorescence cystoscopy under blue/violet light is a new modality helpful in identifying tumour cells which fluoresce red. It is particularly effective in detecting CIS (15).



Flexible Cystoscope

4. Transurethral resection (TUR) of bladder tumour: The aim is to obtain a tissue diagnosis, therefore it is necessary to include bladder muscle in the resection margin. Small tumours (<1cm) can be resected en bloc. A second TUR should take place if the initial resection is incomplete or with high-grade, non-muscle-invasive or T1 tumours. Resection of larger tumours should comprise resection of the exophytic part, the underlying detrusor muscle and the resection edges in fractions. The subsequent pathological report should indicate the tumour grade, depth of invasion and whether sufficient lamina propria and muscle is present with specimen (10).

BLADDER CANCER: WHAT A SURGICAL TRAINEE SHOULD KNOW

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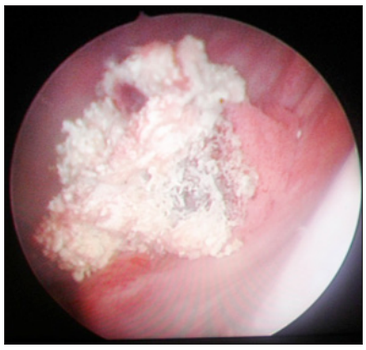


Bladder tumour as seen on cystoscopy

5. Random bladder and urethral biopsies: Particularly with multi focal or suspected CIS.

6. Staging imaging: In suspected muscle-invasive disease Magnetic Resonance Imaging (MRI) has been shown to be superior to CT in T staging bladder cancer (15).

Management

Management is coordinated by the multidisciplinary urological cancer team. Treatment strategies are based on the stages of disease below.

Superficial Disease	pTa/T1, Carcinoma *in situ* (CIS), N0/M0
Muscle-invasive Disease	T2/T3/T4, NX/N0/N1, M0
Advanced Disease (Metastatic)	N2/N3, M1, Any T

1. Superficial Disease:

a. Low risk (pTa G1/G2 and <3cm and solitary)

TUR of tumour followed by adjuvant chemotherapy. A single instillation of intravesical chemotherapy e.g. mitomycin-C administered within 6 hours of TUR has been found to reduce relative risk of recurrence by 39% in all risk groups (16). The chemotherapy is believed to eradicate any residual tumour from an incomplete resection or any circulating tumours cells that may re-implant. Common side-effects include dysuria, frequency and haematuria. Patients receive follow-up cystoscopy at 3 and 9 months then annually for 5 years with subsequent discharge if clear (15).

Preparation of Mitomycin-C

b. Intermediate risk (pTa G1/G2 and >3cm or multiple or recurring, pT1 G2 and <3cm and solitary)

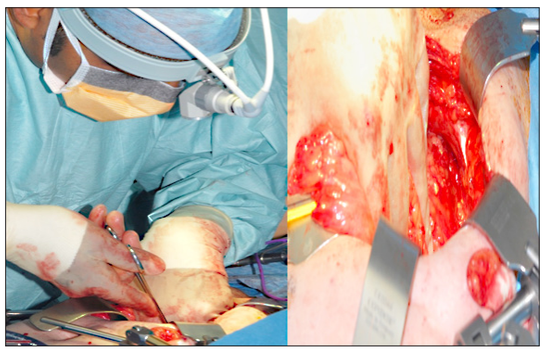
TUR and intravesical chemotherapy as above. Consider re-resection if TUR incomplete. Treatment as per high risk group if chemotherapy fails, otherwise regular cystoscopic follow-up.

c. High risk (pT1 G2 and >3cm or multiple or chemoresistant, pTa/T1 G3, CIS)

TUR and intravesical chemotherapy as above. Consider re-resection if G3 disease or if TUR incomplete. This group of patients are at a high risk of recurrence or progression to muscle-invasive disease. After an initial treatment with intravesical chemotherapy, patients may either undergo primary cystectomy or intravesical immunotherapy with Bacillus Calmette-Guerin (BCG) for at least one year (10). BCG is more effective than mitomycin-C in patients with high risk superficial disease (17). It is particularly indicated for treatment of CIS. It acts to stimulate the immune system to act on bladder cancer cells. Patients undergo induction followed by maintenance BCG treatment with regular cystoscopic follow-up. Side-effects are generally local symptoms of cystitis and haematuria. Systemic side-effects include fever, malaise and skin rash. Any recurrence of disease is an indication to discuss more radical treatment usually cystectomy.

2. Muscle-invasive Disease:

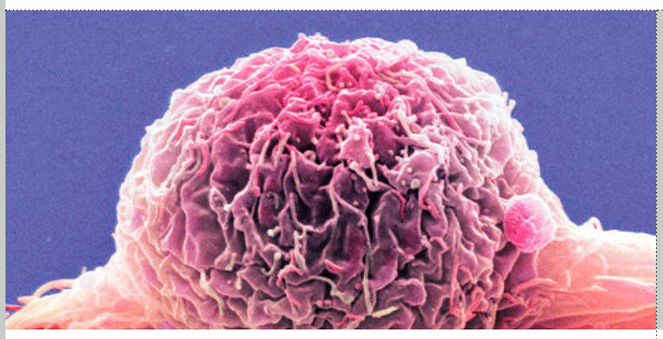
Patients are offered radical treatment or best supportive care where appropriate. Radical treatment with either radical cystectomy or radiotherapy is often preceded by neo-adjuvant chemotherapy in selected patients. Given prior to radical treatment it has been shown to improve overall survival by 5-7% at 5 years (4). There is no evidence indicating the superiority of either surgery or radiotherapy. Treatment choice is influenced by co-morbid factors, tumour grade and stage, as well as patient preference. Patients undergoing radical cystectomy need counselling on urinary diversion which include formation of an ileal conduit, orthotopic bladder or a continent diversion. 5 year survival post cystectomy is over 50% dependant on tumour stage and node involvement (4).



Intra-operative views of a cystectomy

BLADDER CANCER: WHAT A SURGICAL TRAINEE SHOULD KNOW

A Gulamhusein



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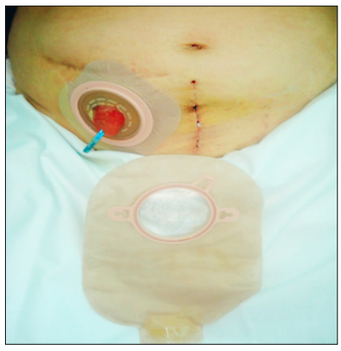

A patient with a Urostomy and stents

3. Advanced Disease:

Palliative chemotherapy can be considered for patients with symptomatic metastatic disease. External beam radiotherapy and occasionally palliative surgery may be used to control local disease. Radiotherapy is also used for the specific treatment of bone pain and spinal cord compression. A palliative care team should be involved to ensure ongoing support and continual assessment

Conclusion

Bladder cancer is a spectrum and its management is just as varied and complex so a competent understanding is crucial in order to be able to discuss options with patients and colleagues. In particular, it is vitally important that every doctor is aware of the referral guidelines for haematuria to ensure patients are managed efficiently and safely.

Questions

1. Bladder cancer most commonly presents with:

a. Painless visible haematuria
b. Urgency, frequency and dysuria
c. Weight loss with an abdominal mass.

2. A 46 year female patient presents with a one year history of recurrent urinary tract infections associated with haematuria. How will you investigate this patient?

a. Urinalysis, Flexible cystoscopy, IVU.
b. Urinalysis, Flexible cystoscopy, USS and X-ray KUB.
c. Urinalysis, USS and X-ray KUB.

3. What is the pathology report of poorly differentiated tumour invading full thickness detrusor muscle, with a single 1.5cm iliac lymph node on CT.

a. G2 pT1N1M0
b. G3pT2aN2M1
c. G3pT2bN1M0

4. A patient with a new bladder cancer is found to have a synchronous ureteral tumour. What cell type is it likely to be?

a. Transitional cell
b. Squamous cell
c. Adenocarcinoma

5. A patient with CIS post intravesical BCG should be treated with:

a. A re-resection of residual tumour
b. Intravesical chemotherapy followed radical radiotherapy.
c. Radical cystectomy.

Answer

1. a

2. b

3. c

4. a

5. c

BLADDER CANCER: WHAT A SURGICAL TRAINEE SHOULD KNOW

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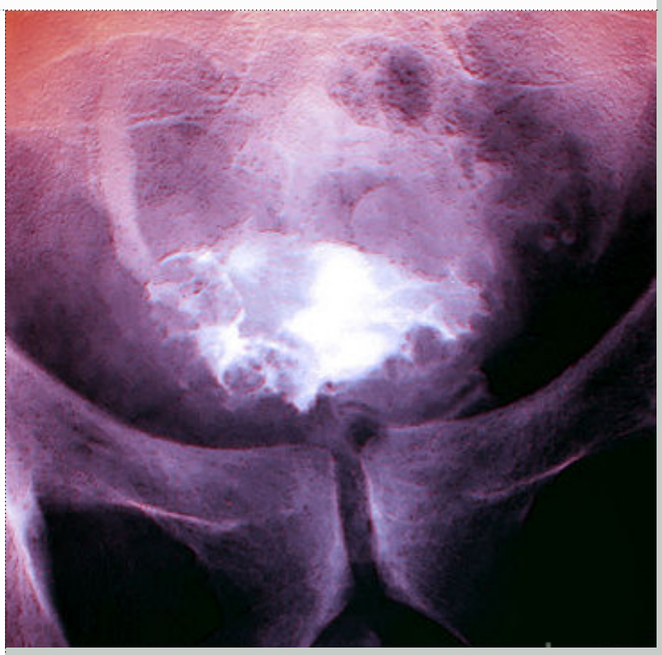

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ALLERGIC RHINITIS: SIMPLIFIED FOR THE CORE TRAINEE

T Kamani, M Munonyara

Allergic Rhinitis: simplified for the core trainee. Otorhinolaryngology & Neck Surgery.

Abstract

Allergic rhinitis (AR) is a condition that commonly presents to the Otolaryngologist. It affects around 20% of people in the UK (1). It has considerable impact on the quality of life of the patient including impact on performance at work and school (2) with an estimated financial burden of loss in work productivity per person of Ð653 annually (3). AR is synonymous with allergic rhinosinusitis, since the sinonasal cavity is one continuous surface lined with respiratory epithelium. Additionally, AR is linked to inflammatory disease affecting respiratory mucous membranes such as asthma, and allergic conjunctivitis (2). Treatment is predominantly medical. This article aims to discuss and update the junior trainee in ENT on allergic rhinitis. This should be supplemented with further reading as well learning in the ENT out-patients setting where AR commonly presents.

KEYWORDS: rhinitis, rhinorrhoea, immunotherapy

Case study

A 21 year old male university student with a background of asthma presents to your ENT clinic with a 5-year history of a blocked runny and itchy nose. This occurs during the late spring to summer. He has noticed that he has to take his inhaler more often during this period especially when playing tennis. His parents are asthmatic and his younger brother suffers from hay fever. He is concerned that his symptoms are affecting his studies. He is set to sit some final exams in the summer but is very worried as he does not sleep well and has missed lectures in the past. His current medications include fexofenadine and an intra-nasal steroid. He states he has had spotting of the nose in the past with the nasal spray so does not like to use it often. His GP would like an ENT opinion as standard treatment has not helped this patient. On examination of the nose, he has a crease on the bridge of his nose with bilateral rhinorrhoea.

Pathophysiology

Allergic rhinitis is a type I (Coombs and Gell classification) IgE-mediated immune response affecting the mucosa of the nasal cavity. Understanding the pathophysiology in figure 1 underpins the various treatments available to provide symptomatic relief. This is a hypersensitivity immune response which results from aberrant regulation by T-helper cells. The response can be divided into the two following; acute or chronic phase response.

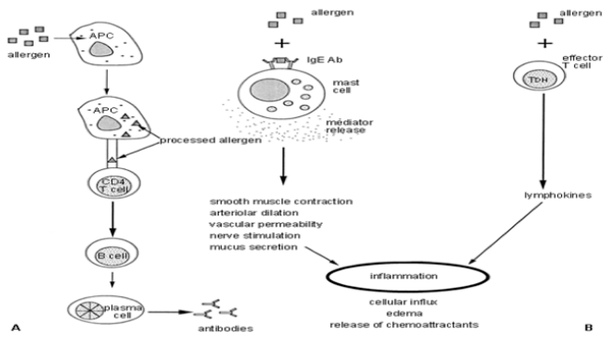

Figure 1. Immunological response of allergic rhinitis. A: Sensitisation phase; the immune response to an allergen from the non-allergic state to the allergic state. APC, antigen presenting cells. B: Clinical phase; re-exposure of the allergen triggering inflammation. (Taken from Stites PS, Terr AI, Parslow TG. Basic and clinical immunology, 8th ed. Norwalk: Appleton Lange, 1994).

Acute phase response (immediate):

This involves B cells producing IgE immunoglobulins specific to an allergen i.e. grass pollen. These IgE then bind to receptors on mast cells. Re-exposure to the allergen results in the IgE immunoglobulins to cross-link causing the mast cells to degranulate in the nasal mucosa. Consequently, there is the release of arachidonic acid, metabolites, chemotactic factors such as histamine, heparin and other enzymes. Alongside, inflammatory mediates such as prostaglandins and leukotrienes are synthesised and released resulting in the acute phase response (4). Furthermore, chemo-attractants such as IL-5 are also released which allows recruitment of eosinophils, neutrophils, basophils, T-lymphocytes and macrophages.

Late phase response:

The T-helper 2 lymphocytes (Th-2) release interleukins (IL-3, IL-4, IL-5) as well as other cytokines which furthers the production of IgE, as well as cause eosinophil chemotaxis and mast cell recruitment (5).

Subsequently, this leads to an increase in capillary permeability and eosinophil infiltration which leads to vascular congestion, oedema, rhinorrhoea and irritation. Mediators also stimulate sensory nerves to cause nasal itching, congestion and sneezing (6).

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Epidemiology

The major prevalence is in children and young adults with the average onset at 9 years of age. In 80% of cases, onset is before the age of 20. Presentation after the age of 65 is uncommon (7). It is the most common chronic disorder of the respiratory tract with 2-16% of the population suffering from this condition (8).

Classification

Seasonal Vs Perennial

Classically, AR can be classified as seasonal or perennial allergic rhinitis. Seasonal AR is sensitisation to allergens coinciding with a particular time of year, usually outdoors such as grass pollen. Perennial AR is sensitisation to allergens throughout the year, usually indoors such as house dust mites, pets and moulds (9). This classification is clinically useful as it helps determine appropriate treatment such as immunotherapy and is therefore most commonly used in the UK.

Intermittent Vs Persistent

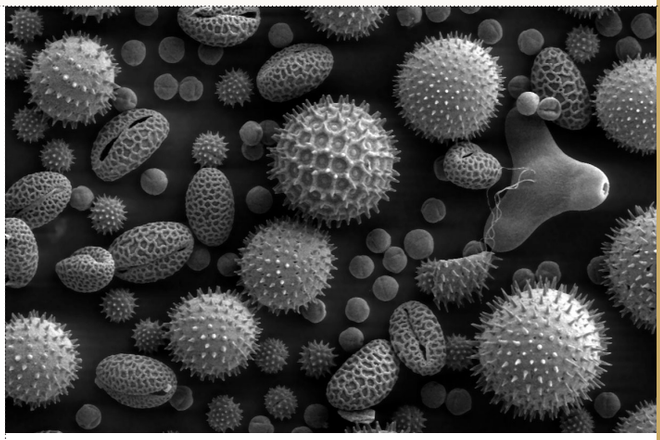
Another classification demonstrated in figure 2 was introduced by the ARIA guidelines (10) (Allergic Rhinitis and its impact on asthma). This classifies AR according to frequency: intermittent or persistent allergic rhinitis, as well as severity: mild or moderate-severe.

Figure 2. ARIA classification of allergic rhinitis.

AR and Asthma (10)

Since similarities in the structure of the upper and lower airways and the pathogenesis for asthma and AR exist this has led to the concept of both diseases as being: 'one airway, one disease'. For example:

- Allergens can affect both the nose and the lungs e.g. animal dander
- Epidemiology studies demonstrate co-existence of the disease with at least 60% patients with asthma have rhinitis
- Asthmatics who have treatment for AR have lower risk of hospital admissions
- High medical costs with both diseases



Diagnosis

Diagnosis is made by clinical assessment, based on history and examination.

History:

Identify the main symptom

Rhinitis is classically characterised by:

- Nasal obstruction: more common in perennial
- Watery rhinorrhoea; anterior or post-nasal drip (If unilateral exclude CSF)
- Nasal itching
- Sneezing

Additionally patients may complain of:

- Hyposmia
- Itching of the palate
- Runny eyes: conjunctivitis is more suggestive of seasonal allergic rhinitis
- Hoarseness

Identify possible allergens and timing of exposure to allergen

- Seasonal or perennial?
- Worse at home or work?
- Holiday: Do symptoms disappear on holiday but return after when exposed back to the same environment?

Document the severity

- The ARIA classification may help distinguish between mild, moderate and severe thus management.

Risk Factors and co-morbidities

- Is it an atopic individual?
- Family history of atopy, AR or asthma?
- First-born
- High socioeconomic class

ALLERGIC RHINITIS: SIMPLIFIED FOR THE CORE TRAINEE

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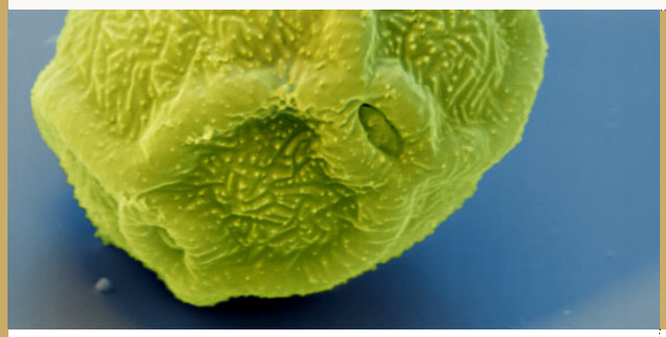

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Social History

- Enquire about the environment, housing conditions, pets
- Occupation
- Quality of life: Nasal obstruction can lead to reduction in sleep and thus quality of life
- Schooling or work: Reduced attendance due to symptoms

Medications

- Symptoms of rhinitis can be caused by NSAIDs, aspirin, anti-hypertensives and oral contraception
- Document the use of any previous medications to-date for AR and compliance

Examination

Start with a general observation followed by a thorough ENT examination looking for particular signs such as:

- Allergic crease: horizontal hyperpigmented / hypopigmented nasal crease across the dorsum
- Allergic salute: habitual manipulation of the nose with the palm of the hand due to itching membranes
- Allergic shiners: due to fluid accumulation in the infra-orbital groove
- Atopic dermatitis

Anterior rhinoscopy:

- Appearance of mucosa: bilaterally swollen, oedematous, pale
- Appearance of turbinates: enlarged inferior turbinates
- Appearance of secretions: bilateral clear fluid
- Any nasal polyps
- Assess airflow: use metal spatula to assess air flow

Examination can be completed by fibre-optic nasendoscopy to assess the middle meatus and posterior nasal cavity for the presence of mucopurlent secretions and polyposis which may be suggestive of chronic rhinosinusitis. Chronic rhinosinusitis exists with or without polyps - the latter simply being a manifestation of severely oedematous mucosa.

Examination of the chest with lung function tests can be carried out in patients who have persistent AR with symptoms suggestive of asthma.

Investigations

In most cases the history and examination will provide diagnostic certainty to commence treatment. However, in the minority where doubt remains and physical findings are absent, investigations can be undertaken (11).

Investigations

- Skin prick testing
- IgE testing: RAST (Radio-allergo-sorbent test) and ELISA (Enzyme-linked immunosorbent assay)
- Nasal smears: eosinophilia
- Nasal allergen challenge: gold standard

Skin prick test (SPT)

This involves the introduction of commonly found allergens introduced into the epidermis, with the use of histamine and saline controls. False negatives can be due to antihistamine or steroid use or age over 50 years (11). Contra-indications to skin testing include patients taking anti-histamines, severe eczema, previous anaphylaxis or dermagraphism. Therefore, anti-histamines need to be stopped for a week before the test is performed. At least 15% of people with a positive SPT do not develop symptoms with the associated allergen. Therefore, clinical history must be interpreted with the results (12).

Specific IgE

This has a sensitivity of around 70% when compared to skin prick testing. This may be helpful in patients on long term antihistamines who would have a suppressed response to skin prick testing or where there is a particular concern of risk of anaphylaxis. Blood tests such as RAST, where a range of potential allergens are tested for have been shown to have a wide range of specificities and sensitivities and are expensive (11).

Treatment

The treatment of allergic rhinitis is mainly medical and has a step-wise approach as shown in figure 3 based on the severity of the symptoms. Appropriate therapy is also based on symptomatic control and severity of the disease.

ALLERGIC RHINITIS: SIMPLIFIED FOR THE CORE TRAINEE

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Education and Allergy avoidance (12)

Patient education is imperative and should focus on:

- Discussion on the nature of the disease, causes and symptoms and available treatment options
- Allergy avoidance
- Drug therapy: benefits and potential side-effects
- Correct technique of nasal spray and drops: poor technique is related to treatment failure
- Benefits of complying with treatment as AR can impact QOL
- Patient should understand that this is a chronic disease and that long-term treatment is required and complete cures do not often occur.

Pharmacotherapy

Several pharmacological medications are used for the symptomatic treatment of AR. The ARIA guidelines recommend that use should be according to the severity and duration of AR. Medications used for AR are administered nasally or orally and illustrated in Table 1.

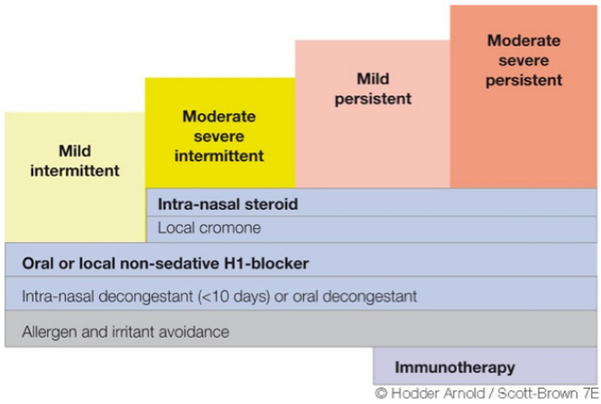
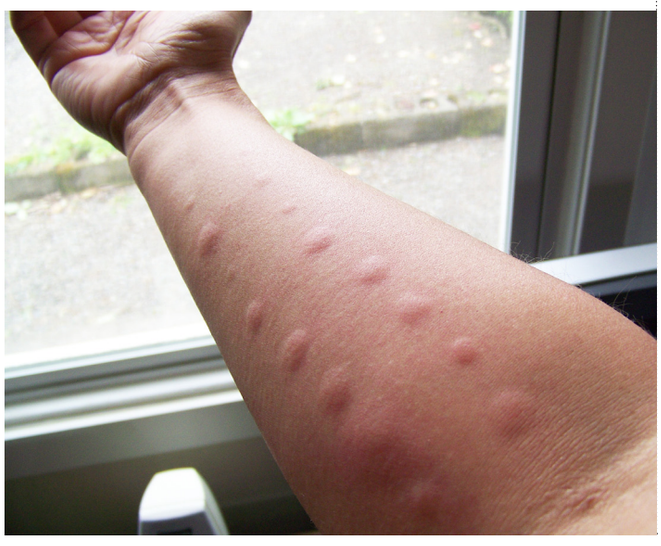


Figure 3. Step-wise treatment according to severity of AR (diagram taken from Scott-Brown 7th Edition)(13)



Pharmacotherapy	
Anti-histamines (oral/topical) *e.g. cetirizine*	First-line for mild to moderate disease. Can use with intra-nasal steroids in moderate-severe. Non-sedating histamines should be used to avoid patients from sleeping at school or work.
Topical and oral corticosteroids *e.g. fluticasone / mometasone*	First-line for moderate-severe. Intra-nasal steroids are thought to be the most effective in AR with improvement of quality of life. Can cause local irritation e.g. epistaxis. Oral steroids (0.5mg/kg for 10 days) can be used for a short duration (rescue therapy) for special events and in conjunction with nasal corticosteroids. Injectable corticosteroids are not recommended.
Decongestants *e.g. xylometazoline*	These are effective for severe nasal blockage as they are sympathomimetics which cause nasal vasoconstriction. Used briefly (<10 days) as prolonged use can lead to rhinitis medicamentosa. This rebound effect is not caused by oral decongestants but these are less effective than the topical route.
Anti-cholinergics e.g. ipratropium bromide.	These are effective for rhinorrhoea no effect on other symptoms. Requires several applications. Anti-cholinergic side-effects can occur.
Cromones e.g. sodium chromoglycate	This inhibits the granulation of sensitised mast cells. Useful for symptoms of allergic conjunctivitis. Not generally useful in the nose.
Leukotriene inhibitors *e.g. montelukast*	Good for nasal obstruction, rhinorrhoea and conjunctivitis. Indicated for patients with AR with asthma in the UK.

Table 1. Pharmacotherapy for AR (2, 12)

Non- pharmacotherapy

This includes acupuncture and phototherapy. However, evidence is limited (14, 15).

Immunotherapy

This is the practice of administering gradually increasing quantities of an allergen to an allergic subject subcutaneously or sublingually to improve the symptoms associated with the subsequent exposure to the causative allergen. Since this treatment requires exposing the patient to an allergen, the potential adverse reactions are a limitation to this treatment. This requires administration by specialists in a medical setting to treat potential anaphylaxis.

Immunotherapy has shown to:

- Have long term efficacy, stimulate clinical and immunologic tolerance, prevents further progression of allergic disease and improves patient quality of life (16).
- Clinical efficacy for seasonal AR such as grass pollens (17).
- Conversely, the clinical efficacy of immunotherapy for perennial AR is reported to be of less clinical benefit compared to that for Seasonal AR (16).

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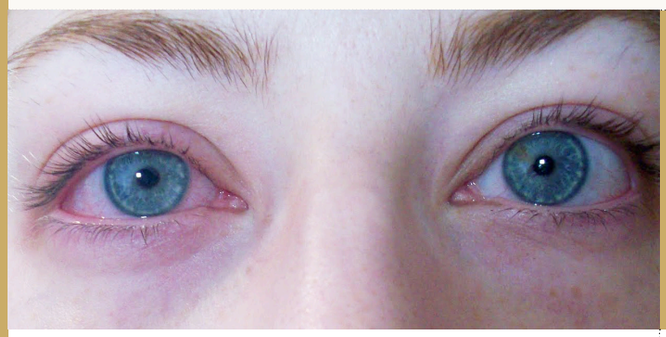

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Indications include (18)

1) IgE-mediated seasonal pollen induced rhinitis, if symptoms have not responded adequately to optimal pharmacotherapy.
2) Selective patients with animal dander or house dust mite (HDM) allergy in whom rigorous allergen avoidance and reasonable pharmacotherapy have failed to control symptoms.

Complications of AR

Acute sinusitis, otitis media, conjunctivitis, sleep apnoea, poor sleep, dental malocclusion impaired cognitive function and missed school days (19).

Surgery (12)

Surgery indicated for allergic rhinitis is uncommon. It does not treat the symptoms but may improve nasal airflow in patients with an anatomical nasal obstruction. The limited benefits of this should be discussed with the patient as length to prevent false expectations.

Indications

- Drug-resistant inferior turbinate hypertrophy
- Anatomical variation of the septum with functional relevance
- Anatomical variation of the bony pyramid with functional relevance

Discussion of case study

This patient demonstrates symptoms of rhinitis triggered by an allergen which occurs late spring to summer such as grass pollen. This is seasonal AR which is also affecting his asthma. He is in the appropriate age group with a strong family history of atopy. According to the ARIA guidelines this patient has severe symptoms as it is affecting this quality life and schooling.

In terms of treatment, education and pharmacotherapy plays a key role:

- Allergy avoidance may be difficult with his lifestyle as he likes to play sport outside.

- Nasal steroids would be beneficial for his nasal obstruction, the symptom which affects him the most.

- A detailed discussion to clarify if he gets nosebleeds frequently as a side-effect with nasal steroids (an indication to withdraw) or whether he has poor compliance as it has occurred once.

- Counsel the patient on correct nasal technique.

- Counsel on the importance of compliance: the benefits of symptomatic control as his AR greatly affects his quality of life and secondly, to prevent his chest symptoms.

- Additionally, he should have further assessment of his asthma.

- He should be reviewed again to see if his rhinitis, asthma and quality of life improves.

He may benefit from a short course of oral steroids prior to his exams and to use the nasal steroids 4 weeks prior to the onset of the pollen season.

Short MCQs (True or false?)

1. Allergic rhinitis:
A is an example of a type IV immune response
B affects 1 in 20 people in the UK
C Acute rhinosinusitis is a complication
D is associated with Samter's triad
E is not associated with allergic conjunctivitis

2. Skin prick tests in allergic rhinitis
A have a high negative predictive value
B are suppressed in patients taking anti-histamines
C are suppressed in patients taking anti-depressants
D are more expensive than RAST
E are positive in 25% of people that develop symptoms on subsequent exposure to the allergen

3. Risk factors for allergic rhinitis include
A Being first born
B Atopy
C Adenoiditis
D Being an immigrant
E Family history of rhinitis

ALLERGIC RHINITIS: SIMPLIFIED FOR THE CORE TRAINEE

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4. Intra-nasal corticosteroids in allergic rhinitis:

A are less effective than anti-histamines

B help relieve symptoms of rhinorrhoea, sneezing, nasal obstruction and nasal itchiness

C should be used in the head upside down position

D can cause sore throat and epistaxis in 10% of people

E if started two weeks prior to an allergy season improves efficacy

5. Complications of allergic rhinitis include:

A Nasal polyps

B Septal perforation

C Oesophageal reflux

D Asthma

E Chronic otitis media

Answers

1. F F T T F
2. T T T F F
3. T T F T T
4. F T T T T
5. T F T T T

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PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

C Bradshaw and J Pottle

Paediatric Upper Urinary Tract Obstruction.
Paediatric Surgery.

Abstract

Upper urinary tract obstruction is a common paediatric surgical condition. It can be classified by the level of pathology into pelviureteric junction (PUJ) or vesicoureteric junction (VUJ) obstruction. It frequently presents with hydronephrosis on prenatal ultrasound, prompting a series of investigations to assess for obstruction and reduction in renal function. This article will explore the epidemiology, diagnosis and management of both PUJ and VUJ obstruction, with particular focus on relevant investigations.

Keywords: pelviureteric , vesicoureteric, hydronephrosis

Obstruction: "Impedance to the flow of urine resulting in gradual and progressive damage to the kidney".
Hydronephrosis: "Pathological dilatation of the renal pelvis and calyces".
Pyonephrosis: "An infected and obstructed renal collecting system, similar to an abscess".
Megaureter: "A dilated ureter". It can be a result of vesicoureteric junction obstruction or vesicoureteric reflux.

Box 1: Terminology

Introduction

Upper urinary tract obstruction is frequently classified by location: obstruction at the vesicoureteric junction (VUJ) or at the pelviureteric junction (PUJ).

PUJ obstruction is defined as impaired urine flow from the renal pelvis into the proximal ureter, with subsequent dilatation of the collecting system and the potential to damage the kidney. It leads to hydronephrosis without ureteric dilatation (1).

VUJ obstruction affects the distal ureter as it enters the bladder, leading to a primary obstructive megaureter often with additional hydronephrosis.

Obstruction at either of these sites is usually chronic or intermittent, though can present acutely. The commonest cause of acute upper urinary tract obstruction in children is urinary calculi. However, calculi are more likely to present with loin pain, haematuria or infection than obstruction and as such are beyond the scope of this review. This paper will therefore discuss chronic PUJ and VUJ obstruction.

Pathophysiology

In the obstructed kidney the pressure in the collecting system rises and urine is reabsorbed back into the interstitium. This leads to rise in intrarenal pressure and hence a fall in renal blood flow, with subsequent nephron damage. In the acutely obstructed kidney, approximately 50% of functioning nephrons will be lost within six days and after six weeks there is complete and irreversible loss of function in that kidney. When infection is present within an obstructed system, renal damage occurs more rapidly. In the chronically obstructed kidney the rate of renal damage is more difficult to predict and depends both on the duration, degree, and any intermittent relief of that obstruction (2).

Prenatal imaging

Prenatal identification of hydronephrosis has dramatically increased with improvements in prenatal imaging and screening (3). Dilatation is frequently not associated with obstruction or renal impairment and the natural course is of progressive improvement. Even when obstruction is present there is still chance of spontaneous resolution.

Conversely, there remains a risk of renal functional deterioration which may become irreversible. The management of prenatal hydronephrosis therefore remains controversial. While there is no definitive test to distinguish benign dilatation from the cases requiring intervention, one potential diagnostic algorithm is shown in Figure 1. For details about the different imaging modalities that are involved, see Box 2.

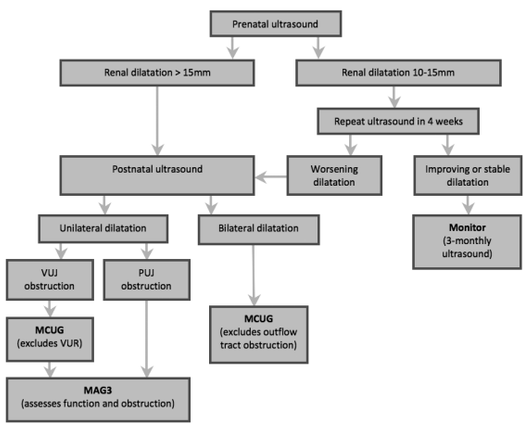

Figure 1: Diagnostic pathway following prenatal identification of hydronephrosis. Adapted from EAU guidelines on paediatric urology (4).

PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

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Ultrasound scanning

Ultrasound scanning (USS) is the first-line investigation for suspected urinary tract pathology in children and a useful tool for monitoring changes in dilatation (see Figure 1). In the antenatal period, a renal anterior-posterior (A-P) measurement of up to 7mm is considered normal, while over 10mm is abnormal. These limits are age-adjusted for later scans.
Advantages: non-invasive, no exposure to ionising radiation, low cost, good resolution in children due to small body habitus.
Disadvantages: Operator-dependent, poor sensitivity for detecting renal scarring, unable to assess renal function.

MAG3 Renography

MAG3 allows simultaneous assessment of drainage of the kidney and renal function and is therefore the investigation of choice for upper urinary tract obstruction. Mercaptoacetyl triglycine (MAG3) is a protein which relies on tubular extraction for excretion. It is radiolabelled with the isotope technetium-99m and injected intravenously. A comparison of the function of the two kidneys (differential renal function) is assessed on images taken one to two minutes after injection (see Figure 2). The combined function of the kidneys is 100%, normal function for each kidney is 40-60%. The drainage of the kidney is then estimated from a renogram curve (see Figure 3). The normal pattern for a drainage curve is an early peak followed by a rapidly descending phase.
Advantages: Provides the best dynamic information on renal drainage and has lower background activity than other dynamic scans.
Disadvantages: Radiation exposure. Assessment of the differential function is also less accurate than DMSA.

DMSA Renography

DMSA renogrpahy is the key investigation in assessing differential renal function, especially when function is poor. It involves an injection of Dimercaptosuccinic acid (DMSA), a protein that binds to the proximal convoluted tubule, which is radiolabelled with technetium-99m. Images are then acquired two to three hours after injection. It provides static images of functioning renal tissue and can therefore generate a measure of relative function between the two kidneys. It can also demonstrate congenital anomalies and the presence of renal scarring.
Advantages: High sensitivity for parenchymal pathology and measurement of differential function.
Disadvantages: The need for intravenous injection requiring cannulation, the length of time taken to perform the study and the radiation exposure.

Neither MAG3 nor DMSA provide information on absolute renal function. If there is concern about the overall renal function, such as in bilateral hydronephrosis, then a formal GFR is necessary.

MRI

Gadolinium contrast-enhanced functional MRI is extremely helpful in demonstrating kidney function and excretion and is likely to ultimately replace renography. Due to the risk of general anaesthetic – necessary to ensure that the child remains still for the duration of an MRI – it is currently reserved for complex cases.
Advantages: No radiation exposure; high quality images providing anatomical detail and assessment of pathology.
Disadvantages: Often requires a general anaesthetic.

MCUG (micturating cystourethrogram)

MCUG is indicted in bilateral hydronephrosis to look for lower urinary tract obstruction, and with megaureter to investigate for vesicoureteric reflux (VUR).
The child is catheterised and a water soluble contrast is introduced to the bladder. The catheter is removed and lateral and oblique views are taken to demonstrate evidence of VUR or bladder outflow obstruction during micturition.

Box 2: Renal imaging

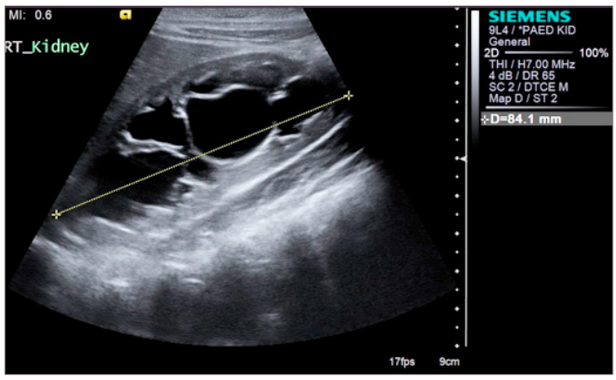

Figure 1: USS showing a right kidney with significant pelvicalycael dilatation and an A-P diameter of 84.1mm.

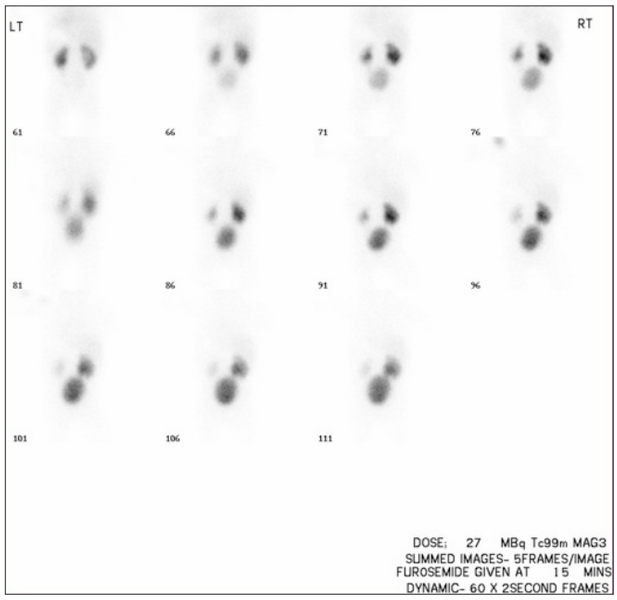

Figure 2: MAG3 dynamic scan. Initially the left kidney contains a greater concentration of the isotope.However, it fades throughout the series as the kidney drains , while the right kidney takes much longer to fade indicating delayed drainage.

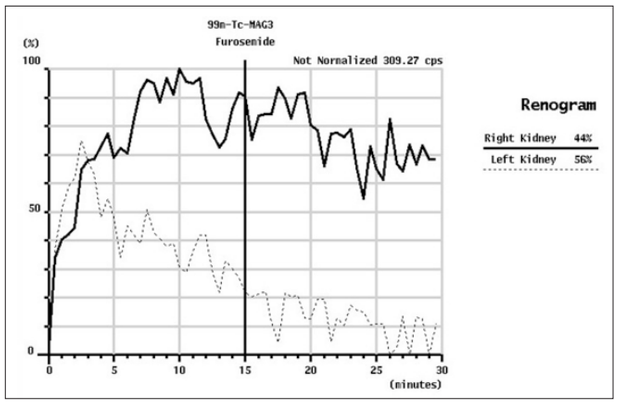

Figure 3: MAG3 drainage curve. This demonstrates normal drainage in the left kidney and delayed drainage in the right kidney. It also indicates that the split function between the two kidneys (right 44%, left 56%) is within normal limits.

PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

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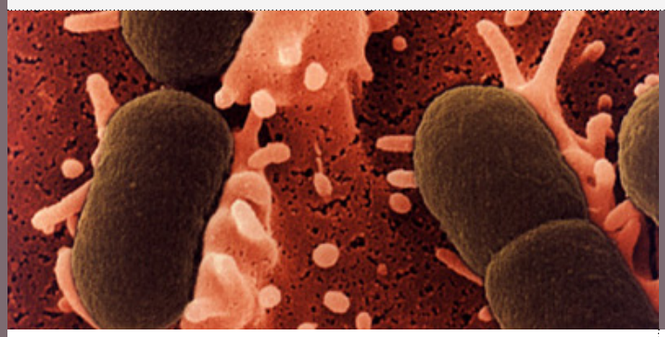

Paediatric Upper Urinary Tract Obstruction.
Paediatric Surgery.

PUJ obstruction

Case vignette
A seven year old boy, who has had multiple presentations to A&E with non-specific abdominal pain and urinary tract infections (UTIs), presents with intermittent loin pain. The pain is sharp and stabbing in the left loin and radiating to his groin. He is apyrexial and has no previous medical history. Urea, electrolytes and other routine bloods are within normal limits.

Q: What is your immediate management?

A: Send a urine dip and urine cultures, provide adequate analgesia and request a renal ultrasound. In this case a renal ultrasound is indicated independent of the urine dip result as there is a history of repeated urinary tract infections.

The urine dip is negative for all parameters. The renal ultrasound shows left hydronephrosis with an anterior-posterior (A-P) diameter of 12cm and no ureteric dilatation.

Q: What is the most appropriate imaging modality now?

A: MAG3. The patient is symptomatic with hydronephrosis and the USS indicates PUJ obstruction (hydronephrosis with no ureteric dilatation). A MAG3 is therefore needed to assess renal drainage and function.

A MAG3 shows an obstructed left kidney with differential function of 30%. The patient is referred to paediatric urology.

Q: What is the likely procedure to be performed?

A: The most appropriate procedure would be a pyeloplasty to relieve the obstruction.

The patient underwent open pyeloplasty. At time of surgery aberrant crossing vessels were found. A JJ stent was inserted and a USS at six weeks showed some resolution of hydronephrosis. The stent was removed at six weeks and a USS at three months showed near-total resolution of hydronephrosis with complete resolution of symptoms.

Background

PUJ obstruction has an incidence of 1:1500 births (4). The left kidney is more commonly affected in a 2:1 ratio. It is more common in children with other urinary tract anomalies such as multicystic dysplastic kidneys, and in association with other congenital syndromes such as the VACTERL spectrum (1).

Aetiology

- **Intrinsic obstruction**
  - Short region of stenosis at the PUJ of unknown cause.
- **Ureteric folds**
  - The proximal ureter is tortuous and kinked. This may resolve with growth and subsequent straightening of the ureter.
- **High insertion**
  - An anatomical abnormality where the ureter enters the calyces superiorly. Urine therefore has to briefly flow against gravity on exiting the calyces.
- **Extrinsic obstruction**
  - Anatomical variation in the position of renal vasculature leads to aberrant or crossing lower pole vessels which impinge on the ureter. This is the commonest cause of PUJ obstruction when it presents symptomatically in childhood (5).

Clinical picture

PUJ obstruction has an extremely unpredictable course. It is the most common clinically significant uropathy detected prenatally. However, it may also present with UTI resulting in pyonephrosis, pain (typically in children age>4), haematuria or an abdominal mass (6).

Diagnosis

Diagnosis is with USS followed by MAG3. The severity of dilatation on USS (A-P diameter) predicts functional impairment. If the A-P diameter on the antenatal scan is greater than 50mm then function is almost invariably impaired (7).

DMSA is reserved for poorly functioning obstructed kidneys to help guide the choice of management between pyeloplasty and nephrectomy. Further imaging is only required in more complicated cases.

PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

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Management

1. Conservative

Conservative management is undertaken when there is normal differential function, i.e. when the obstructed kidney has a differential function of greater than 40%. When the dilatation is bilateral less emphasis can be placed on the differential function and management is guided by the severity of the dilatation.

2. Pyeloplasty

Pyeloplasty is the operation of choice for PUJ obstruction and is effective long-term with a low incidence of recurrent obstruction (8). Indications include: symptomatic PUJ obstruction (pain, infection, mass); as symptomatic obstruction with reduced function (less than 35-40%); failure of conservative management (deteriorating functioning or increasing dilatation) or persisting obstruction showing no evidence of resolution despite stable function.

The obstructing portion of the dilated renal pelvis is excised and an anastomosis is performed over a stent to minimise the risk of stenosis and facilitate post-operative drainage. The choice of stent is variable, most commonly a 'JJ' stent or an external nephro-stent ('blue stent') is used. A 'JJ' stent is so-called because of the J-shaped curves at either end, which sit in the bladder and renal pelvis to prevent displacement of the stent. Several weeks after the initial operation the stent is removed cystoscopically. Though this procedure requires a general anaesthetic, removal of an external nephro-stent does not.

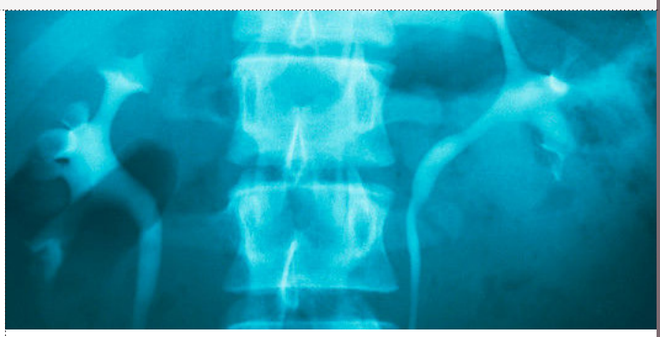
In infants, an open procedure with the anterior extra-peritoneal approach is the mainstay of treatment whereas in adults a laparoscopic approach is commonly used (9). In children, however, there remains debate as to the optimal approach and laparoscopic pyeloplasty is gaining acceptance in the paediatric population. Laparoscopic surgery seems to be best suited to older children in order to gain the maximal benefit of reduced pain and hospital stay10. Post-operative follow-up consists of USS and repeat MAG3.

3. Nephrectomy

If the affected kidney is non-functioning (differential function less than 10%) then nephrectomy may be preferable to pyelopasty, as relieving the obstruction will not improve function and the non-functioning kidney is a potential source of infection. This level of function is more reliably assessed by DMSA renogram than a MAG3.

4. Percutaneous nephrostomy

Percutaneous nephrostomy may be used to provide temporary drainage, especially if there is pyonephrosis. Once the infection is controlled a more accurate assessment of function with a DMSA can be carried out prior to planning definitive surgery.



VUJ obstruction

Case vignette

Significant left hydronephrosis was identified during a routine antenatal scan. Postnatally the infant was started on trimethoprim UTI prophylaxis and an USS was repeated showing left hydronephrosis with a dilated ureter along its whole length, diameter 1.3cm.

Q: What scan should be performed?

A: An MCUG must be carried out in any case of ureteric dilatation to assess for vesicoureteric reflux (VUR).

An MCUG was performed, which showed no evidence of VUR. At three months a MAG3 renogram was performed. This showed a left sided VUJ obstruction with a differential function of 45% on the left and 55% on the right.

Q: What would be the commonest management approach?

A: Conservative management is the commonest approach in this scenario. Surgical management is reserved for cases where there is significantly decreased differential function (<35%) or repeated symptoms.

In view of the equal function it was decided to manage conservatively and he was followed up with a repeat USS and MAG3. These showed no progression of the dilatation and no change in the differential function. The patient was followed up until age four when repeat USS showed improvement in the dilatation. He was discharged from follow-up.

Background

VUJ obstruction has an incidence of approximately 1:1500-1:2000. Males are affected more than females and the left kidney is more commonly affected than the right. It is not associated with any specific congenital abnormalities.

Aetiology

VUJ obstruction usually occurs due to a stenotic segment of ureter immediately proximal to the VUJ. When the segment is not-stenotic, the obstruction is thought to result from loss of peristalsis in that segment (11).

PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

C Bradshaw and J Pottle

Paediatric Upper Urinary Tract Obstruction.
Paediatric Surgery.

Clinical presentation

VUJ obstruction is most commonly detected during routine prenatal USS and accounts for 10% of all prenatally diagnosed uropathies. UTI is the most common symptomatic presentation, and severity can vary from simple UTI to pyonephrosis. Rarer presentations include intermittent loin or abdominal pain, abdominal swelling or renal calculi.

Diagnosis

- **Ultrasound**

- USS is the first-line investigation to demonstrate ureteric dilatation and assess the severity of pelvicalyceal dilatation. If the diameter of the ureter is less than 1cm then there is unlikely to be significant obstruction and function in the affected kidney is likely to be preserved. Even when the dilatation of the ureter is significantly greater than 1cm the amount of pevicalyceal dilation may be relatively small and renal function may be preserved.

- **MCUG**

- MCUG should be carried out to exclude VUR and outflow obstruction as possible causes of ureteric dilatation.

- **MAG3**

- MAG3 will show whether there is obstruction. Drainage curves may be difficult to interpret in the presence of a grossly dilated ureter as the isotope may be emptied from the kidney into the large ureter but not actually be draining.

Management

1. Conservative

Up to 85% of VUJ obstruction detected prenatally will spontaneously resolve (4). The majority of patients are therefore managed conservatively by monitoring with USS, initially every three to six months (12). UTIs are not an automatic indication for surgery. Prophylactic antibiotics can be started to prevent further UTIs. However, UTIs that are severe or recurrent despite prophylaxis may indicate a need for further intervention.

Indications for surgery include: differential function of less than 35%; recurrent or severe UTIs; deteriorating function or failure of conservative management and, rarely, pain or abdominal mass (4).

2. Surgical management

Ureteric reimplantation is usually performed for mild dilatation. The principle is to allow good drainage of the ureter without permitting reflux. The distal ureter is mobilised intravesicularly and the stenotic segment is excised. The ureter is then reimplanted into the bladder through a submucosal tunnel (Cohen cross-trigonal tunnel). The length of this tunnel should be at least four times the diameter of the ureter. It maintains the angle of entry of ureter into bladder, preventing VUR. A stent is usually placed at time of operation and is left *in-situ* for a some time post-op to prevent further stenosis.

If moderate to severe dilatation is present then the dilated ureter is identified extravesically. As it is more difficult to create a tunnel of appropriate length in these cases, tapering or plication of the distal ureter can be performed. These techniques can be combined with a psoas hitch, where the bladder is anchored to the psoas muscles where the ureter enters the bladder. This reduces the risk of kinking and obstruction during bladder filling.

Post-operative follow-up is with an USS and MAG3 at six to twelve months. In some cases a longer period may be required before improvements are demonstrated on the MAG3 drainage curve. Likewise, the ureter may remain dilated for a prolonged period post-operatively.

An indwelling ureteric JJ stent is an alternative to reimplantation and is the preferred option in infants due to technical difficulties with performing a reimplantation in this age group. It can either be inserted cystoscopically or via an open cystostomy and can be left *in-situ* for six months. In some cases a stent alone can be sufficient to resolve the obstruction without the need for further surgery (13), while in the older age group a stent may be used to temporise the situation prior to reimplantation surgery. However, it is important to remember that the majority of VUJ obstructions are managed expectantly as they will often spontaneously resolve.

Summary

With the advances in prenatal imaging, hydronephrosis associated with PUJ and VUJ obstruction is now frequently identified in the neonatal period. It is challenging to identify those children in which the obstruction will lead to renal damage as the clinical course of these conditions is uncertain. Numerous investigations can be used to further clarify pathology. Initial management is most commonly conservative and regular evaluation, usually with USS, is key to picking up potential problems before renal function is affected. Surgical management is usually reserved for those where there is evidence of deterioration in renal function or increasing tract dilation.

PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

C Bradshaw and J Pottle

EMQs

What would be your next choice of investigation in each of these clinical scenarios?

A. DMSA
B. Gadolinium contrast-enhanced MRI
C. MAG3
D. MCUG
E. USS

1. Prenatal USS shows a left renal A-P diameter of 9mm (normal is less than 7mm).

2. Postnatal USS has confirmed a diagnosis of left megaureter.

3. Following a diagnosis of left hydronephrosis on prenatal USS, a postnatal USS showed both kidneys to have A-P diameters greater than normal limits.

4. A four year old boy presents to the paediatricians with a history of recurrent left loin pain. An USS scan has been arranged by his GP and has shown left PUJ obstruction.

5. Prenatal screening showed right hydronephrosis. A postnatal USS showed right PUJ obstruction. Aged three months a MAG3 was performed, which showed an obstructed right kidney with a differential function of 10% in that kidney.

MCQs

1. Which of these is not an advantage of USS?

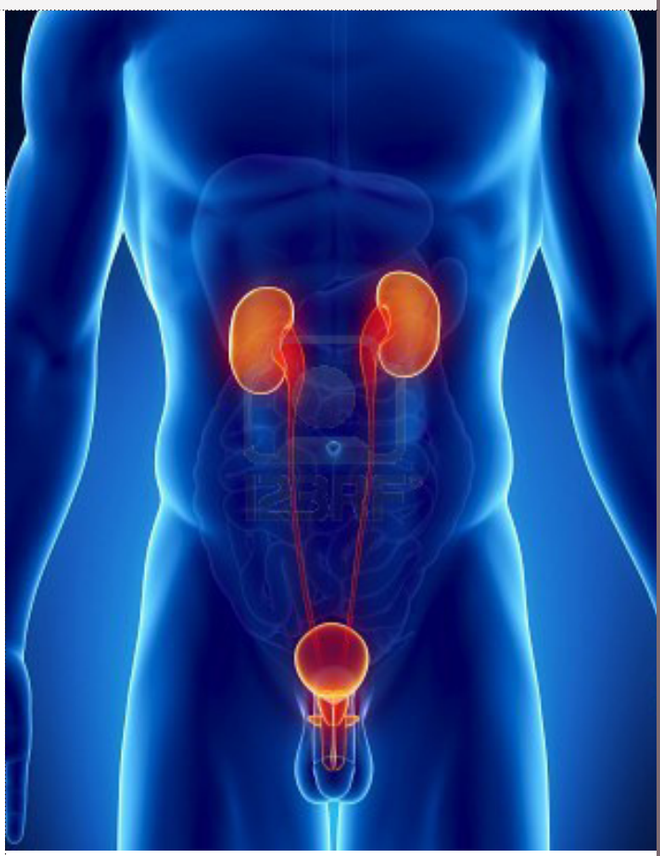
A. Non-invasive
B. Accurate assessment of function
C. Cost effective
D. Better resolution in children than in adults
E. Accurate assessment of renal dilatation

2. What is the most likely underlying aetiology in a child presenting symptomatically with PUJ obstruction?

A. High Insertion
B. Ureteric folds
C. Aberrant crossing vessels
D. Intrinsic obstruction
E. Renal tumour

3. What percentage of patients presenting with prenatally detected VUJ obstruction will spontaneously resolve?

A. Over 95%
B. 75-85%
C. 60-70%
D. 40-50%
E. Less than 10%



4. A three year old boy presents to A&E with a temperature of 39°C and left loin pain. Urine dipstick is positive for leucocytes and nitrites. An USS performed on admission shows left hydronephrosis with PUJ obstruction. He is treated with analgesia and IV antibiotics. However, he continues to spike a temperature. What would be the most appropriate surgical intervention?

A. Cystoscopy and insertion of a JJ stent
B. Nephrectomy
C. Pyeloplasty
D. Percutaneous nephrostomy
E. None – further investigation is required first

EMQ answers

1-E; 2-D; 3-D; 4-C; 5-A

MCQ answers

1-B; 2-C; 3-B; 4-D

PAEDIATRIC UPPER URINARY TRACT OBSTRUCTION

C Bradshaw and J Pottle

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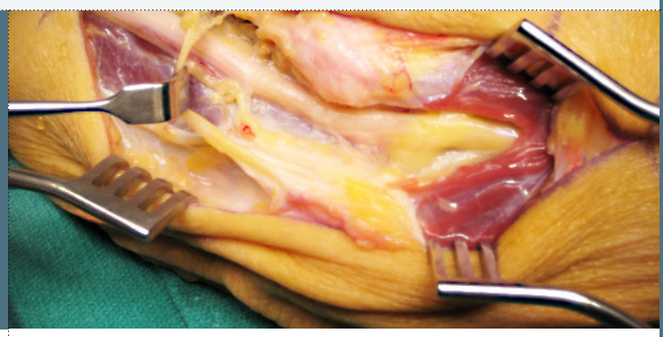
CUBITAL TUNNEL DECOMPRESSION

E Theophilidou, V Sangle



Cubital Tunnel Decompression.
Neurosurgery.

Abstract

Ulnar neuropathy describes sensory and motor symptoms due to ulnar nerve compression or irritation. The nerve can be compressed at any point along its course. Ulnar neuropathy at the elbow is the second most common cause of compressive peripheral neuropathy, after median nerve neuropathy (carpal tunnel compression). The presentation of this condition consists of change in sensation or tingling of the 4th and 5th digits, elbow pain and nocturnal awakening due to pain. The patient might describe worsening of symptoms with repeated elbow and/or wrist flexion.

A focused examination will confirm the diagnosis and should identify co-existing neuropathies of the medial or radial nerves if present. Provocative tests can be used to aid the diagnosis, however, the sensitivity and specificity of these tests for ulnar neuropathy appears suboptimal. Conservative treatment includes lifestyle modifications such as avoiding elbow flexion. Surgical treatment is offered to patients with clinical and electrophysiological evidence of moderate to severe ulnar neuropathy who have persistent weakness and numbness that is unchanged with conservative management.

Keywords: ulnar nerve, neuropathy, cubital tunnel compression

Introduction

Ulnar neuropathy describes sensory and motor symptoms due to ulnar nerve compression or irritation. The nerve can be compressed at any point along its course but common sites of compression include:

- **At the elbow, as the nerve passes through cubital tunnel.**
- **At the wrist, in Guyon's canal.**
- **In the hand, due to compression of the deep motor branch against the pisiform and hamate.**

Epidemiology

Ulnar neuropathy at the elbow is the second most common cause of compressive peripheral neuropathy, after median nerve neuropathy (carpal tunnel compression). Latinovic et al assessed the incidence of common compressive neuropathies in the UK by examining the records of 253 general practices (1). The annual incidence of ulnar neuropathy (including compression at any point along the course of the nerve) was 25.2 per 100,000 for men and 18.9 per 100,000 for women.

The first aetiology for cubital tunnel compression was identified in the literature in 1878 due to remote elbow fracture or osteoarthritis. (2) By 1899, Broca and Mouchet applied the term "tardy ulnar nerve" to the clinical syndrome. The term "cubital tunnel syndrome" was first used in 1958 to include entrapment under the humeroulnar arcade (this is the region of the aponeurosis of the two heads of the flexor carpi ulnaris muscle as they originate from the olecranon and the medial epicondyle of the humerus). (3)

Anatomy

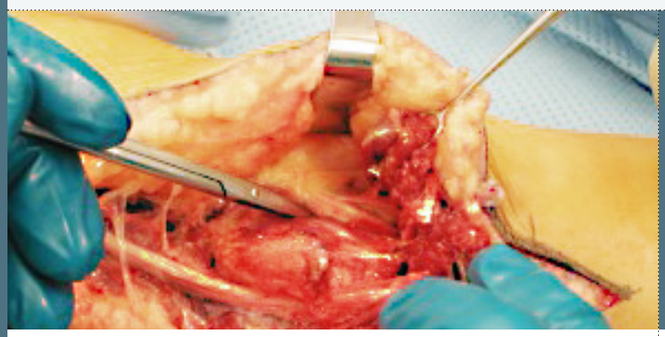
The ulnar nerve is derived form the anterior rami of the C8 and T1 spinal nerve roots with a variable contribution from C7. The nerve roots continue to the lower trunk and further to the medial cord to give off the fibers to the ulnar nerve.

The ulnar nerve descends on the posteromedial aspect of the humerus and runs in the upper arm in close proximity to the median nerve and brachial artery. At the mid-point of the humerus it pierces the medial intermuscular septum (this hiatus in the septum is also called the arcade of Struthers) and enters the posterior compartment of the upper arm.

On reaching the elbow, the ulnar nerve travels within the retrocondylar groove, posteromedial to the medial epicondyle. Behind the medial epicondyle the nerve is covered by Osborne's ligament (aponeurotic attachment of 2 heads of FCU, from medial epicondyle of humerus to the olecranon process of the ulna). On exiting the groove, it travels within the cubital tunnel through the two heads of the flexor carpi ulnaris muscles.

CUBITAL TUNNEL DECOMPRESSION

E Theophilidou, V Sangle



Cubital Tunnel Decompression.
Neurosurgery.

The ulnar nerve provides motor innervation:

- In the forearm, via the muscular branches:
- Flexor carpi ulnaris (FCU)
- Flexor digitorum profundus (FDP), supplying digits 4 and 5
- In the hand, via the deep branch of the ulnar nerve:
- Hypothenar muscles
- 3rd and 4th lumbricals
- Dorsal interossei
- Palmar interossei
- Adductor pollicis
- In the hand, via the superficial branch of the ulnar nerve:
- Palmaris brevis

Sensory innervation includes (palmar and dorsal branch of the ulnar nerve):

- Ulnar portion of the palm
- Ulnar aspect of the dorsum of the hand
- Dorsal surfaces of the 5th and ulnar half of the 4th digit

Along with the ulnar artery, the ulnar nerve passes through Guyon's canal at the wrist and then further divides to superficial and deep terminal branches.

Aetiology

Causes of ulnar neuropathy are listed in table 1 below:

Positional, for example compromise under general anaesthetic, cycling (4,5)	Trauma (especially fractures including childhood supracondylar humeral fractures, dislocations)
Subluxation of the nerve over medial epicondyle	Cubitus valgus
Joint deformities (Osteoarthritis, Rheumatoid arthritis)	Bony spurs
Tumours Ganglia (6)	Direct compression, for example leaning on elbow
Repetitive elbow flexion and extension especially in the workplace (7)	Constricting fascial bands

Table 1. Causes of ulnar nerve neuropathy.

Clinical Presentation Of Cubital Tunnel Syndrome

The presentation of this condition can vary to some extent from patient to patient. It presents with change in sensation or tingling of the 4th and 5th digits, elbow pain and nocturnal awakening due to pain. The patient might describe worsening of symptoms with repeated elbow and/or wrist flexion. (8)

The nature of the change in sensation can vary from a simple numbness to of burning pain or tingling sensation. The distribution of the affected area does not always fit the ulnar sensory innervation described in textbooks due to variation in the actual areas innervated by each nerve.

On other occasions, patients have described the affected area accurately, but the distribution can extent to include the complete ring finger, or even extend to the medial aspect of the middle finger. Of course the classic presentation would involve pain and sensory changes in the classical distribution of the ulnar nerve, i.e. the little finger and the medial aspect of the ring finger, with the distribution extending over the palmar and dorsal region of the hand. Also, lower motor neuron symptoms can present in the muscles supplied by the ulnar nerve.

Apart from a change in sensation, the presentation may be due to either pain or weakness. Pain is often noticed in the arm or over the elbow. Referred pain can be felt proximally or distally to the site of nerve entrapment. The degree of pain tends to vary with time, often with flexion of elbow, or increased usage causing worsening pain.

Clinical Examination

The history provides clues regarding expected findings on examination. A focused examination will confirm the diagnosis and should identify co-existing neuropathies of the medial or radial nerves if present.

The examination should include a careful inspection, comparing both sides in order to identify any muscle wasting (especially the interossei and hypothenar eminence), deformity and scars.

You may note muscle weakness, and in the event of chronic presentation, the classic clawed posture of the hand where the 4th and 5th interphalangeal (IP) joints are held in flexion, and the metacarpophalangeal joints of the first 3 digits in extension will be noticed.

CUBITAL TUNNEL DECOMPRESSION

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Masses or swellings should be excluded along the path of the ulnar nerve, especially above the elbow and in the retrocondylar groove.

The ulnar innervated intrinsic and extrinsic muscles of the forearm and hand (as described above) should be tested. Sensation is assessed to pinprick and light touch in all territories, including the palmar and dorsal cutaneous branches.

Provocative Tests

Clinical maneuvers that might aid to diagnosis include Tinel's test, elbow, flexion, pressure, combined elbow flexion with pressure and palpation for local tenderness and nerve thickening.

Tinel's sign at the elbow is said to be positive when the ulnar nerve is gently tapped at the ulnar groove and slightly distal to the cubital tunnel and produces paresthesia in the sensory distribution of the ulnar nerve.

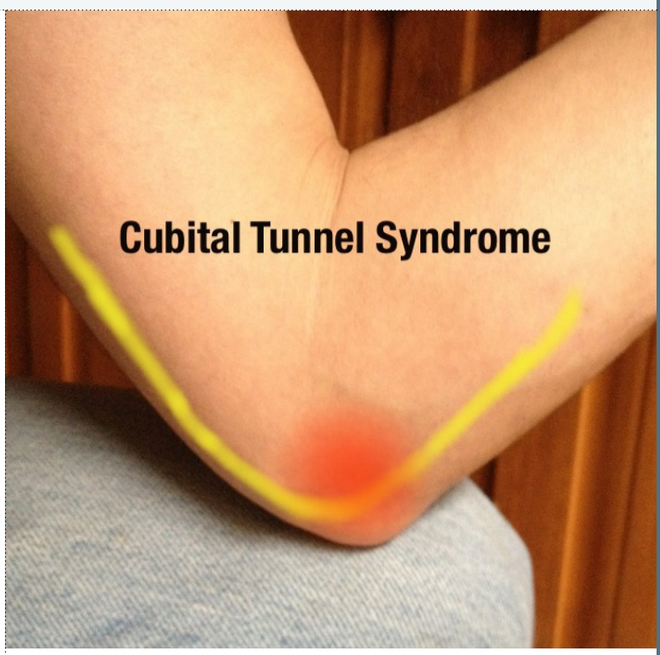
Froment's sign is a test used for ulnar nerve palsy. It specifically tests the action of adductor pollicis muscle. The patient is asked to hold a piece of paper between the thumb and index finger as the paper is pulled away. The patient with ulnar nerve palsy will flex the thumb to try to maintain a hold on the paper.

However, the sensitivity and specificity of these tests for ulnar neuropathy appears suboptimal. Beekman et al performed a prospective cohort study evaluating specificity, sensitivity, negative and positive predictive values for these provocative tests. (9) The study assessed 192 patients and 137 were diagnosed with ulnar neuropathy at the elbow using electrophysiological studies and neurosonography. The sensitivities and specificities were as follows (table 2):

Provocative test	Sensitivity	Specificity
Tinel's test	62%	53%
Combined elbow flexion	61%	40%
Palpation for nerve thickening	28%	87%
Palpation for nerve tenderness	32%	80%

Table 2. Sensitivity and specificity values for provocative tests in ulnar nerve neuropathy (at the elbow). (9)

Nerve conduction studies are helpful to confirm the diagnosis and should show slowing in the UN velocities across the elbow, although normal velocities may be maintained during early involvement. EMG may show fibrillations in the ulnar innervated intrinsic muscles.



Treatment

Conservative treatment includes lifestyle modifications such as avoiding elbow flexion. The use of soft foam elbow pad to reduce compression of the nerve and/or night splinting (45 degrees extension splint), alleviate compression during excessive flexion. If symptoms do not improve with splinting, then daytime immobilization can be considered.

Surgical treatment is offered to patients with clinical and electrophysiological evidence of moderate to severe ulnar neuropathy who have persistent weakness and numbness that is unchanged with conservative management.

Surgical Management

When obtaining consent from patients for cubital tunnel decompression, the following must be discussed:

- Wound complications including pain, numbness, infection, delayed healing (especially in immunocompromised patients), swelling, bruising and tenderness
- Surgical failure, defined as inability to provide relief for the patient's symptoms
- Recurrence of symptoms requiring further operations.
- Prolonged recovery, especially in severe cases of motor involvement. Motor function can take from 9 months up to a year to recover. This highlights the importance of nerve conduction studies in these cases not only for diagnostic reasons but also to aid prognosis.

After the patient is anaesthetised the WHO surgical safety checklist is performed.

CUBITAL TUNNEL DECOMPRESSION

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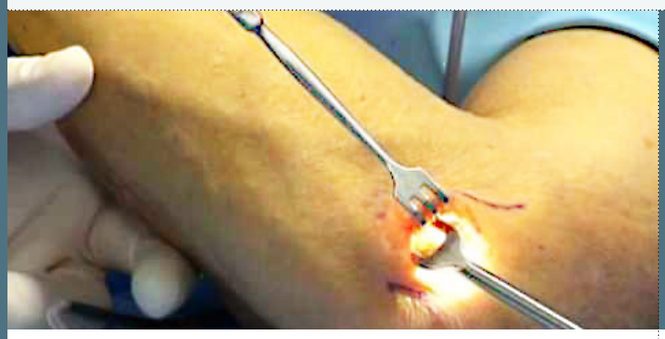

Cubital Tunnel Decompression.
Neurosurgery.

The surgical approach steps are described below (10):

· The patient may be positioned supine with an arm table (arm abducted and externally rotated) or in the lateral position with the arm over an 'L' prop.

· The incision is made in the posteromedial surface of the elbow (between the olecranon and the medial epicondyle of the humerus) beginning proximally and passing distally to the epicondyle, in line with the course of the nerve. (Image 1)

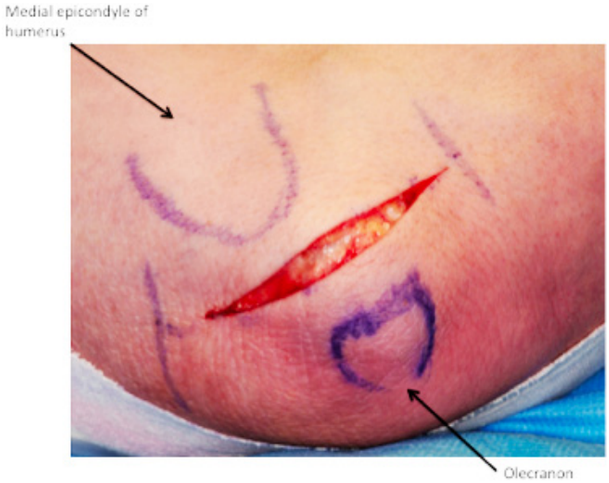

Image 1

· The anterior skin flap is reflected to expose the common origin of the flexor muscles. Avoid excessive retraction, which may damage the medial antebrachial cutaneous nerve.

· The ulnar nerve is identified in its groove posterior to the medial epicondyle and is freed of soft tissues using blunt dissection. (Image 2)

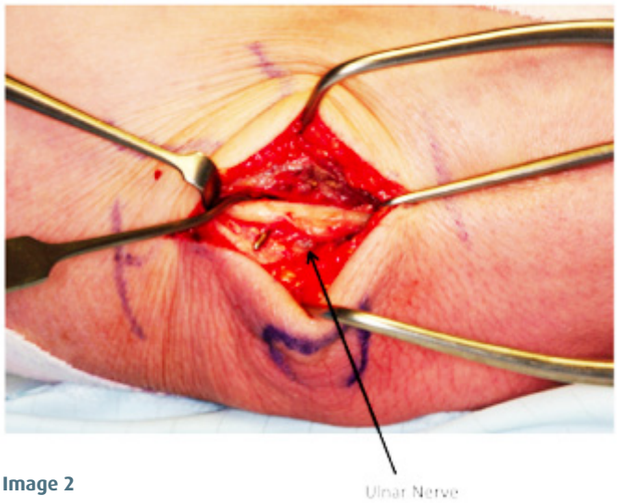

Image 2

· The nerve must be freed up proximally to the medial intermuscular septum and distally to the two heads of FCU. Any other tendenous bands that may constrict or otherwise injure the nerve should be excised and vascularity of the nerve maintained.

· The nerve should be assessed for instability after its release. Anterior transposition of the nerve should be considered if subluxation occurs.

· Other surgical procedures that can be performed include medial epicondylectomy, subcutaneous or submuscular transposition.

· The tourniquet may be deflated and haemostasis achieved before closure as postoperative haematoma may be significant in this area. Alternatively, the tourniquet may be deflated after skin layer suturing in order to allow for clearer visualisation during closure and to reduce the risk of nerve injury.

Post-Operative Care

The wound is protected in a soft bulky dressing, and early range of motion is allowed as tolerated. Physical therapy is started and continued to prevent secondary changes in the muscles of the hand. Appropriate splinting is continued until sufficient function has returned to allow the patient to be free of brace or splint.

CUBITAL TUNNEL DECOMPRESSION

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MCQs

Select the most appropriate answer:

1) Which of these muscles are innervated by the ulnar nerve?

A. Opponens pollicis
B. Flexor pollicis brevis
C. Flexor carpi ulnaris
D. Abductor pollicis brevis

2) Which muscle is innervated by both median and ulnar nerves?

A. Flexor digitorum profundus
B. Flexor digitorum superficialis
C. Pronator quadratus
D. Flexor pollicis longus

3) Clinical test for cubital tunnel compression include:

A. McMurray test
B. Allen's test
C. Phalen's test
D. Tinel's test

4) Which of the following is not a clinical feature of cubital tunnel compression?

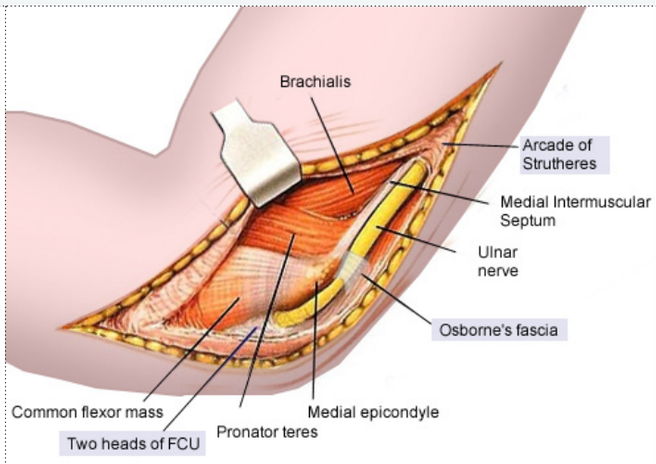
A. Hypothenar muscle wasting
B. Weakness of thumb abduction
C. Pareasthesia in the 4th and 5th fingers
D. Clawing of the hand

5) Which of the following are not recognized causes of cubital tunnel compression:

A. Joint deformities at the elbow
B. Trauma
C. Pregnancy
D. Ganglia

Answers

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



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SO YOU WANT TO BE A SURGEON? A REVIEW OF THE PROCESS AND A GUIDE TO BEING COMPETITIVE IN APPLICATIONS FOR A NATIONAL TRAINING NUMBER IN SURGERY

A Peckham-Cooper, J Joel, R Wilkin and S Davies

Abstract

Surgical training in the United Kingdom is a constantly evolving and competitive process poorly understood by junior trainees. Currently there are two significant major application steps (entry into core surgical training (CT1) and specialist training (ST3)) that trainees need to surmount to enter specialist registrar training in their chosen field. Historically surgical training has been a highly competitive speciality and this remains the case today with a reduction in the number of training posts available and an increasing pool of high quality candidates. Understanding the process, the basic requirements and some of the challenges associated with these at an early stage of training can only serve to aid individuals generate high quality curriculum vitaes and position themselves appropriately in this difficult job market.

This review aims to illustrate and simplify the current application processes for foundation year doctors and core surgical trainees whilst providing tips, observations, guidelines and a timeline, by which individual candidates can make sure they have completed not only all core components required but also additional desirable achievements that will make trainees competitive at both stages of the application process.

Keywords: surgery, speciality registrar, core training

Introduction

This review aims to clarify the process involved, identify the core elements required and highlight simple do's and don'ts that will make aspiring surgical trainees stand out from the competition.

Background

In 2011, there were 646 core surgical training posts in England, of which 2,680 applications were received from 1,355 candidates, a competition ratio of 4:1 (1) Progression to ST3 was, as expected, more competitive. Carr et al. (2011) reported that in 2010 there were 341 ST3 posts across all surgical specialties (excluding neurosurgery due to run-through training and maxillo-facial surgery due to duel accreditation) applied for by 2,178 candidates (1,988 unique applicants) giving a 6:1 ratio (2)

The process is set to become more competitive with calls for a reduction in National Training Numbers (NTNs) across surgical specialties to meet a reducing demand for Completion of Certificate of Training (CCT) holders. A clear example is illustrated by the parliamentary group, the Centre for Workforce Intelligence (CfWI), in conjunction with the British Orthopedic Association (BOA) who proposed a need for the reduction in trauma and orthopaedic NTNs by 30 over the next three years to meet workforce planning targets (3). This would raise competition ratios to 10:1 based on current application numbers.

Overview of Surgical Training.

Broadly speaking, Surgery comprises nine main specialties which have further options for sub-specialisation embedded within them. Most surgical specialties involve two years of Core Surgical Training, which follows on from the Foundation Programme. Typically, Foundation Training involves a wide spectrum of experience in specialties rotating on a four monthly basis. The idea is to provide junior doctors with a broad spectrum of core knowledge and experience. In some deaneries more 'surgical' themed Foundation Year 2 programmes are available to individuals but this is Deanery dependent and typically doesn't affect application to Core Training.

Surgical training begins with CT1 and CT2 years with, typically, four six-month rotations in sub-surgical specialties. Core Training is becoming increasingly 'themed' to provide trainees with at least one year of experience in the sub-specialty of their choice and one year in complimentary specialties. For example a Urology themed CT1/2 job may include the following:

- **CT1: 6 months Urology, 6 months lower GI Surgery**
- **CT2: 6 months Plastic Surgery; 6 months Urology.**

Often rotations include some time spent in a teaching hospital and some time in a district general hospital to give a mixed exposure to varied case-loads, treatment options and working practices.

From ST3 onwards, trainees can apply to higher training programmes and train in one of the following sub-specialties: general surgery, trauma and orthopaedic surgery, paediatric surgery, urology, cardiothoracic surgery, otolaryngology (ENT), plastic surgery, oral and maxillofacial surgery (OMFS). Neurosurgical trainees continue to be recruited in ST1 and then complete a run-through training programme. Specialty Training lasts approximately six years, after which successful trainees will be awarded a Certificate of Completion of Training (CCT).

Developing your CV

So, what do you have to do to make your CV stand out? In the following section we have divided the key areas in which competitive applicants should aspire to excel in order to give them a chance of success at the interview stage. These are the opinions and suggestions of the authors and not a didactic list.

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**So You Want to Be a Surgeon?
A Review of the Process and a Guide to being Competitive in Applications for a National Training Number in Surgery.**
Career Focus.

Operating and Logbook

Entry into surgical training requires applicants to understand, and provide evidence for their suitability to become members of the surgical profession (4). Given this all trainees are expected to have a documented record of their surgical experience from the outset of their professional training. The 'e-portfolio' is utilised initially during foundation years to record core competencies defined by the foundation programme curriculum. However this doesn't provide an opportunity to log surgical experience gained during this period including observed, assisted and performed procedures within a surgical environment.

Interviewers will expect candidates to be able to present a detailed account of their surgical exposure throughout the early years of training at whatever level this may be. If you are lucky enough, it is brilliant to have the opportunity to assist with cases. However, theatres with larger cases are usually crowded with more senior trainees and junior doctors are often busy covering the wards. So, it is as important to record not only these cases but the smaller surgical procedures individuals are involved in. Examples include insertion of arterial lines, incision and drainage of abscesses, excision of sebaceous cysts and assisting with appendicectomies. Indeed everything surgical trainees perform or merely observe should be recorded.

Several free online logbook services exist however the Pan-Surgical Electronic Logbook for the United Kingdom & Ireland (www.elogbook.org) (5) is now recommended throughout the surgical specialities and this is what the authors recommend to be utilised. Getting into the habit of recording your procedures in real time from the beginning of your Foundation Training is good practice. It will also provide a comprehensive and detailed log of trainees experience that many colleagues and competitors will find difficult to reproduce.

Assessment Tools

Workplace-based assessment (WBA) and feedback are central to the philosophy of Foundation Training and surgical training as a whole. Regular assessment ensures appropriate progression, provides documentary evidence of achievements and can be used to identify any problems that trainees are having early on (6). Used properly they provide a powerful educational tool to encourage feedback from trainers and allow a conversation to occur between the trainer and trainee with regards to strengths, weaknesses and identification of areas of development.

Throughout the pan surgical recruitment process individual's WBAs have held increasing importance as evidence of competence, progression and trainability. Indeed many candidates have come under heavy scrutiny particularly during the interview stages with regard to their lack of WBAs and an inability to demonstrate skill progression through the use of these.

Each Deanery has individual guidelines available for the minimum number of required WBAs at different stages of your training. The authors recommend that not only do you complete these as advised but try and perform as many as possible particularly focusing on demonstrating your skill progression. A simple guideline is to complete one a week.

For example, it may be the case that you perform, under supervision an incision and drainage of abscess and receive a 'level 2' assessment - able to perform the procedure, or part observed, under supervision. During your rotation you should strive to develop this skill and repeat this DOPS at a later date demonstrating your improvement and progression. Holding two or three WBAs for the same subject provides an easy way to demonstrate to interviewers that you are both trainable, self-reflective, motivated and someone who strives to improve their performance.

Teaching and Training

It is difficult to show excellence in teaching and training. One way is to take part in, or organise regular teaching sessions as most doctors will be offered the opportunity to teach or train others during their career. It is crucial to take these chances and then obtain some form of written feedback on the teaching, no matter how informal the session. It is this written feedback that provides your portfolio evidence of teaching, highlights your ability to learn and a desire to improve.

During the Foundation Years most teaching experiences will be undertaken with medical students, nurses or members of the multi-disciplinary team. Medical students are omnipresent on the wards and, jump at the chance to have doctor-led hands on teaching exposure. This may be at the bedside, in a small group or a more formal lecture based setting. From an application perspective individuals should record all these sessions, the numbers involved in the session, what was taught and reflect on changes that should be made. Design a simple feedback form to hand out at the end and spend some time collating the data and making a graph of the results for each session. In an interview it will be easy to display your experience, progression and, utilising the feedback forms, demonstrate how you have developed and changed your skills as an ongoing process.

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Whilst informal teaching will hold candidates in good stead, greater points are awarded in the application process for those candidates that have designed and run their own course or taught as a member of faculty on a registered college course such as Adavanced Life Support (ALS), Advanced Trauma Life Support (ATLS) or Care of the Critically Ill Surgical Patient (CCrISP). Whilst attending ALS, ATLS and CCrISP courses it is worth noting that candidates are being assessed throughout for instructor potential, which will allow you to become a faculty member should you be selected as having the desired attributes.

Running and designing an individual course requires more thought and can be logistically and financially challenging. Opportunities are available, however, to develop a study day in specialist areas for fellow trainees where perhaps knowledge and education is limited. Examples may include the use of regional anaesthesia in surgery or understanding local enhanced recovery programmes.

Courses and Continued Professional Development

Courses are an excellent way to support and consolidate your in-house training. There is a large selection of available courses to attend throughout the country. However, there are certain courses that should be considered a core requirement for surgical applications. There are also common courses that are taken by applicants to specific surgical areas. These are shown below. Once again this is not a didactic list but should provide a basis from which you can plan your professional development in the early years of training. It is worth remembering that courses are expensive and with reducing study budgets being provided by deaneries a large percentage of the cost of these courses will be met by the surgical trainee. Therefore, careful planning ahead and budgeting for these is strongly recommended.

For core-surgical training

- Advance Trauma Life Support (ATLS)
- Basic Surgical Skills

For higher specialist training

- Care of Critically Ill Surgical Patient
- Teaching the Teachers/Trainers

Audit

Clinical audit is defined as "a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change" and as such makes up a crucial part of clinical governance. Understandably, there is a strong emphasis placed on trainees to perform audits throughout their training. The intention is for trainees to develop an understanding and insight into the process of audit, develop skills in communication whilst implementing change and gain an insight into NHS structure and management.

In the early years of training there will be plenty of opportunities to become involved in service provision audits that make up part of Trust based requirements. Examples include drug chart, clinical notes and antibiotic prescribing audits. Whilst these are a quick and easy way to gain broad audit-based experience, your competitors will all have done these too and as such these will not make you stand out from the crowd.

The authors recommend aiming for 1 large audit (n>100) a year in addition to one service provision audit. Whilst this is inevitably more time consuming and difficult, large audits will provide much more scope with which to publish and present results to regional and national meetings as posters or presentations. Furthermore, following re-audit and completion of the audit cycle, they provide more opportunities to write these up as papers. Of note, in one author's core surgical training interview, a senior consultant commended the achievement of two large surgical audits undertaken in Foundation Year training but was also critical that these had not progressed any further and been presented or published, highlighting this as a wasted opportunity.

Research, Publications and Presentations

Throughout this article the authors have highlighted critical areas to optimize your CV in preparation for applications for surgical training. As a junior doctor the most daunting of these is often the requirement to produce publications and presentations. Medical students are familiar with writing up Special Study Modules and some are lucky enough to present their finding at meetings. The majority of Foundation Year doctors, however, are unfamiliar with this process. The easiest way to get started is to communicate with your colleagues. Registrars and SHOs will often have projects that are ongoing and will be looking for ambitious and committed juniors to take the initiative and help with data collection with the reward of a name on the publication.

As mentioned previously maximise the potential in the work you do. A good audit with sufficient 'n' numbers that has been well researched will often be of interest to relevant regional and surgical meetings. This may be as a poster or presentation and as such will produce both an audit and publication for your CV.

Case studies are becoming increasingly difficult to get published in the large journals. However interesting cases can still be written up and submitted to online journals such as the International Journal of Case Studies, which specialises in publishing such articles.

Larger, more formal research work is often not expected of candidates at this stage of training unless they have undertaken a period of Out Of Programme Experience for example, an MD or PhD, in which case interviewers will have higher expectations of a candidate's career and professional development.

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Post Graduate Exams

To be eligible to enter higher surgical training at ST3 level you need to have passed the Intercollegiate Membership of the Royal College of Surgeon's examination (iMRCS). The examination is completed in two parts, which include:

Part A - Four hour MCQ examination consisting of two papers, each of two hours duration, taken on the same day.

- Paper 1: Applied Basic Sciences
- Paper 2: Principles of Surgery in General

Part B – OSCE examination.

Although not a mandatory criteria for entry into Core Surgical Training, many candidates will have passed part A of the iMRCS exam before applying for Core Training. While this provides an excellent demonstration of commitment to the specialty, it will also provide candidates with fundamental basic science knowledge and an insight into core surgical principals in preparation for the interview stages of the application process.

There is no particular time schedule that the authors would recommend for sitting your post-graduate exams. However, there are several things to consider when planning your academic activities.

Part A examinations are held three times a year in January, April and September and applications for these close three months in advance. In order to have sat the exam and have the results in time for applications to Core Surgical Training you either need to do this as a FY1 or look to sit the September exam one month after starting your FY2 training. In addition to this, it is worth taking into consideration that passing the exam is far from a foregone conclusion. Whilst the new format iMRCS examination is a very fair test of basic science knowledge and clinical acumen, it requires hard work and a period of focused and concentrated study to be adequately prepared. This is often the first time that many candidates experience the difficulties of juggling a full time career with a massive extracurricular workload and can inevitably prove a challenging and stressful period for junior doctors.
Part B of the iMRCS is an OSCE format. The exam is designed to mimic 'a day in the life of a senior surgical SHO/junior Registrar' and as such candidates often find this less challenging after a period of working as a surgical SHO in a variety of specialities. It is our advice that candidates should embark on this as soon as they feel comfortable, there is a lot to achieve in the early years of training and much of this is conducted in your own time. Completing the exam early consolidates knowledge and provides a solid grounding from which to establish your reputation as a competent SHO. Importantly, it also allows eligible candidates to focus on other extracurricular activities.

Importantly, don't forget when planning the next three years, there is the realistic chance that you might fail and may need to re-sit a part, or parts of the examination.

Summary

This overview is not designed to scare potential trainees away from a career in surgery but instead to focus your mind on to specifically what is required to be competitive in the job market. It is hard work but also remarkably rewarding and satisfying. Each achievement will broaden your experience and develop trainees as both individuals and as doctors.

Some of the key points are summarised in the list below. Remember to enjoy the early years of your training and good luck with your future surgical careers.

- Keep a surgical logbook from the outset
- Complete more than the basic requirement of work based assessments, and endeavour to show progression within them.
- Make a plan early with regards to exams and courses. Write application deadlines in your diary so you don't miss out.
- There are plenty of projects going on. Take the initiative and volunteer to do some of the data collection for your Registrars or Consultants. It may not be glamorous but the rewards are often greater than doing something yourself.
- Enjoy it.

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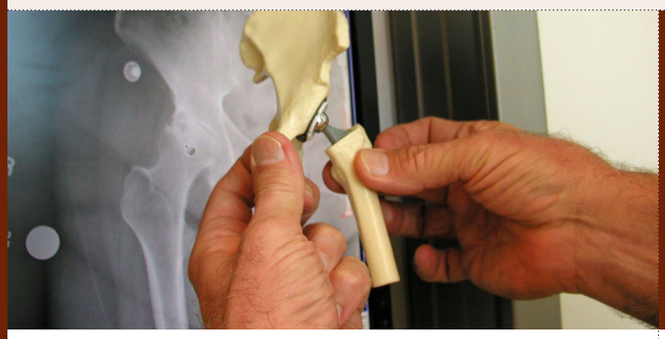
A GUIDE TO SIMULATION FOR THE ORTHOPAEDIC SURGEON

J Nichols, NA Ferran, DJ Bryson, RU Ashford, B Bhowal and JJ Dias



A guide to simulation for the orthopaedic surgeon.
Current Training Issues.

Abstract

While the complexity of health care delivery continues to grow, tension between service commitments and training in the National Health Service (NHS) has increased with the reduction in trainees' hours. Innovative and new methods of learning need to be utilised to compensate for this reduction in training time. Rather than 'time-based' training, trainees are being moved towards competency-based training. Simulation presents one way of reconciling the conflict between service provision and a reduction in working hours and training.

The use of simulators is not a new concept. The airline industry has widely embraced flight simulators while in the medical realm simulated manikins have been employed in resuscitation training for more than half a century. Simulators afford surgical trainees the opportunity to develop and refine critical technical skills. With advancements in technology have come marked advances in the quality and capacity of simulators and associated computer programmes.

However, questions persist over 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. This review examines the current use of simulators as a training tool in orthopaedics and explores potential future developments in this field.

Keywords: simulation training, EWTD, orthopaedics

The need for new training methods

While the complexity of health care delivery continues to grow, tension between service commitments and training in the National Health Service (NHS) has increased with the reduction in trainees' hours. The challenge now therefore is to continue to deliver high quality training within the current service constraints. Patient care and safety remains the priority, however, the current model of service provision relies on trainees to deliver much of this care, particularly out of hours. Following implementation of EWTD, the Association of Surgeons in Training (ASiT) / British Orthopaedic Trainees Association (BOTA) surveyed 1,600 surgical trainees and showed 84% of respondents worked in excess of their rostered hours and 67% were attending work out of rostered time to gain training experience [1].

Innovative and new methods of learning need to be utilised to compensate for this reduction in training time. Rather than 'time-based' training, trainees are being moved towards competency based training, while accreditation bodies now mandate demonstration of competence prior to certification. Simulation presents one way of reconciling this conflict between service, hours and training.

In the age of Facebook and Twitter, trainees are becoming increasingly adept at using digital technology [2]. 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. This review considers where we are at present and the likely future developments in this field.

Here in Leicester, we are in a unique position to be able to offer our experiences. Leicester University has been using simulated patients for over a decade, and the Virtual Ward Round project offers our medical students access to an ever-growing database of virtual patients. The Orthopaedic Bioskills laboratory at the University Hospitals of Leicester has been renovated and refurbished in the Leicester Royal Infirmary. Leicester trainees and trainers now have access to the insightARTHRO VR® simulator and arthroscopy training stacks. The insightARTHRO VR® simulator is an advanced arthroscopic training simulator that allows users to learn and improve minimally invasive surgical techniques. Now established, we are running projects to examine if increased training on a virtual reality simulator correlates with improved performance. Uniquely, this is not an isolated teaching course, but forms part of an ongoing training programme.

Developing Simulators

The effective use of simulation can help to lessen the impact of reduced hours and shift working by accelerating the acquisition of technical skills and transferring learning away from the patient [3-6]. In 2006, Lord Darzi re-introduced the concept of simulation based training to surgeons [5], and the Temple report [3] 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 [4,6,7-8].

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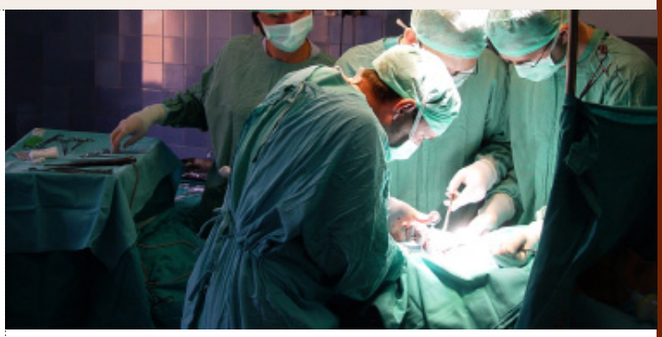
The use of simulators is not a new concept. The airline industry has embraced simulators for many years to supplement pilot training and flying hours. In many professional flight schools, initial training is conducted partially in the aircraft, and partially in relatively low-cost training devices such as Flight and Navigation Procedures Trainers (FNPTs) and Flight Training Devices (FTDs). As the student becomes familiar with basic aircraft handling and flight skills, the portion of flight training conducted in these devices increases significantly. For more advanced aircraft-specific training, Full Flight Simulators (FFS) are used. For many commercial pilots, most aircraft orientation and recurrent training is conducted in high level FTDs or FFS. In comparison to training in an actual aircraft, simulation based training allows for the training of manoeuvres or situations that may be impractical (or even dangerous) to perform in an aircraft, while keeping the pilot and instructor in a relatively low-risk environment on the ground. For example, electrical system failures, instrument failures, hydraulic system failures, environmental system failures, and even flight control failures can be simulated without risk to the pilots or aircraft.

Simulators have been used for many years in medicine. In 1960, the Resusci Anne® (Laerdal Medical, Orpington) manikin was first used in cardio-pulmonary resuscitation training. The baton has now been handed over to the gaming industry, where patient simulators are now used to replicate realistic physiological responses to an ever-increasing range of defined clinical interventions on sophisticated mannequins.

Instructors can now create, control, and deviate clinical scenarios through sophisticated software and in this way optimise learning opportunities. Recent studies have shown that not only did 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 [6-7, 9]. Each hour spent on the simulator reduced the time taken to achieve proficiency on a real case by almost 2.3 hours. Not only is simulation a more cost effective method of training, but it also leads to enhanced levels of patient safety and trainee confidence [5-7].

Simulators in Trauma and Orthopaedics

Orthopaedic surgeons have been using simulation in different forms for decades. AO courses have used sawbones to teach surgical management of common fractures. Practical sessions involve the fixation of common diaphyseal and articular fractures on real size artificial bone models, using AO instruments and implants. The use of cadaveric specimens is common on orthopaedic courses, e.g. basic hip and knee arthroplasty, and basic knee arthroscopy. Standardised and simulated patients are widely used especially in the assessment and training of undergraduates. Orthopaedic surgeons are therefore well experienced in simulation for training and probably lead the medical profession.



Simulation in training can involve every aspect of technology assisted learning, from Virtual Patients, to computer based learning, in which patient cases unfold in response to learner input, standardised patients, manikins, part task trainers, and systems requiring specialist equipment. Although other aspects are discussed in this review, we will concentrate on simulation based training requiring specialist equipment that is entirely virtual (i.e. the patients and effects are all simulated).

Arthroscopy lends itself to simulation. Firstly, triangulation is a technique that needs to be learnt. It is something that does not come naturally to all surgeons and experience is necessary. Traditional teaching was that one only became competent after doing a minimum of 50 procedures. Studies on virtual reality simulators as well as operating-room records have shown that operative time is associated with surgical experience. The ability to learn triangulation on a simulator is therefore appealing. Howells et al. noted improvement in economy of movement with simulated training [4, 9].

Basic skill acquisition is better away from patients in many disciplines, and early competence levels are acquired more quickly this way. It is important to protect teaching time where the trainee can use a range of tools to achieve educational objectives. Such simulated learning would reduce the number of cases needed before the trainee becomes useful and participates actively in the procedure. It will also reduce the time per procedure and those procedures the trainee participates in will be used more effectively. Pedowitz et al. [10] asserted that early arthroscopic learning is often associated with substantial patient morbidity, often because of articular cartilage damage. If we can improve the technical skills of trainees outside the operating room, we may prevent avoidable harm to patients.

Arthroscopic computerised simulators are available that allow users to learn and improve minimally invasive surgical techniques. Virtual reality techniques constitute a supporting tool to enable learning of the arthroscopic environment as well as manual coordination with an arthroscopic instrument. The simulator also focuses on the maximisation and evaluation of the educational process through the appropriate categorisation of the difficulty of exercises, skill evaluation techniques and multimedia tools.

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Arthroscopic simulators teach surgeons the essential skills of triangulation, camera orientation, and hand-eye co-ordination. The systems typically use two haptic devices that allow the user to mimic surgical procedures using such tools as a probe and a burr. While surgeons follow training modules on a computer screen, the haptic devices they hold literally "push back" on their hands as they perform virtual surgery on physical 3D knee and shoulder models. In addition, the system generates realistic sounds and can assess skills.

Computerised simulators also have the advantage of an intrinsic mechanism to record the usage and progress of an individual trainee through a series of exercises. These can vary from simple navigation to more complex procedures. The ability to playback the recorded arthroscopy with the Trainee enhances the learning process.

There are disadvantages to simulators. Despite providing haptic feedback, a computer can never exactly replicate the feel of a human knee or shoulder. The computer model does not allow a figure-of-four position for the knee, which is a key position for many surgeons during a routine knee arthroscopy. The cost of cadaver specimens, and the need for specific facility to use these, can mean that these are not a real alternative for most centres.

Training arthroscopic stacks offer more familiar equipment, where trainees can carry out arthroscopic procedures on bone and plastic models (eg. Sawbones, Washington, USA) using the familiar arthroscopic equipment. This allows them to perform instrumented procedures, such as menisectomy (with multiple tear configurations available) and retrieval of loose bodies within the knee joint. Shoulder and ankle joints are also available that allow the trainees to perform simple procedures including debridement, cuff repair with anchor fixation and other similar techniques.

While these offer a useful alternative to allow all grades to practice skills there are again certain disadvantages. Unlike the simulator, the these models do not have an inbuilt mechanism to record the trainee's progress and time spent in the acquisition of these new skills. These parameters, however, might be reflected in an improved performance in theatre, and measurably on workplace based assessments such as DOPs or PBAs.

These two types of simulators may provide two different opportunities: the computerised simulator for the junior trainee (CT1, 2 and ST3) looking to establish the principles and diagnostic technique, while the training stack may allow the more experienced trainee to hone their skills at interventions such as menisectomy.

Howells et al [4,11] have shown that orthopaedic trainees who have undergone a period of laboratory-based arthroscopic simulator training go on to demonstrate improved technical performance in the operating theatre compared with an untrained group. This transfer validity is of importance to those responsible for planning training curricula, and suggests a future role for the incorporation of simulator-based training for procedure skills.

Simulators currently available are focussed on knee and shoulder arthroscopy but are being expanded to include the ankle, wrist, elbow and hip. Clear learning objectives will be required at all stages, and this type of simulation will add realism and complexity in assessments [12,13]. Despite the increased breadth of technology-enhanced learning, the key principles behind effective teaching and learning still apply: whatever the technology or mode of delivery, learning should be the key objective, and pedagogy rather than technology should drive the decision making - whether the process takes place at the level of an individual devising activities on the simulator, or involves the work of a team in orchestrating learning activities which involve the use of the simulator technology as part of a learning session or programme [14].

Effective training delivery

Before setting up a simulation programme within any training programme we must ask ourselves "What is the purpose of this?" Higher education platforms and websites are littered with empty wikis, deserted discussion forums, and rarely visited online course areas. This may be due to several factors, but often there is insufficient purpose to the intervention. We should not be solving problems that do not exist. Any simulation should be built into the regular face-to-face training programme, or its assessment structures, and trainers must be committed to set up and maintain activities.

E-learning rarely works where there is little support or recognition that it is time consuming for the trainer, and requires the trainer's presence as much as during other types of training. In a study presented by Paul Brennan at the "Surgical Simulation: Problems and Pitfalls with Pretending" conference at the RCSEd in February 2011, over 50% of those 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.

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We must therefore make sure that such systems are easily accessible. For instance, they should be embedded in working areas to allow ready access by trainees. Time must be taken to help trainees, and oversee training, including logging, booking time, teaching, maintaining and developing. Their performance should also be assessed to ensure these experiences are meaningful to the trainee.

Conclusion

So rather than asking the question "Does surgical simulation work", we should be asking how can we, in the formal, guided process of orthopaedic training, use the power and potential of recent electronic media to enable our trainees to learn better from us, and from each other, and independently? Challenges will no longer be in the development of the technology, but in bringing about a change in medical culture and policy. In America and Australasia, evidence of simulation based training is currently required in revalidation. This currently takes the form of CPD credits accumulated in areas of technical and non-technical skills. Evidence of simulation based training in CPD credits may be required in the UK in the future for revalidation, assessment and re-licensure. It is therefore beholden on us as trainers and trainees to maximise the training opportunities in the face of the twin pressures of reduced training and increased service commitments.

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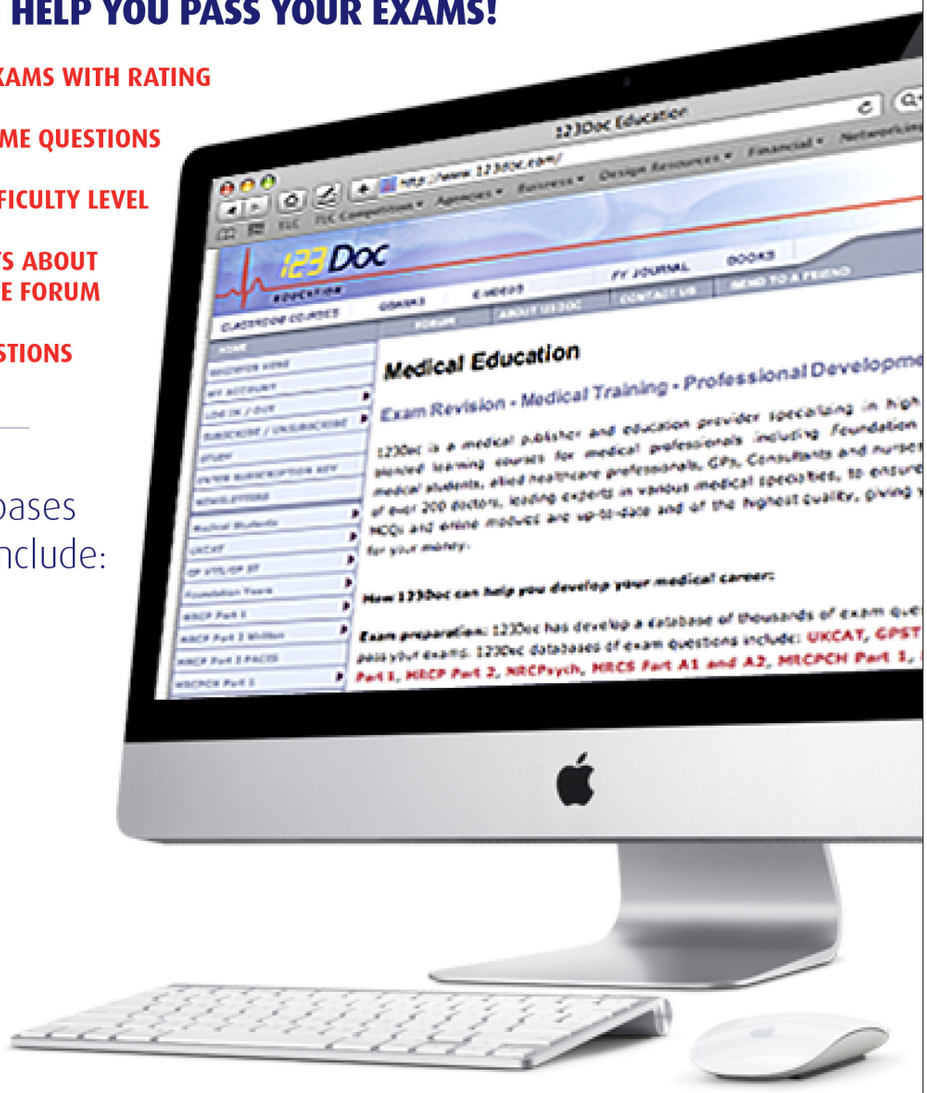

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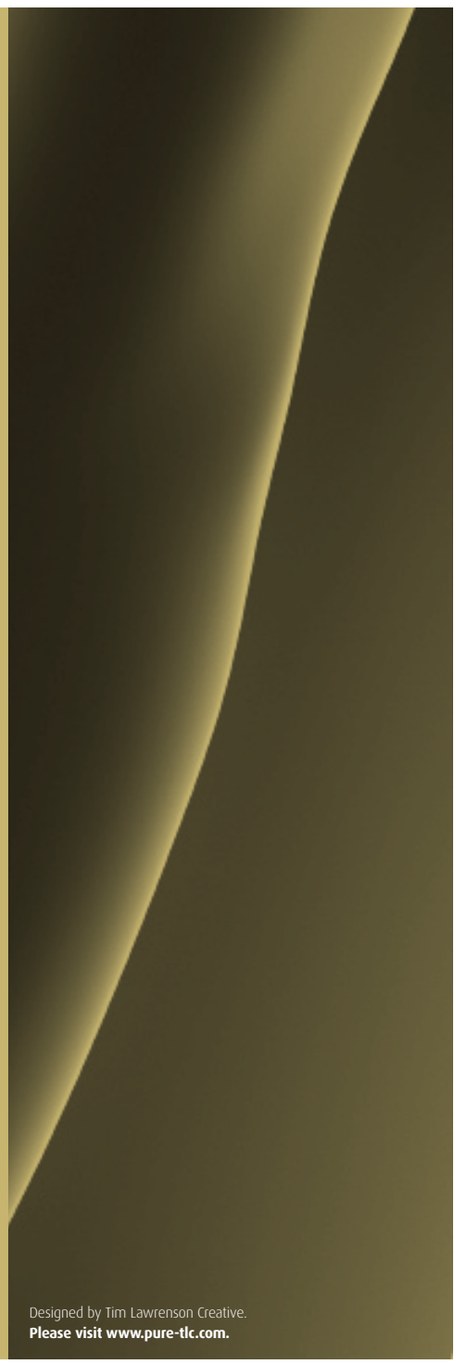

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