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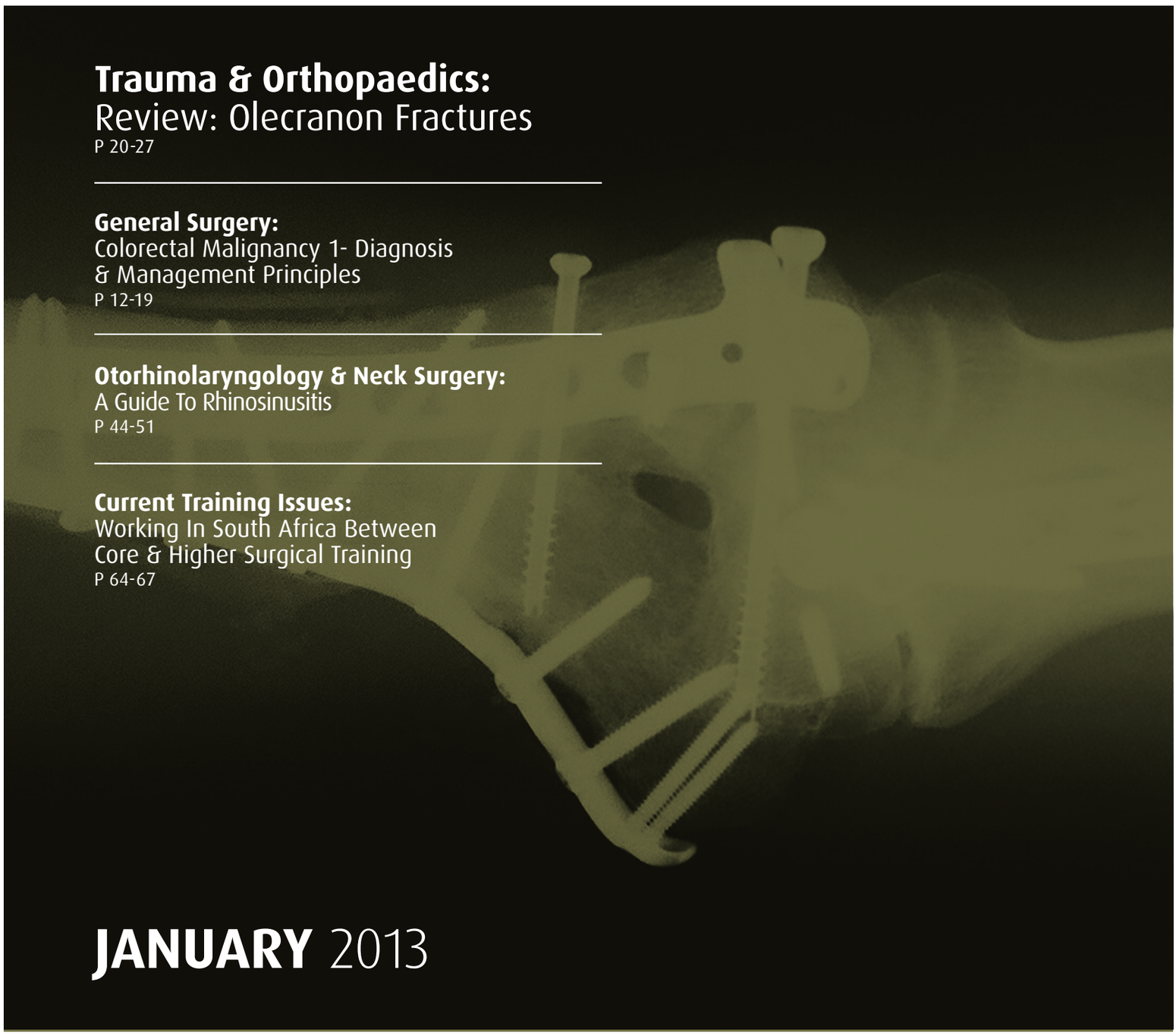
CORE SURGERY JOURNAL

Volume 3, Issue 1



JANUARY 2013

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Dear Prospective Authors

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.**

Copyright

Articles accepted for publication become copyright of *Core Surgery* and authors will be asked to sign a transfer of copyright form. In signing the transfer of copyright it is assumed that authors have gained permission to use any copyrighted or previously published material. This includes all images taken or copied from books, articles, websites etc. All authors must read and agree to the conditions in the copyright agreement form and either sign the form or agree that the corresponding author can sign on their behalf. The copyright form will be issued on acceptance of the article.

Format of Articles

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 salient points. Articles should be set out as follows:

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

Audit

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

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Review Articles

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

Course Reviews

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

Research Papers

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

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.

How To Order

A GUIDE TO TEACHING THEORY & TECHNIQUES USED BY SURGICAL TRAINERS

JS Nichols, RU Ashford, S Williams

Abstract

Good Surgical Practice defines that "Surgeons should be willing, as part of their professional practice, to engage in the training and supervision of students, trainees and other members of the surgical and health care team". In specific relation to medical students, the Association of Surgeons in Training (ASiT) states that surgeons should encourage and support medical students, involving themselves actively in teaching if students are attached to their team (1). Teaching, training, appraising and assessing doctors and students is important for the care of patients now and in the future.

Keywords: surgical training, teaching, surgical appraisal

As doctors, we should be willing to contribute to undergraduate training. GMC good practice guidelines state that those who are involved in teaching must develop the skills, attitudes and practices of a competent teacher (2). Most recently the GMC has stated that trainers will need to be recognized and that this recognition will require evidence of activity mapping to seven domains specified in the document GMC Aug 2012: Recognising and approving trainers. As a trainer, you will be required to collect supporting evidence.

The majority of post-graduate surgical trainees deliver teaching to medical students, most have had no formal training in teaching methods, nor been assessed in the quality of their teaching. As a result, teaching is often variable and suffers from failures of implementation. Much of our experience in teaching originates with clinical encounters at the patient bedside, where the teaching provided is often opportunistic, and as such presents challenges to the teacher and the student.

A guide to teaching theory & techniques used by surgical trainers
Back to Basics

The opportunities to see and assess patients in clinical practice are constantly shrinking in the surgical specialties, for example, patients are often admitted on the morning of surgery. Such emphasis is placed on providing surgical opportunities for trainees there is often a lack of time in the workplace to allow for reflection, resulting in feedback which is often delayed or inadequate.

A recent survey performed by ASiT provides some insight into the current delivery of medical student education. The survey shows that: not many trainees have received formal educational training, even less have received feedback from peers on the quality of their teaching, teaching by trainees often occurs in their own free time and when they are at work they are locked into set activities without allocated teaching sessions (1).

Surgical trainees currently find it difficult enough to meet their own training needs within the allocated workplace time. Rarely is there dedicated time available for them to teach others. There is certainly no time for preparation of learning material or for reflection, critical evaluation and modification of the delivered session. Feedback forms are rarely used or poorly developed to evaluate the session properly. Rarely is there a plan in place for supervision of any delivered session by an experienced educator to aid evaluation and provide objective educator feedback. As a result there is a risk that delivered sessions fail to improve and quality suffers.

This article aims to cover some of the common teaching theories that may help you in your own teaching practice.

My initial experiences of teaching were based in the dissection room, teaching anatomy. Behaviourist theories centre on the concepts of rote learning, repetition and drilling, which advocates of the theory would suggest are necessary to convey basic facts. Repetition is often required to convey facts, as a new and complex language of anatomical teaching is learnt. However, this results in a very teacher centered session, with students taking a very passive role in their own learning (3).

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JS Nichols, RU Ashford, S Williams

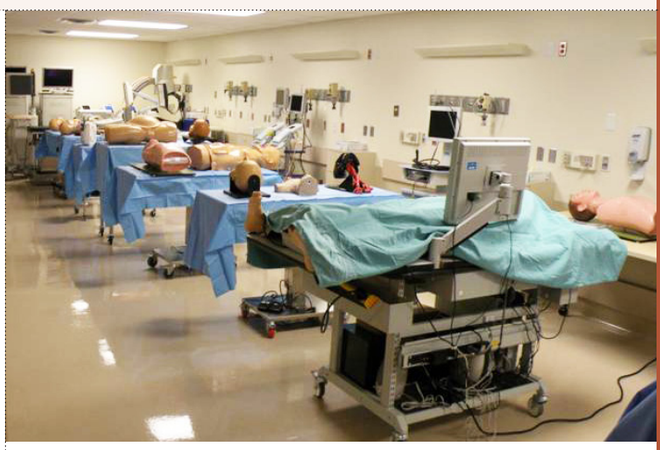
As my own learning has expanded, I have aimed to include a more constructivist attitude to the student learning. When approaching these sessions now, I find the teaching more successful if I can apply context, with clinical problems and examples. The constructivist approach to learning is based primarily on the work by Piaget (4), Vygotsky (5) and Bruner (6). Here the teacher should not be viewed as a transmitter of knowledge, but as a guide who facilitates learning. The facilitator can generate interest, enthusiasm, provide relevance through citation of examples based on experience and give essential purpose and context to learning.

Entwistle (3) tells us that this approach may foster a deeper learning. Initial sessions may have been considered to only encourage "surface learning" as described by Entwistle, where facts are learned without meaningful structure. In placing the facts in a clinical context, with the use of X-rays, clinical examples and other tools, I hope to encourage "deep learning", whereby students can develop meaning on the grounding of the factual information, and internalise their learning. Prosser and Trigwell (7) state that this deep approach to learning is more likely to be associated with higher quality learning outcomes.

Although this style of learning may generate a more stimulating and challenging educational environment, traditional knowledge based assessments of curriculum outcomes have shown little or no difference in students graduating from problem based learning or traditional curriculums. While some constructivists argue that "learning by doing" enhances learning, critics of constructivism have argued that little evidence exists to support this statement with novice learners.

Sweller et al (8) argue that novices do not possess the underlying mental models or "schemas" necessary for "learning by doing". Kirschner, et al. (9) describe constructivist teaching methods as "unguided methods of instruction". They suggest more structured learning activities for learners with little or no prior knowledge. Novice learners with no primary experience of the situation are more likely to adopt a child-like style of learning as they are unlikely to be able to draw on any relevant similar experience. They criticize a problem-based learning (PBL) experiment for medical students, who did not perform as well on a written test as traditionally taught students. The (PBL) medical students demonstrated better clinical skills, but were less efficient, ordering more unnecessary investigations. Nevertheless, some critics of Kirschner et al. have argued that they personally would prefer the better clinical skills, regardless of written test performance.

Clinical teaching - that is teaching and learning directly involving patients and their problems - is the largest part of my teaching practice. Learning in a clinical environment has much strength. It is focused on real problems, with students motivated by relevance and active participation. It is the only setting where the skills of history taking, physical examination, clinical reasoning, decision making, empathy and professionalism can be taught and learnt as an integrated whole.



Clinical teaching draws on one of the most widespread theories of learning from experience, which is associated with David Kolb (10). Kolb suggested that learners must be able to immerse in new experiences which require reflective skills and multiple views of observation. Learners must then be able to conceptualize the observations and the experiences by integrating them into theories, and finally they must be able to use these theories for making decisions and solving problems. As teachers, the most effective application of the model is to use it to ensure that teaching activities give full value to each stage of the process (11, 12, 13). For example:

Planning (Pragmatist): Students will try brainstorming for relevant symptoms and signs. This helps students to draw from their primary experience, activate prior knowledge, orientates them and provides a framework and structure for the session.

Experience (Activist): Students will interview a patient in pairs under supervision, and perform a focused physical examination. This gives them the opportunity to implement and practice skills.

Reflection (Reflector): Feedback and discussion away from the patient provides opportunity to confirm correct procedure and techniques, identify learning points both positive and negative, raise topics for self directed learning, set tasks to facilitate planning, generate discussion.

Theory (Theorist): Providing the basic facts about the patient diagnosis, investigation and management helps students to link the practice with theory.

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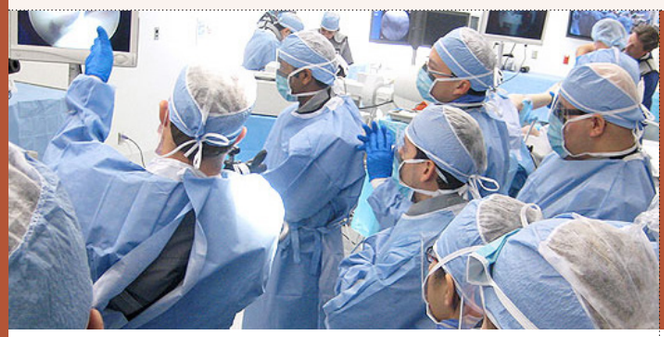

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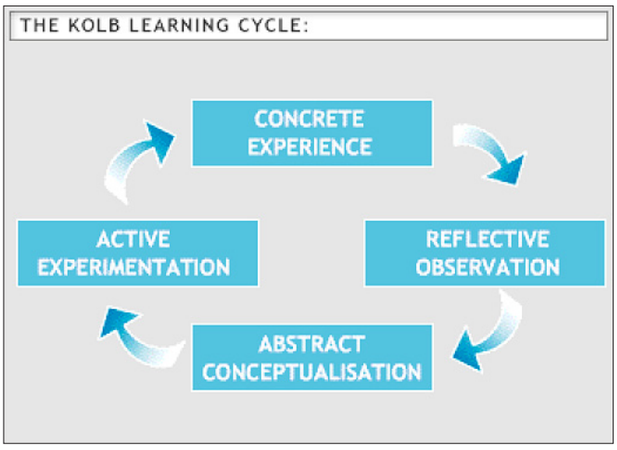
Back to Basics



In order to complete Kolb's learning cycle, it is important to return to the planning stage. To allow students to prepare for the next clinical encounter, and evaluate their progress, a debriefing, with questions such "What have I learnt?", and "How will I approach a patient like this next time?" can help students articulate areas where they may be having difficulty, or which they wish to know more about. Patients themselves may also be used for feedback on communication skills, attitudes and bedside manner. Structuring clinical teaching in this way is very much student centered in its approach, and as well as Kolb draws on both the constructivist theories and theories of adult (androgogic) learning. It is also designed to foster "deep" learning, one of the concepts introduced by Entwistle (3).

One of the unique characteristics of teaching in the clinical setting is that learning is dependent on the patient problems available at that time. This means that both the student and teacher must be opportunistic in identifying learning opportunities that are appropriate, and teachers in providing timely, targeted feedback. Clinical teaching is being recognized by some as central to the whole curriculum in undergraduate medical education and not just reserved for the clinical years.

Because of the increasing inclusion of problem-based learning focused on clinical cases in the preclinical portion of medical school, clinical teaching is being introduced in these early years to help illustrate the basic sciences, and as mentioned, to allow students to place these facts in context. This early introduction of clinical teaching in the preclinical years allows students an opportunity to practice their clinical skills and gain assurance and confidence in the quality of their capabilities prior to working with real patients.

Problem based learning also draws on Knowles principles of adult learning. It aims to motivate the students, encourages them to set their own learning goals, and to participate in decisions that affect their own learning. Knowles (14, 15) defined "Andragogy" as "the art and science of helping adults learn". In this he made certain assumptions. Firstly he states that adults are independent and self directing. We must therefore involve them in planning and curricular content, and in formulating their own learning objectives.

Secondly Knowles states that adult learners are more motivated to learn by internal drives than by external ones. We should therefore involve adult learners in identifying their own needs, which will help to trigger internal motivation. Essentially adult learners are likely to challenge what they are taught based on their primary experience.

The degree to which they will do so obviously varies with their exposure to that situation. If their exposure is minimal or non-existent they are more likely to accept what they are taught and behave more as paedogogic learners.

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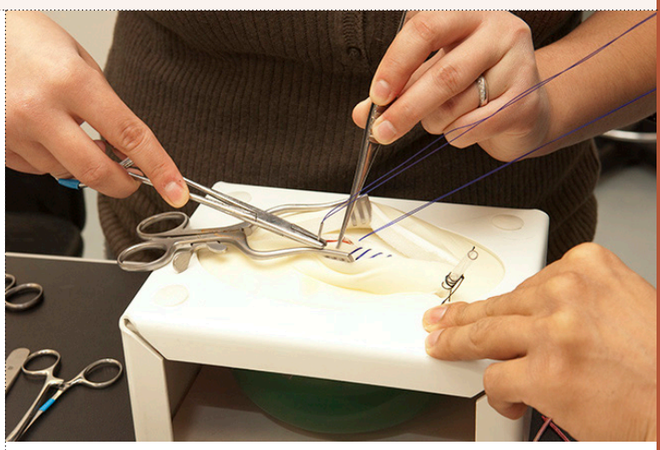
Critics of Knowles' approach to adult learning suggest that it does not adequately reflect that while adult learning is often self-motivated it is not devoid of a student's need for an instructor who can provide guidance to learning and provide the framework for students to succeed. Kerka (16) also addressed some concepts of self-directed learning. The first is that adults are naturally self-directed, when, in reality, their capability for self-directed learning may vary widely. The second is that self-direction is an all-or-nothing concept - it is apparent a continuum exists. Adults have varying degrees of willingness or ability to assume personal responsibility for learning. These may include the degree of choice over goals, objectives, type of participation, content, method, and assessment. Lesser motivated learners may profit from a more teacher-directed approach.

So what about assessment? Brown et al (17) state that assessment tends to shape much of the learning that students do. We know that students may focus strongly on what they believe will be in the examinations, and prepare strategically. Brown suggests that if we want to change the way our students learn, and the context of what they learn, the most effective way is to change the way we assess them. In order to achieve this, we must consider the 4 criteria that allow us to evaluate the advantages and disadvantages of assessment. These are validity, reliability, discrimination and practicality.

Assessment can be seen as a sampling process, whereby we take the totality of intended learning, and test the student on a fraction of it, so that we can say that they have reached a satisfactory level of understanding and performance. As with any sampling process, we must ensure that it is valid. Gipps (18) states that if an assessment does not measure what it is designed to measure (or doesn't measure a wide range of learning objectives for a module or course), then its use is misleading.

He described Reliability as the 'accuracy' with which an assessment measures the skill or attainment it is designed to measure, and Discrimination as the extent to which an assignment allows for differences in achievement to be recognised. Ramsden (19) argues that student will adopt a surface approach to learning or a deep approach, depending on how they perceive the learning context, and most crucially, how they perceive the assessment task.

Changes in the post-graduate assessment are also filtering down to the undergraduate level. Work places based assessments, including the CBD (Case Based Discussion), PBA (Procedural Based Assessment), CEX (Clinical Examination Exercise) and Mini-PAT (Peer Assessment Tool) are tools used for continuous assessment at all levels. These allow competence and also underperformance to be documented. Although these tools have great versatility, they depend on the relationship and experiences of the trainer and trainee working together to be able to use it to its best effect.



There is a recent shift away from the use of the traditional workplace based assessments. Supervised Learning Experiences (SLEs) are being introduced to improve interaction and feedback between the trainee and trainer. The old style assessments being viewed as tick box exercises as cited in the BMJ 29th Sept 2012 careers pg5. Trainees are required to keep records of reflective practice in their portfolio and log book of surgical procedures, and these tools encourage that practice. It is hoped that reflection will be used to evaluate failing trainees, to extend good trainees, and to develop evaluation skills.

The use of continuous assessment, with more emphasis on work placed based assessments is being used increasingly in the undergraduate curriculum, led by Dundee and Liverpool. Whilst these assessment tools are described as having no value on their own – except for giving feedback, and should be thought of as "formative". En mass in a portfolio with other evidence however, they have will have summative value.

Critics have suggested that whilst these assessments may meet the criteria of validity and reliability, it is hard to see how such an increase in the number of assessments make these practical, or fully allow discrimination between trainees. The large number of assessments may lead trainees to view them with skepticism, and they risk losing meaning as an effective form of feedback. However, as with many vocational courses, this type of formative assessment can be used encourage students to reflect on their own progress, and to set further targets, including action plans or learning agreements.

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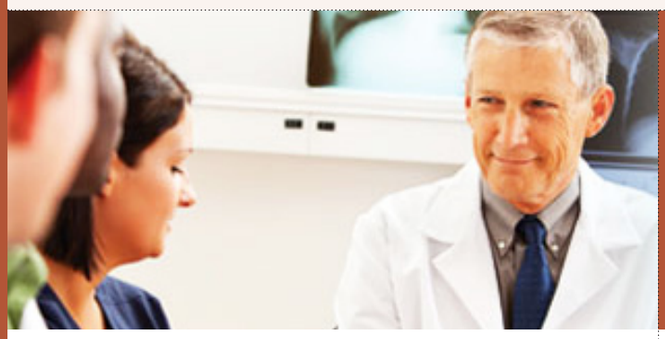

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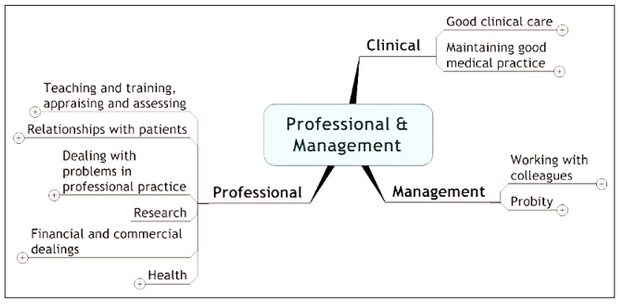
Within the new curriculum, there has been more focus on the "non clinical" aspects of the syllabus. The new Senate of Surgery Continuing Professional Development (CPD) classification (Clinical, Professional, and Management) aims to provide an ongoing framework which also maps to Good Medical Practice. In doing so, they aim not only to create an accessible syllabus for non-clinical skills but also lay a foundation for lifelong learning (and CPD) that will serve trainees as well as consultants. The focus of the Professional & Management syllabus is on "being a surgeon" as much as it is on "doing surgery". This syllabus articulates for the first time many topics passed on as tacit knowledge previously through an informal socialisation process.



GMC Good Medical Practice guidelines state that teaching, training, appraising and assessing doctors and students is important for the care of patients now and in the future, and we should all be willing to contribute to these activities. The GMC feels that if you are involved in teaching, you must develop the skills, attitudes and practices of a competent teacher. Guidelines also state I should ensure that I and anyone to whom I delegate responsibility for appraising and assessing, receives appropriate training and regular feedback. One particular point, which is critical to the development and progression of the undergraduate students, and to our own development, is the statement from the GMC that "you must be honest and objective when assessing the performance of colleagues, including students. Patients will be put at risk if you describe as competent someone who has not reached or maintained a satisfactory standard of practice".

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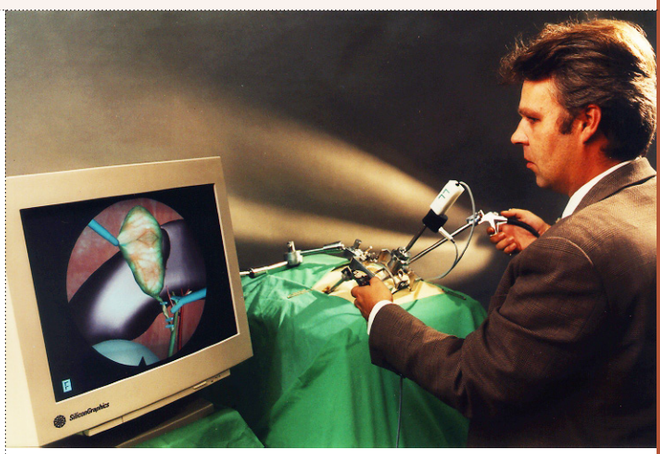

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Corresponding Author

JS Nichols
Honorary Surgical Educator
School of Surgery South
East Midlands Healthcare Workforce Deanery
Email: jenny_nichols@hotmail.com

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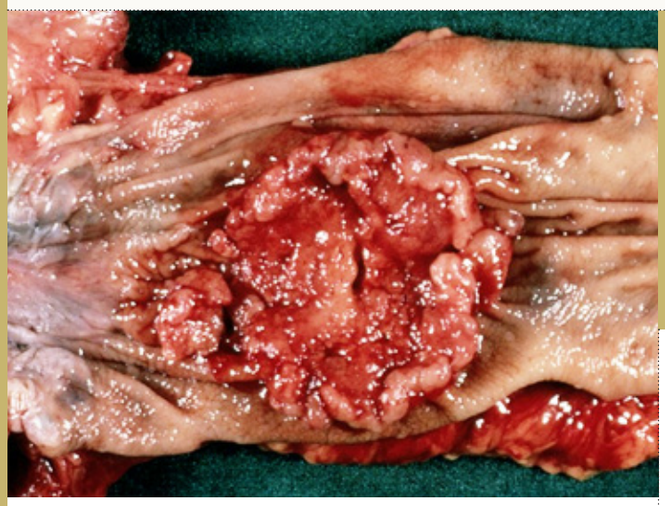

Abstract

Colorectal cancer is one of the most common cancers in the world and it is also one of the most common causes of cancer-related deaths in the UK. It forms the largest bulk of cancer work for gastro-intestinal surgeons with trainees encountering such patients regularly, requiring adequate degree of clinical knowledge and aptitude in order to manage them effectively. This article will discuss the clinical presentation and its various diagnostic modalities, followed by the management and follow-up.

Keywords: Colorectal Malignancy, Dukes, TMN Classification

Clinical vignette

A 65 year old gentleman presents to his GP with a three week history of constipation and tenesmus with associated loss of appetite. He was referred under the two-week rule and reviewed by a colorectal surgeon. Upon rigid sigmoidoscopy at the clinic a lesion was visualised and biopsied. A staging CT was performed which showed thickening in the rectum but no other suspicious lesions. A laparoscopic anterior resection was performed with a defunctioning colostomy. He had an uneventful postoperative recovery and was discharged on day 4. His staging was shown to be a Duke's B malignancy and subsequently went on to have radiotherapy to his pelvis.

Introduction

Colorectal cancer is the second most common cause of cancer death in the UK after lung cancer (1-3). It is the third most commonly diagnosed cancer in males (after prostate and lung), and the second most for women (after breast). Even as death rates have fallen significantly over the last decade, in 2009 an average of over 100 cases were diagnosed daily.

The aetiology of colorectal cancer is multi-factorial, with genetics, such as APC and K-RAS mutation and its association with carcinogenesis pathway being established as a well-recognised factor. Dietary lifestyle, such as high red meat intake (4) and low fibre consumption (5) has been associated with increased risk of carcinoma. Other factors including smoking, obesity and high alcohol intake have also been strongly linked.

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Adenocarcinoma accounts for 95% of colorectal cancer types, with the remaining that include rarer types such as carcinoid tumour and squamous cell carcinoma. Most colorectal cancers result from malignant changes in adenomatous polyps that developed at least a decade earlier (6). Tubulovillous and purely villous adenomatous polyps are particularly associated with higher risk of progression to carcinoma especially if they are larger than 10 mm in diameter and display high-grade dysplasia.

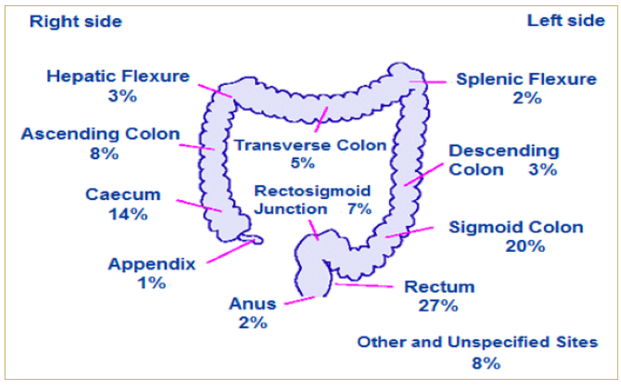

Diagram 1: Distribution of cancer cases within the large bowel (7)

Clinical presentation

Presentation of colorectal cancer may depend on the location of the tumour. In left-sided tumours, common manifestations include rectal bleed (43 – 53%) and changes in bowel habit (43.2 - 65%) with greater propensity towards increased in frequency of defaecation or looser stools (8-9). This may occur separately or in combination with each other. However 60% of rectal bleeding in cancer may occur without any associated perianal or rectal symptoms (9). Patients with lower rectal cancer may have a history of tenesmus. In right sided tumours (caecal and ascending colon), presentations may be more insidious. They are often associated with iron deficiency anaemia (75%) and are often diagnosed incidentally (10) and there may be a presence of a right sided abdominal mass. Other features that may not be associated with the cancer site include abdominal pain, a common presentation seen in over half of patients, intestinal obstruction and tiredness.

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Diagnosis and Investigation

The pathway of appropriate investigation is heavily reliant on an adequate history and clinical examination. Patients with lower gastrointestinal symptoms (rectal bleed and/or change in bowel habits) should undergo digital rectal examination with or without rigid sigmoidoscopy as up to 75% of rectal masses are palpable (11). Patients who fall under the 'high-risk' category (table 1) should be referred urgently for a specialist opinion and further investigations.

All patients > 40 years old	• History of rectal bleed AND change in bowel habit (more towards looser stools or increased frequency) persisting for 6 weeks or more.
All patients > 60 years old	• History of rectal bleed persisting for 6 weeks or more or, • History of change in bowel habit (more towards looser stools or increased frequency) persisting for 6 weeks or more.
All patients (any age)	• With right lower abdominal mass or, • With palpable rectal mass or, • Men of any age with unexplained iron deficiency anaemia and haemoglobin of 11 g/100 ml or below or, • Non-menstruating women with unexplained iron deficiency anaemia and haemoglobin of 10 g/100ml or below.

Table 1: High risk patients requiring urgent specialist referral (12)

Recommended investigations

The decision about the type of investigation is dependent on the presentation and the local availability of diagnostic capabilities. Nevertheless, achieving optimal visualisation of the colon is of paramount importance.

Endoscopy serves as an important diagnostic tool in colorectal cancer with colonoscopy currently being the 'gold standard' option. Flexible sigmoidoscopy can be used in patients with a history of rectal bleed or changes in bowel habit with no other significant diagnostic features. In cases where resectable cancers were detected through flexible sigmoidoscopy, completion colonoscopy is advised pre or postoperatively in order to exclude synchronous tumours. In patients with features that include iron deficiency anaemia, weight loss and/or right-sided abdominal mass, colonoscopy should be considered, with sensitivity to detect colorectal cancers of up to 95% (13).

These methods also allow biopsy for histological diagnosis or polypectomy to be performed, although risk of perforation (approximately 1 in 1,000 for diagnostic colonoscopy and 1 in 500 for polypectomy) (14) is higher than any other diagnostic modalities.

A barium enema can also be considered with a sensitivity ranging from 85.2% to 96.5% if the double-contrast method is used (13, 15) . Although considered safe with very low complication rates (1 in 25,000 perforation and 1 in 250,000 mortality) (16), smaller lesions in the sigmoid region may be missed especially in the presence of diverticular disease. In these instances, a barium enema should always be complimented with some form of endoscopy, at least flexible sigmoidoscopy (12).

CT colonography is now increasingly used as a diagnostic tool for colonic pathologies. In this procedure, a flexible tube is inserted into the rectum for colonic insufflation with carbon dioxide with CT images taken of the patient in various bodily positions. Sensitivity in detection appears to confer a wide range depending on the size of polypoidal mass. However sensitivity for medium to large polyps is 86% and 93% respectively. When focused on cancerous lesions however, sensitivity can be up to 95.9% (17) with risk of serious adverse events of 0.02% to 0.08% (18-19).

Endoscopy vs barium enema vs CT colonography

Debates go on with regards to the appropriateness of selected investigations. Proponents of endoscopy find this as an attractive option from an efficiency point of view, because it functions as a single procedure with a dual purpose: diagnostic and therapeutic, with the latter feature lacking in other imaged-based investigations such as CT colonography.

With its high sensitivity of results and potential to provide a histological profile, endoscopy has been the 'gold standard' option in UK units, primarily within the screening population. Nevertheless, in comparison to other methods, endoscopy also has one of the highest complication rates. It may also have an inferior ability in lesion localisation compared to a barium enema (20).

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Detection of synchronous lesions should also be considered as incidences range between 2 – 8% (21-25). Although the diagnostic yield for barium enemas in primary cancerous lesions should not be discounted, synchronous lesions can be missed in half of patients (26), with better diagnostic yield for synchronous lesions seen in colonoscopy and CT colonography.

If patient acceptability was to be taken into account, contrasting data were seen regarding the magnitude of negative experiences when comparing between colonoscopy and barium enemas (27-28). When comparing CT colonography with colonoscopy or barium enemas, patients preferred CT colonography over other two modalities (29-30). Nevertheless, the supportive function of each modality should be acknowledged, as in a situation where one method may have been deemed technically difficult or to have given an inadequate result, another modality must be used. It also should be acknowledged that the choice of investigation is linked with availability of local service provision.

Assessment of extent of disease

Once a lesion is confirmed, further imaging is needed to identify the extent of disease, which will determine the appropriate intervention and prognosis. Complete imaging of the thorax, abdomen and pelvis should be performed once colorectal cancer is confirmed, to exclude metastasis, which can be seen in up to 9.2% of patients at initial diagnosis (31). A CT scan can detect tumour invasion beyond the muscularis propria with a sensitivity of up to 86% and regional lymph node involvement of 70% (32), whilst the status of metastasis (M-stage) has a sensitivity of up to 85% (33). However, if concurrent CT imaging of the abdomen and pelvis identifies no liver metastasis, a chest X-ray is sufficient in assessing the lung for the presence of metastasis (12) .

In cases of rectal cancer (defined as a cancer whose distal margin is seen at 15 cm or less from the anal verge), greater attention is paid to its affect on adjacent organs due to their proximity and potential operative complexity. An MRI of the pelvis must be performed to assess circumferential margins and nodal involvement, which will determine resectability or whether preoperative radiotherapy should be offered. These patients should also undergo endoanal ultrasound scanning to determine the depth of tumour penetration.

T (Primary tumour)	T_x	Primary tumour cannot be assessed
	T_0	No evidence of primary tumour
	T_1	Tumour invades submucosa
	T_2	Tumour invades muscularis propria
	T_3	Tumour invades through muscularis propria into subserosa or into non-peritonealised pericolic or perirectal tissues
	T_4	Tumour perforates the visceral peritoneum or directly invades other organs or structures
N (Regional lymph nodes)	N_x	Regional lymph nodes cannot be assessed
	N_0	No regional lymph node metastasis
	N_1	Metastasis in 1 to 3 pericolic or perirectal lymph nodes
	N_2	Metastasis in 4 or more pericolic or perirectal lymph nodes
M (Distant metastases)	M_0	No distant metastases
	M_1	Distant metastases present

Table 2: TNM staging for colorectal cancer.

Dukes' stage	Explanation
A	Invasive carcinoma not breaching the muscularis propria
B	Invasive carcinoma breaching the muscularis propria, but not involving regional lymph nodes
C1	Invasive carcinoma involving the regional lymph nodes (apical node negative)
C2	Invasive carcinoma involving the regional lymph nodes (apical node positive)
D	Invasive carcinoma with distant metastases

Table 3: Dukes' staging for colorectal cancer based on histological examination of resection specimen.

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Management

The pathway of management depends on the extent of disease and the characteristics of the patient, primarily the presence of other co-morbidities. Although curative resection (with or without neoadjuvant/adjuvant chemo-radiotherapy) poses as the best opportunity to ensure long-term survival, surgery should be avoided if hazards may potentially outweigh the benefits. Therefore, decisions about the appropriate treatments should be discussed in a multidisciplinary setting with the patient fully informed on all available treatments and given the autonomy to make their own decisions.

Curative resection

There are two major principles in achieving the best oncological outcomes for colorectal resection: optimal resection of diseased bowel with appropriate margins and the removal of the lymphatic drainage that accompanies the blood supply. Resection is only deemed 'curative' if there is complete surgical excision confirmed by both macroscopic and histological analysis.

For right-sided tumours involving caecum and ascending colon, right hemicolectomy can be utilized. A planned resection for right hemicolectomy includes the removal of a segment of the terminal ileum and the proximal transverse colon, with the ligation of the ileocolic, right colic and the right branch of the middle colic arteries at their origins. If the tumour is situated at the hepatic flexure up to the middle of the transverse colon, a variation known as the extended right hemicolectomy is performed. Tumours in such positions have lymphatic drainage that follows both right colic and middle colic artery, therefore ligation must also include the latter and its origin.

Tumours affecting the splenic flexure and the descending colon would require a left hemicolectomy. This involves the removal of distal transverse colon and descending colon down to the level of approximately 2 – 3 cm above the sacral promontory. An extended right hemicolectomy may also be performed. Primary lymphatic drainage follows the left colic and the inferior mesenteric artery, with the latter vessel requiring ligation during this procedure. Whilst left hemicolectomy encompasses portions of the sigmoid colon, lesions within the sigmoid are rarely treated with a sigmoid colectomy. Lesions at the proximal sigmoid may require ligation at the root of the inferior mesenteric artery, whereas middle or distal sigmoid lesion may be treated with the ligation of the inferior mesenteric artery distal to the left colic artery.

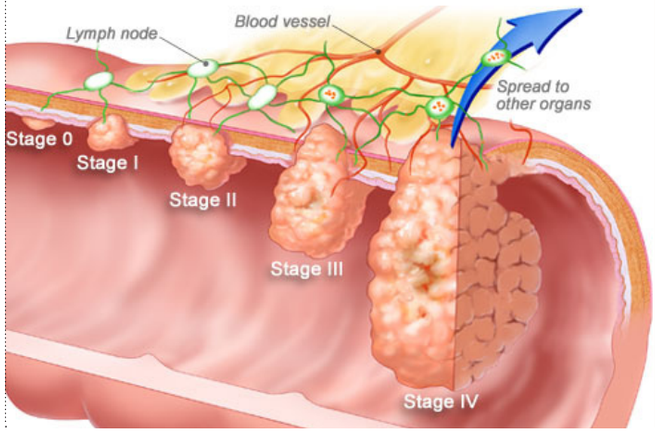
Lesions of the rectum

Surgical technique is of vital importance with regards to optimal removal of all diseased parts of the rectum, including the mesorectum and associated lymph nodes. The deep cavity in which it is situated with the presence of an extensive network of pelvic autonomic nervous system makes surgical excision quite challenging. Stapling guns have led towards the advocacy of sphincter-saving procedures in order to restore gastrointestinal continuity and anal continence, provided at least a 1 cm distal margin of clearance can be ensured.

Rectal tumours located within the upper third require the removal of the rectum and the mesorectum with margin taken 5 cm distal to the lesion and resected up to the level of the sigmoid colon with anastomosis performed; a procedure called 'high anterior resection'. A defunctioning stoma is not usually required in this type of approach.

For tumours in the middle and lower third of the rectum, anterior resection with total mesorectal excision (TME) is required, which involves the complete excision of the lymphatic-rich mesorectum that envelopes the posterior aspect of the rectum.

The development of this technique has reduced recurrence rates (34-35), but the reported anastomotic leakage is also high (36) and defunctioning stoma always accompanies TME.



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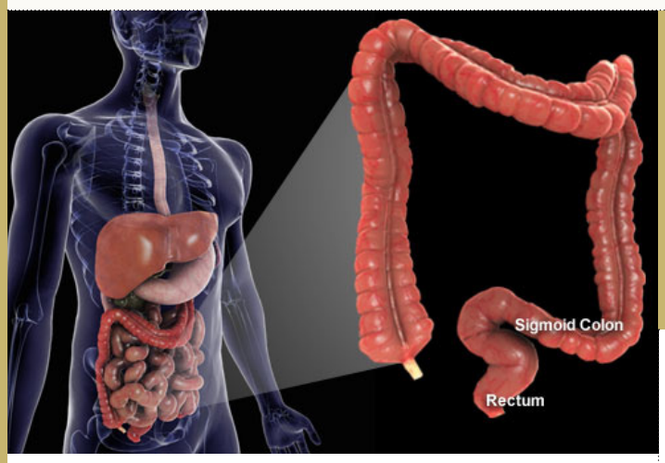

Nevertheless, some lower rectal tumours may not be amenable to sphincter-saving procedures and would require abdomino-perineal resection of the rectum (APER). It is a two stage operation consisting of the abdominal and perineal component, with the resection of the sigmoid colon and the entire anal canal and the division of part of the pelvic floor muscles, leaving the patient without an anal orifice resulting in a permanent end colostomy. Nevertheless, it is advocated that rectal cancers be treated by anterior resection, provided the surgeon is confident that at least 1 cm distal clearance can be secured.

Radiotherapy and chemotherapy in colorectal cancers

The usage of radiotherapy is primarily for patients with rectal tumours, as it has been shown to reduce the rates of local recurrences (37). It is recommended that patients with resectable rectal cancers receive preoperative short course radiotherapy. Post-operative radiotherapy must also be considered if there are established features that would predict local recurrences such as positive circumferential resection tumour margin or mesorectal lymph node involvement, and if preoperative radiotherapy was not given.

Chemotherapy has also served as a major factor in the improvement of long-term survival outcome. Standard agents include pyrimidine analogue 5-fluorouracil (5-FU) in combination with folinic acid (leucovorin) given postoperatively over 6 months in Dukes C or node positive colorectal cancer. The combination therapy has shown significant improvement in 5 year disease free and overall survival compared to surgery alone (6). Oxaliplatin can be added as part of a combination therapy with 5-FU and folinic acid which has led to significant reductions in rate of relapse (38-39).

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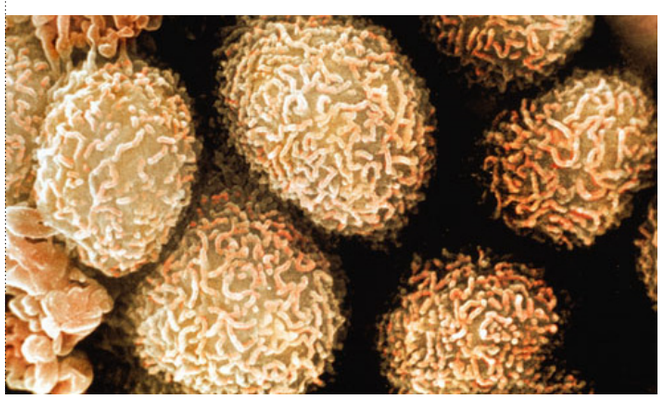
With regards to node negative cancers, a study has shown that 5-FU and folinic acid chemotherapy treatment can improve survival by approximately 3.6 % (40). It is advised that high-risk node negative cancers (perforated/obstructed tumours, poorly differentiated of mucinous histology or with perineural/extramural vascular invasion) should be assessed for these specific risks by the MDT and counselled regarding the potential need for chemotherapy treatment.

Follow-up

Follow-up management remains controversial, however it has been associated with improved survival and significantly earlier detection of recurrences (41). Nevertheless, there is no clear consensus for clinicians on the frequency of appointments and the duration of surveillance. A survey of surgeons in England and Wales undertaken in the 1990s depicted great variations in personal practice on post-operative follow-up, ranging from discharge after one clinic appointment to surveillance of over 10 years, with most surgeons offering appointments for 2-5 years after initial treatment (42).

Follow-up does not seem to impact much on patients' quality of life, although most patients have a favourable and positive perception of follow-up for the reassurance it provides (43), whilst facilitating the auditing of treatment outcomes and patients' survival. It is commonplace to perform abdominal CT scans at 6, 12 and 24 months together with 6 monthly CEA tumour markers.

With regards to the detection of recurrences or metachronous diseases, it is satisfactory to perform 5-yearly colonoscopy of a 'clean' colon. Asymptomatic and fit patients can also be offered a CT scan of the thorax and abdomen 2 years after initial surgery to identify any distant metastases, primarily resectable liver metastases (12).



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Questions

1) Which part of the large bowel that has got the highest occurrence of malignancy?

a) Anus
b) Caecum
c) Rectum
d) Sigmoid
e) Splenic flexure

2) Which type of colorectal polyp that is LEAST associated with malignant potential?

a) Hyperplastic polyp
b) Sessile-serrated adenoma
c) Tubular adenoma
d) Tubulo-villous adenoma
e) Villous adenoma

3) If a cancerous lesion were to be present, which part of the large colon would require magnetic resonant imaging in the assessment of the extent of disease?

a) Caecum
b) Hepatic flexure
c) Rectum
d) Splenic flexure

4) Provide the TNM classification for below:

Tumour has invaded through muscularis propria into the subserosa. 2 of the 9 lymph nodes removed showed evidence of tumour cells. There is no clinical evidence of distant metastasis to other organs.

a) T2N2M1
b) T3N1M0
c) T2N2M0
d) T3N2M0
e) T1N1M0

5) Which arterial vessel or vessels will be ligated in a right hemicolectomy?

a) Ileocolic artery
b) Inferior pancreaticoduodenal artery
c) Right colic artery
d) Right middle colic artery
e) Superior haemorrhoidal artery

Answers

1) d

2) a

3)c

4)b

5) a, c and d

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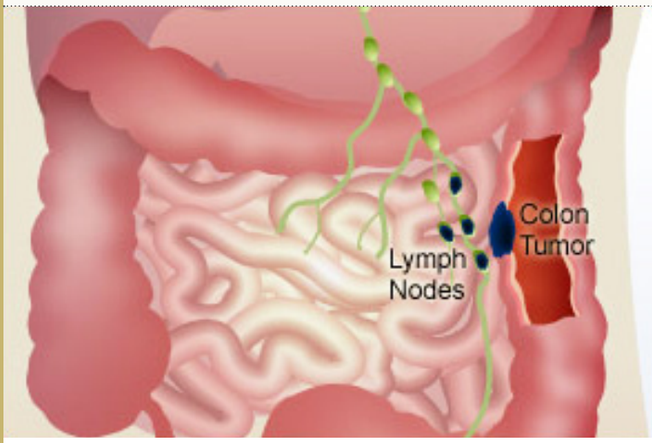

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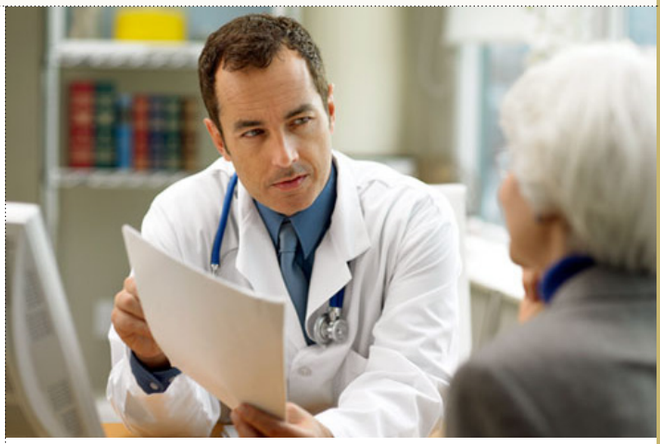

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Corresponding Author

Ihsan Hamzah
Email: ihsanhamzah@doctors.org.uk

REVIEW: OLECRANON FRACTURES

N Bhamber, R Gogna

Review: Olecranon Fractures
Trauma & Orthopaedic Surgery

Abstract

The olecranon provides an important articular surface for the elbow joint with the humerus and radial head. 10% of elbow fractures are olecranon type fractures (1). Due to the complex anatomy of the elbow, neurovascular and soft tissue injuries are associated with olecranon fractures. A functional limb impediment can develop if these fractures are not managed appropriately.

There is a vast array of treatment options which are governed by anatomical, radiological and patient centred considerations. In general, non-operative methods are used for undisplaced fractures, tension band wiring techniques for simple fractures, and plating for complex fractures. Metalwork failure and metalwork irritation are the most common problems associated with operative management.

Keywords: olecranon fractures, tension band wiring, elbow injuries

Case Study

A 55-year-old female engineer attends the emergency department having fallen onto her dominant flexed right elbow, and is otherwise medically well. On examination, there is evident bruising around the right elbow and movements are extremely painful. Secondary survey reveals no other associated injuries. Radiographs confirmed an intra-articular simple transverse fracture of the right olecranon.

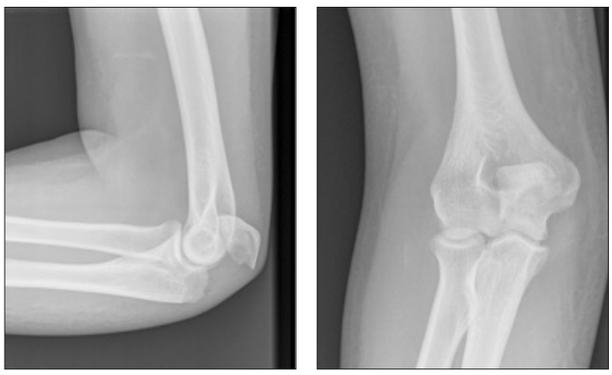

Figure 1: AP/ Lateral radiographs of the elbow showing a simple transverse fracture of the olecranon.

Given her pre-injury high functional demands and simple fracture pattern, operative intervention using tension band wiring techniques was used.

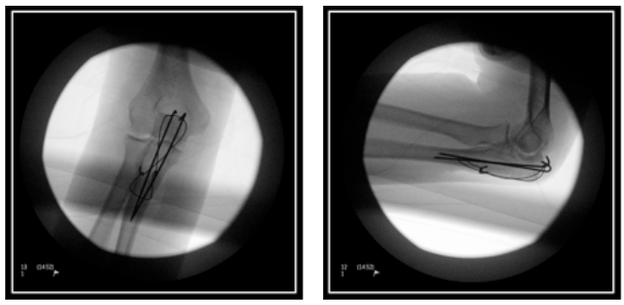

Figure 2: Intraoperative imaging showing AP and lateral views of tension band wiring.

The operation was uneventful and on further review in fracture clinic, she made an excellent post-operative recovery. Radiographs at three months showed complete union of the fracture with no complications.

Figure 3: AP and lateral radiographs 3 months post tension band fixation at clinic.

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Background

Olecranon fractures represent 10% of all fractures around the elbow (1). The olecranon is the strong bony prominence of the proximal ulna that articulates with the trochlea of the distal humerus at the elbow joint, and extends distally to the coronoid.

They occur predominantly in the elderly population, often due to a simple fall from standing height. In younger patients high energy trauma is usually responsible (2). The olecranon region of the elbow has little protecting soft tissue being subcutaneous and is vulnerable to direct injuries.

The most common mechanism of this injury is a fall onto a semi-flexed, supinated forearm. Avulsion injuries can also occur with eccentric force acting against a contracting triceps, with resultant bone failure and fracture formation. Fractures of the olecranon can be very debilitating, due to a resultant poor elbow extension and reduced triceps strength. Both of these functions are needed for activities requiring overhead reaching.

Clinical Features

There may be significant bruising, an elbow joint effusion, and if there is significant displacement a palpable gap at the fracture site may also be felt. It is important to test the extensor mechanism of the triceps muscle, by active flexion and extension movements with gravity eliminated. Most olecranon fractures are isolated injuries, however it is important to perform a full physical examination and have a high suspicion for associated injuries.

The integrity of the overlying skin should be assessed; open fractures have been reported in 2-31% of cases.(3) It is also important to assess the neurovascular status of the limb, as occasionally injuries can occur to the radial, median and ulnar nerves. The ulnar nerve is particularly vulnerable to injury, due to its close proximity to the fracture site on the medial aspect of the elbow. Neuropraxia injuries usually recover without any significant intervention.

Classifications

There are several methods of classification for olecranon fractures, those most frequently used are shown in the table.

Classification	Breakdown	
Mayo[4]	I II III	undisplaced · Displaced (>3mm) stable · Displaced (>3mm) unstable A – non-comminuted B – comminuted
AO[5]	A B C	- Extra-articular Intra-articular Olecranon Intra-articular Olecranon & Radial head
Schatzker-Schmeling[6]	A B C D E F	- Transverse, Intra-articular Transverse with impaction Oblique Comminuted Oblique, distal to trochlear notch Fracture-dislocation

Table 1: Classification of Olecranon fractures

Olecranon fractures show considerable diversity, ranging from simple undisplaced fractures to complex fracture-dislocations of the elbow joint. However, the majority remain relatively undisplaced. Fracture displacement is mainly due to the pull of the triceps muscle, although the strong fibrous sheath overlying the olecranon can help to minimize this.

Initial Management

As with all fracture management, there should be appropriate adherence of ATLS guidelines. This is followed by a focused review of the olecranon fracture itself. A collar and cuff can be applied in the emergency department as a splint to aid with analgesia. If an open fracture is noted, this should be dealt with as per BAPRAS open fracture guidelines. On first presentation to the emergency department, it is paramount to document the motor-sensory status of the median, radial and ulnar nerves of the arm.

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Radiographs

The stability of the elbow should be assessed both clinically and radiographically. It is important to obtain an antero-posterior radiograph and a true lateral radiograph of the fracture site. Specifically one should look for associated injuries to the coronoid and radial head, as well as an obvious fracture dislocation of the elbow.

Radiographic stability can be assessed checking the displacement of the coronoid (anterior support for the distal humerus) and the olecranon (posterior support for the elbow). A line parallel to the anterior cortex of the humerus should intersect the middle third of the capitellum. A positive anterior or posterior fat pad sign is indicative of an undisplaced fracture around the elbow.

The most commonly seen fracture pattern is a transverse or slightly oblique fracture near the base of the olecranon (See figure 1). Fractures with >2mm displacement or significant comminution may require surgical intervention.

Definitive Management

Olecranon fractures can be managed with operative and non-operative methods. This is largely guided by a few key principles outlined below;

- Fractures of the olecranon by nature of the anatomy are regarded as intra-articular fractures and as a result restoration of the articular surface is essential to avoid secondary osteoarthritic changes.
- The elbow joint is susceptible to long term stiffness, and we advocate early mobilisation whenever possible. Hence, any disruption to the extensor mechanism should also be repaired.
- Overall joint stability should be considered, which would include the presence and absence of joint dislocation and ligamentous damage.
- Fracture type and displacement will govern operative choice.
- Other factors to consider are; age, occupation, hand dominance, previous medical history, osteoporosis and associated fractures.

Non-operative management

This is generally only considered in patients who have undisplaced fractures or avulsions with an intact extensor mechanism.

Other significant factors to consider for non-operative management are patients who largely would be contraindicated for operative management, such as those with multiple co-morbidities or complete functional deficit of the arm prior to fracture. Other factors to consider are those patients using long-term high dose steroids, osteoporosis and significant smoking history.

Undisplaced olecranon fractures treated conservatively have good outcomes. Some surgeons may wish to treat displaced fractures with conservative measures, but patient should be warned that there may be a greater than 50% loss of the extensor mechanism power.

Non-operative options available are:

- Active mobilisation, with collar and cuff for comfort.
- 3 weeks of casting/bracing at 45-90 degrees, ffollowed by limited flexion to 90 degrees until signs of radiographic healing. Followed by physiotherapy for gentle range of motion exercises.

Operative management

Most olecranon fractures are treated with some form of operative management, because it allows early mobilisation and prevents long-term stiffness. Factors to consider operative management are those patients with a loss of joint congruity (> 2 mm step of joint surface), comminuted fractures and clinical loss of the extensor mechanism.

There are a variety of options to consider, such as tension band wiring, open reduction and internal fixation with a plate, intramedullary nailing/screw and triceps advancement. Tension band wiring technique being one of the most common techniques used on simple olecranon fractures, this article will concentrate on this method.

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Tension band wiring of the olecranon (14)

All tubular structures when put under eccentric axial load have a side under compression and another under tension. The principle of tension band wiring is a process of converting a force which is tensile to a compressive one on the opposite cortex.

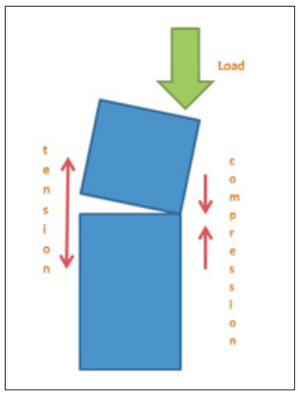

Figure 4a: Shows how eccentric load on a columnar structure such produces a compressive tensive side. This simplifies the forces at a fracture site.

Tension bands can either be static or dynamic. Static tension bands create compression through the fracture site during the application of the wire, as there is little movement through the fracture site. Dynamic tension bands are described when compression forces are increased during movement.

The olecranon fracture is a good example of the use of dynamic tension band wiring. The tension band converts tensile forces on the posterior (convex) side of the olecranon into compression forces at the joint line (concave side). In the olecranon, the figure-of-eight wire loop acts as a tension band during flexion of the elbow. It is this converted compressive force that provides mechanical stability at the fracture site to aid healing.

This technique cannot be used in a heavily communited fracture, or in a fracture where the anterior wall of the olecranon is unable to act as buttress.

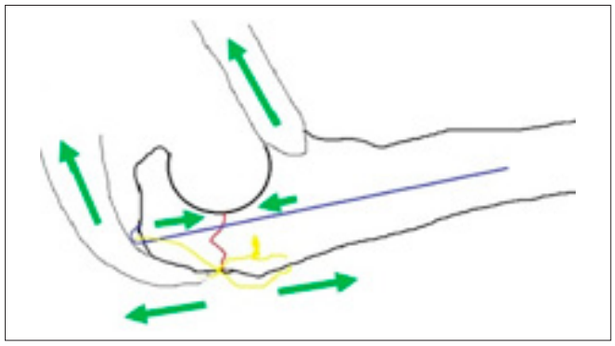

Fig 4b: Shows tension band wiring of a simple olecranon fracture. The green arrows so show some of the important forces acting through the joint.

Operative technique:

1. Check consent and WHO checklist
2. Anaesthesia: Anaesthetised using general anaesthesia or regional block as appropriate.
3. Positioning: Either supine or in the lateral decubitus position with an arm bar, with consideration for placement of the image intensifier and screen in your theatre. Apply a high arm tourniquet.

Figure 5: A suggested patient position and theatre arrangement. Note tourniquet placed high up on arm.

4. Give antibiotics as per your local trust guidelines to cover for orthopaedic metalwork operations.
5. Screen the fracture with image intensifier with traction and confirm you are happy with the fracture pattern.
6. Use the direct posterior elbow/ulna incision, making a longitudinal incision over the olecranon, fracture site and distal ulna. Stay over the bone and be mindful of the ulna nerve on the medal side. The fracture haematoma is evacuated and curettage is used to tidy the fracture ends. It useful to use a normal saline wash at this stage. See figure 6.

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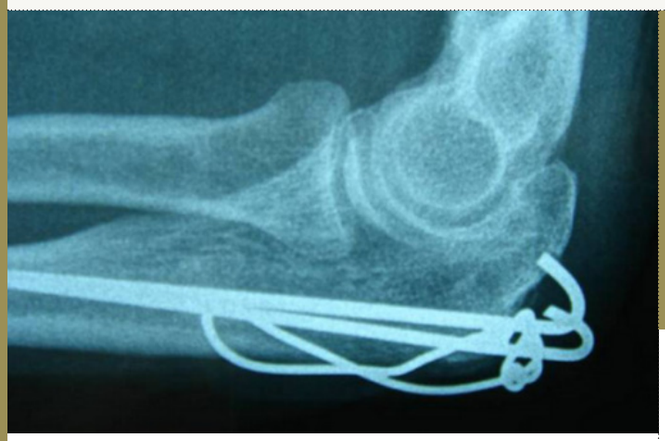

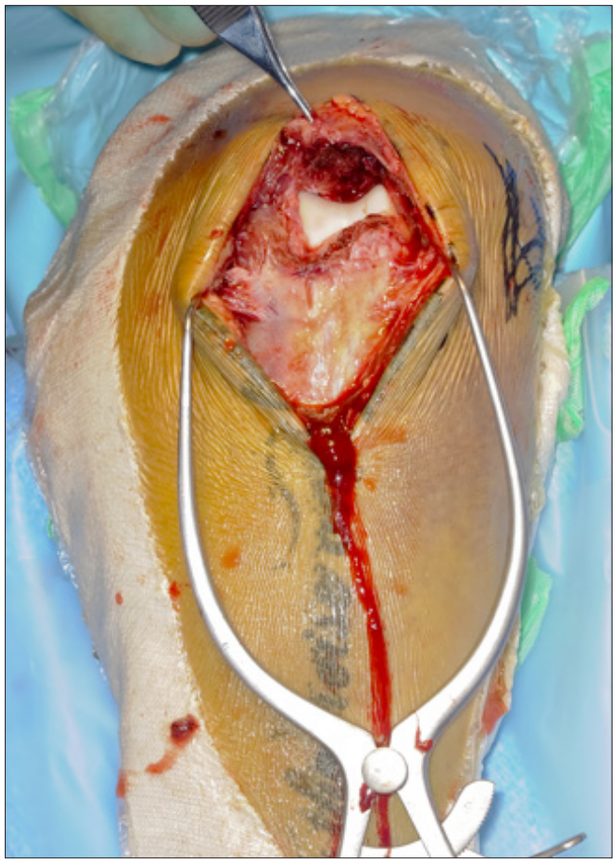

Figure 6: Posterior Ulna incision showing the fracture site of a simple 2-part olecranon fracture. Proximal fragment held up using forceps. Trochlea of distal humerus visible.

7. Fracture reduction is done with the arm in traction to minimize the displacement effects of the triceps muscle. A reduction clamp is used to temporarily stabilise the fracture. See figure 7.

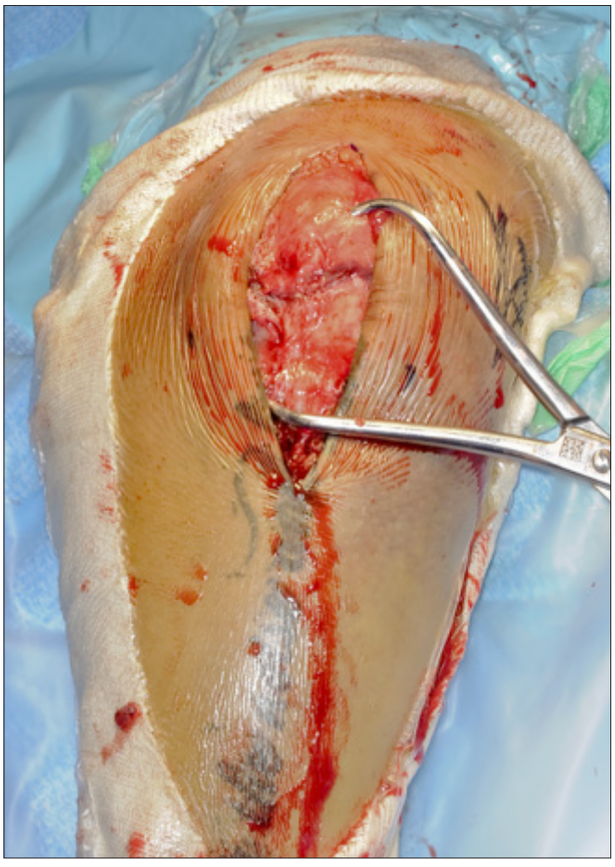

Figure 7: Fracture reduction using pointed reduction clamp.

8. The surgical technique involves placing two k-wires down an anatomically reduced simple fracture site from proximal to distal. These should both be down the intramedullary canal, use the guide to place them parallel. Both k-wires are left proud of the proximal end, see figure 8. Check this with the image intensifier in both AP and lateral positions. Note: some surgeons advocate the placement of wires in an oblique fashion to purchase into the anterior cortex instead, this has a risk of anterior interosseous nerve damage if over penetrated. It may also reduce postoperative range of motion. Use a method with which you are comfortable.

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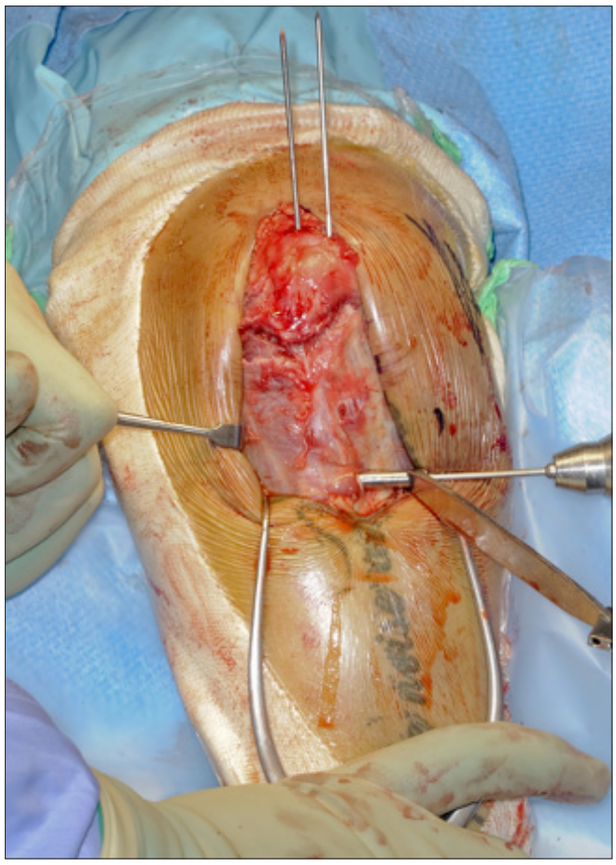
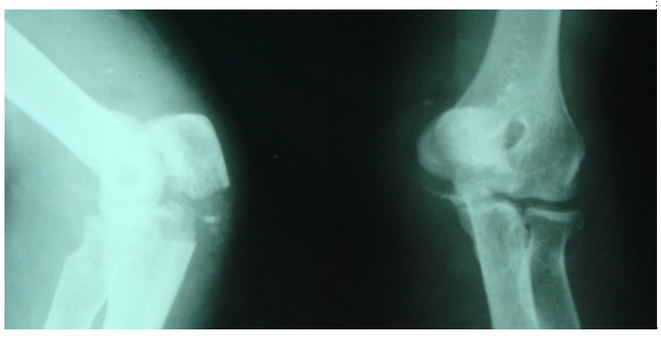


Figure 8: Two K-wires are placed down shaft of the ulna. A distal cortical hole is drilled through the posterior cortex of the ulna, for the passage of the tension band wire.

9. Five cm distal to the fracture site a horizontal 2 mm hole is drilled through the posterior cortex of the ulna. See figure 8.

10. Then a 1.6 mm tension band is sequentially bound in a figure of eight fashion around the two k-wires and deep to the triceps on the proximal end and the distal ulna hole. It is important to place the wire deep to the triceps, as this produces the tension band wire effect. Two loops are created before sequential tightening of k-wire is done. Excess wire is then cut off. See figure 9



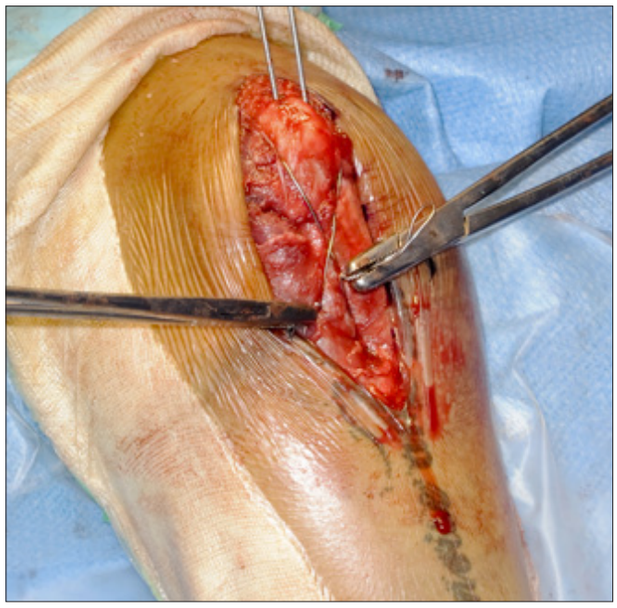


Figure 9: Final tensioning of the tension-band wire. Note the figure of eight formation looping around the two k-wires and through the distal screw hole.

11. The proud K-wires are then cut to a shorter length before being curled over, and hammered in to hold the proximal loop of steel wire in. Cut the overlying triceps muscle and fascia to bury your wires deep. See figure 10 .

Figure 10: Tapping down the ends of the curled K-wires, after incising the triceps fascia.

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12. Screen your reduction in theatre for stability. Then close the triceps fascia to aid as an extra posterior support, followed by closure to skin. A loose wool and crepe bandage can be applied, but gentle mobilisation can begin post-operatively.

Intramedullary Nail

This technique can only be used for simple non-comminuted fractures similar to tension band wiring. It involves the placement of a large cancellous screw down the shaft of the ulna; this may be coupled with a tension band wire technique. Some studies have suggested that this technique is superior to traditional tension band wiring, providing a stronger and stiffer construct (4). If intramedullary nailing is done, it has theoretical advantage of a small incision and surgical exposure. Reported problems with this technique are loss of reduction, screw bending and fixation failure (5).

Olecranon Plating

Typically used for those fracture patterns where a tension band wire cannot be used, such as heavily comminuted fractures, displacement of the coronoid and Monteggia fractures. The plates are placed on the dorsal side of the ulna, due to this being the tensile side of the bone. There are a variety of options available, including 1/3rd tubular plates which can be manually contoured to fit the olecranon, pre-fabricated olecranon plates and various choices between locking and non-locking plates.

The olecranon is predominantly subcutaneous and patients should be informed about the ability to feel and be irritated by the metalwork, and a subsequent operation to possibly remove metalwork at a later date. It has been reported that tension band wiring is usually more irritant than a plate and requires subsequent removal (4).

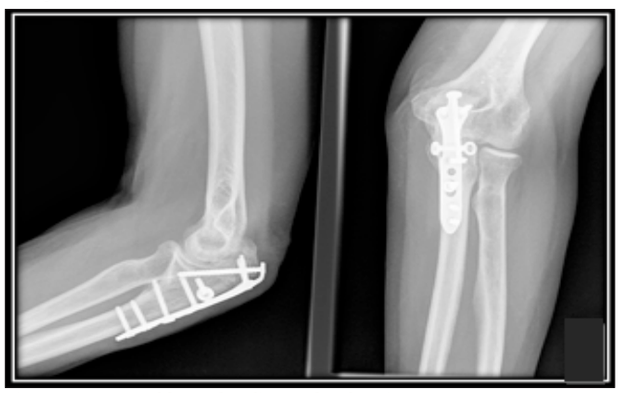

Figure 11: AP and lateral radiographs showing a plate in situ for an olecranon fracture.

Excision and Triceps advancement

This is an uncommon procedure, it can be thought of as a salvage operation after failure of internal fixation. It may be considered in patients where there is low functional demand and non reconstructable fracture patterns. It involves excising fracture fragments, alongside the detachment of the distal triceps tendon with reinsertion into a more distal portion of the ulna with non-absorbable sutures.

Complications and considerations for consenting

The most frequent complication is symptomatic hardware problems (upto 80%) which can often necessitate removal of the metalwork (3, 9, 10, 11). Specific issues associated with tension band wiring are the risks of migration, soft tissue irritation, wire breakage and fracture displacement (3). These complications appear to be less frequent for intramedullary screw and plate fixation techniques.

Other complications include reduced range of movement, heterotopic ossification (13-14%) and infection (5%). Non-union occurs in fewer than 5% of cases,(3, 12) and excellent results can be achieved with secondary internal fixation and bone grafting.(13) Patients should be informed that they may still experience joint pain and stiffness after fixation and they may require a prolonged recovery programme with physiotherapy. They should be warned that an extension deficit of approximately 15 degrees may occur.

Post-operative care

Usually the arm is immobilised initially to assist in wound healing. However definitive fixation allows for early mobilisation to improve range of movement, and once radiographic healing is evident then muscle-strengthening exercise can be commenced. After 3 months patients can usually restart heavy-duty work and activities.

Summary

We have discussed the epidemiology, clinical features, classification and management of olecranon fractures. There are several methods of surgical repair and the chosen method should be dictated by surgeon preference as well as patient factors and fracture configuration. With careful consideration, excellent outcomes can be achieved.

Questions

Q1.) During tension band fixation surgery, what nerve is at risk with over penetration of the proximal anterior cortex of the ulna with the Kirchner wire?

A.) Anterior interosseous nerve
B.) Posterior interosseous nerve
C.) Median nerve
D.) Radial nerve
E.) Ulnar nerve

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Q2.) An 84-year-old osteoporotic woman presents with a severely comminuted olecranon fracture involving the proximal 40%. Which of the following would be most appropriate method of management?

A.) Intramedullary screw
B.) Fragment excision and triceps advancement
C.) Hinged elbow brace with early active range-of-motion
D.) Total elbow arthroplasty
E.) Kirschner wire tension band

Q3.) After tension band fixation of an olecranon fracture, there is a risk of impaired forearm rotation due to which of the following?

A.) Lack of triceps tendon repair
B.) Olecranon fracture comminution
C.) Use of ulnar intramedullary Kirschner wire fixation
D.) Protrusion of Kirschner wire fixation through the volar cortex of the proximal ulna
E.) Ipsilateral proximal humerus fracture

Q4.) An 18-year-old male sustains an isolated, closed, transverse fracture of his right olecranon. This is subsequently fixed using a tension band technique. What forces are generated at the articular surface?

A.) Two-point bending
B.) Shear
C.) Neutralization
D.) Torque
E.) Compression

Q5.) Which of the following is the most commonly reported complication following olecranon fracture fixation?

A.) Infection
B.) Nonunion
C.) Symptomatic hardware
D.) Avascular necrosis
E.) Heterotopic ossification

Answers

A1) Preferred Response: A

Over penetration of the anterior cortex of the ulna can result in injury to the anterior interosseous nerve. This can be assessed clinically be testing flexion of the thumb interphalangeal joint or the index finger distal interphalangeal joint. Initial treatment of this nerve injury is observation.

A2) Preferred Response: B

For elderly, osteoporotic patients with severely comminuted fractures, fragment excision and triceps advancement remains the most appropriate method of fracture treatment. Stability will be maintained provided the coronoid and distal trochlea are intact. When performed, the triceps should be attached adjacent to the articular surface.

A3) Preferred Response: D

Advancing the K-wire too radial or too far through the volar (anterior) cortex of the proximal ulna can impair pronation/supination. Over penetration also carries risk of injury to the anterior interosseous nerve.

A4) Preferred Response: E

Simple transverse olecranon fractures are often fixed using a tension-band construct. This converts distraction forces at the joint generated by the pull of the triceps into compression forces. To work effectively, it requires active movement of the elbow extensor mechanism.

A5) Preferred Response: C

Symptomatic hardware is the most frequent complication of olecranon fracture fixation (upto 80%), which often requires premature removal of the metalwork. There is also risk of migration, soft tissue irritation, wire breakage and fracture displacement.

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Corresponding author

N Bhamber
Core Surgical Trainee, Royal Derby Hospital
Email: nivraj@gmail.com

PINNAPLASTY - A STEP BY STEP GUIDE

B Green, D Nikkhah, W Chow

Abstract

In this article we discuss the different surgical approaches to correct prominent ears, which is a common condition that can lead to psychological distress in patients. We describe the benefits of each technique as well as complications that may arise after surgery. By the end of this introductory article the core trainee should be able to describe the broad categories of prominent ear correction and know the key points when undertaking the history and examination of a patient undergoing pinnaplasty.

Key words: prominent ears, pinnaplasty, otoplasty

Case example

A 7 year old Caucasian girl presents to the plastic surgery department accompanied by her parents asking for her ears to be "pinned back" as she had become increasingly self-conscious due to the appearance of her prominent ears. Her parents reported that she is teased and bullied at school and as a result, her academic performance was becoming adversely affected.

On examination, there was significant conchal hypertrophy, thereby causing protrusion of the ears. As a result of this and the psychological distress caused by the appearance of the ears, a combination pinnaplasty was performed consisting of anterior cartlage scoring with posterior mattress sutures. The patient made a full recovery and experienced no complications post-operatively. At follow-up, the patient and her parents were satisfied with the clinical outcome of her surgery, which successfully reduced the prominence of her ears.

Introduction

The condition of prominent ears is the most common congenital external ear deformity that presents to the Plastic Surgery department. It is prevalent among the Caucasian population with an incidence of 6% in the UK (1). Males and females are equally affected (2). The condition although benign can cause considerable psychological trauma in children. To avoid the possible psychosocial distress of peer ridicule in school, it is possible to operate at an early age as ear development is rapid compared to other craniofacial structures. The human ear is almost 85% grown by the age of three (3,4,5).

Some surgeons advocate correction when the child becomes aware of the deformity and therefore expresses a desire for correction (2) whereas other surgeons advocate the procedure taking place between the ages of 3 to 6 (6). There has been a particularly significant increase in the number of 10-14 and 15-19 year olds asking for pinnaplasty as there has been increased media exposure to cosmetic procedures and so there has been an increased demand (7).

The normal pinna develops around five weeks in utero from six mesenchymal proliferations surrounding the first branchial cleft and ascends to the head at the level of the eyes. The pinna consists of helix, superior and inferior crura forming the antihelix, the concha and the lobule (8,9) (figure 1). The auricular cartilage framework consists of three tiers; the anti-helix-anti-tragus complex, the conchal complex and the helix-lobule complex (10) (figure 2).

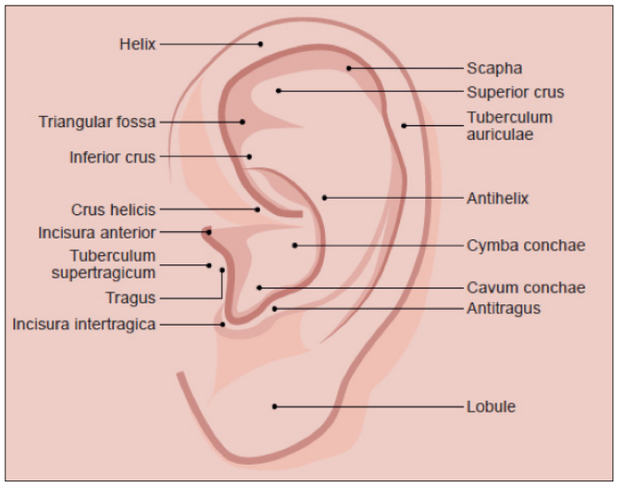


Figure 1: The anatomy of the pinna.

PINNAPLASTY - A STEP BY STEP GUIDE

B Green, D Nikkhah, W Chow

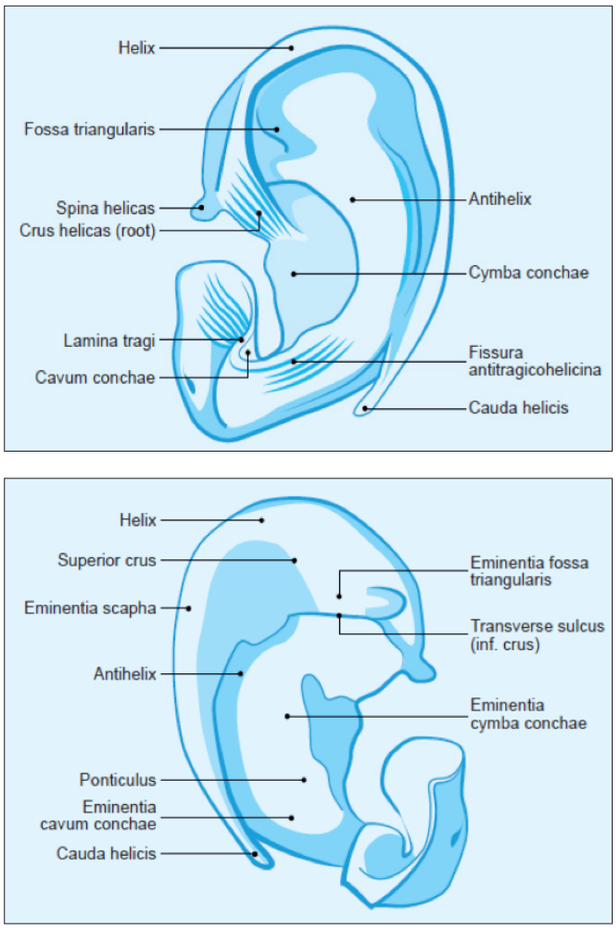


Figure 2: Cartilage anatomy.

The characteristics of the normal ear include a 17-21 mm distance between the lateral helical rim and the mastoid (11) with an accompanying auriculomastoid angle of 20-30° (10). Protruding ears are most commonly caused by conchal hypertrophy, underdevelopment of the anti-helix or a combination of both. Although this generally affects both ears, the cause of prominence may be different in each ear. Prominent ears are defined as protrusion when the concha-mastoid angle is greater than 40° (11).

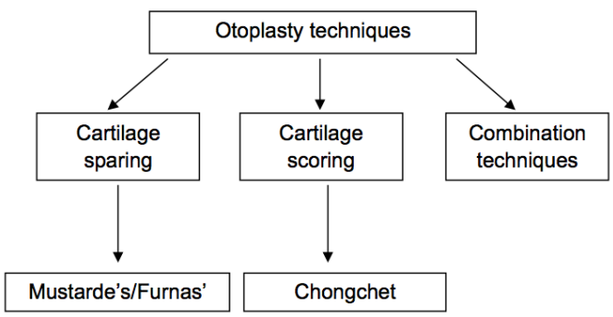
Goals for pinnaplasty[12]
Complete correction of protrusion of the upper third of the ear
Visibility of the helix beyond the antihelix when viewed from the front
A smooth and angular helix
Prevention of distortion or decrease in the depth of the postauricular sulcus
Placement of the ear at the correct distance from the head
Symmetry
An antihelical fold that is smooth, rounded, correctly placed and is adequately prominent
The helical rim must project no farther than the lobule

Pre-surgery, measurements are taken at three different levels on both ears. These measures aim to provide a quantitative assessment of projection for the upper, middle and lower thirds of the ear. These measurements are then repeated at the end of the procedure (13). An alternative method is the use of facial photographs pre- and post surgery to assess the change in the measurements made from the mid-face to the end of the face and from the end of the face to the end of the pinna (14).

Prior to surgery, there is the problem of hair interference. Despite the use of traditional surgical drapes, fine peri-auricular hair can get caught in Mustarde and post-auricular skin sutures leading to intra-operative aggravation and the risk of infection. Gels and preparatory agents are messy and are unacceptable to the patient so either elastic bands to restrain hair or a latex swimming cap can be used. If the patient is allergic to latex, silicone caps are also available. This allows for hair to be completely tucked into the cap leaving the surgical field free from hair (15).

Pinnaplasty techniques

Pinnaplasty is the surgical correction of protruding ears. More than 200 techniques have been described since Dieffenbach first performed the procedure in 1845. Although there is a vast array of techniques and it is not entirely clear which is the definitive technique (16), many are variations of two main concepts; sutures and scoring. Suturing techniques involve the use of permanent sutures such as Mustarde's mattress sutures or Furnas' conchamastoid sutures and also include any kind of fixating sutures to correct deformities whereas scoring is making incisions into the cartilage:



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Cartilage sparing techniques

Mustarde first described this procedure in 1963 and suggested it as a technique that can be used for folding an antihelical fold in children with soft or thin cartilage (17) (figure 3).

- The procedure begins by making an incision in the retroauricular skin 8-10 mm below and parallel to the helical rim.
- The skin above the cartilage is mobilised caudally up to the mastoid and cranially to the helical rim. In order to prevent post-operative skin distortions, the mobilisation should not be extended beyond the helical rim.
- The perichondrium and the auricular cartilage remain intact.
- The new antihelical fold is punctured with needles containing methylene blue from ventrally and is marked from retroaurically if necessary.
- The mattress sutures of non-absorbable, transparent or white material, are placed on the corresponding markers using a retroauricular access through the auricular cartilage and perichondrium and not penetrating the ventral skin.
- The knots of the mattress sutures can be everted towards the inside to prevent later extrusion of the sutures (17).

The advantage with this technique is that it spares the auricular cartilage. Also the risk of perichondral haematoma is low, but it is only suitable for children up to the age of 10. If the cartilage is firm, there is an increased risk of the ear returning to its original shape and also the risk of suture tear-out. There is also the risk of suture granuloma (18).

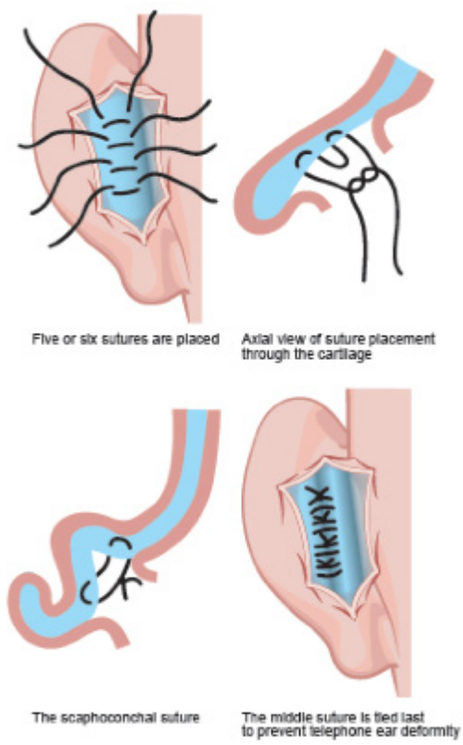

Figure 3: Mustarde's Procedure.

The Furnas' technique is for the correction of excessive conchal cartilage. This procedure can also be performed in conjunction with Mustarde's technique (figure 4).

- The skin exposure is made to expose the auricularis posterior muscle and detach its insertion from the conchal cartilage,
- The muscle and the neighbouring musculoareolar tissue attached to the medial skin flap are left.
- The skin is elevated along with the auricularis posterior muscle and the adjacent soft tissues post-forward as a musculocutaneous flap.
- The plane of the mastoid fascia is exposed far enough to provide a nest for the concha.
- The concha-mastoid sutures are then placed (19)

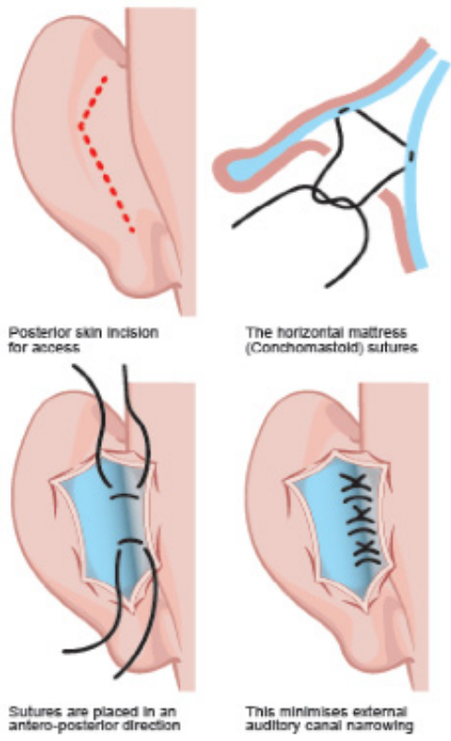

Figure 4: Furnas' Procedure.

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Cartilage scoring techniques

Chongchet first described the anterior scoring of cartilage to correct prominent ears.

- The helix is first of all pushed back into its normal position and during this, an antihelical fold will appear and this is marked.
- The skin needs to be infiltrated with lidnocaine with adrenaline, so to aid dissection of the skin from the cartilage and postauricular skin is then removed between the free border of the helix and cephalo-auricular angle and this runs along the entire length of the ear.
- Once the antihelix is assessed and marked, an incision is then made through the thickness of the cartilage; this incision is made distal to the mark.
- The skin overlying the anterior cartilage is cut and once free, a curl of cartilage can be seen.
- Whilst the cartilage is held, parallel incisions are made through the perichondrium and cartilage- this is the anterior scoring. By doing this, you produce a smooth area of cartilage for the antihelix.
- Finally, a stitch is needed in order to hold the fold of cartilage and once this is done, sutures can then be placed along the skin edge and the antihelix is achieved by overlapping the sutures (20).

Combined techniques

Procedures that combine suturing, excision and cartilage scoring techniques have an advantage in that there is avoidance of the disadvantages of the techniques when performed separately. One example is that with anterior scoring, there is the tendency to produce sharp edges; therefore a combination of anterior scoring, posterior excision and suturing can be used to produce the best possible final ear shape and position. Hinderer produced a procedure which combines anterior cartilage scoring with posterior mattress sutures placed along the anti-helical fold together with trimming of the tail of the helix and a thinning of the antitragus. This is then ended with skin excision along the posterior medial surface (21).

Another such technique was produced by Chait and Nicholson who used a combination of skin excision, cartilage transaction together with anterior skin elevation, cartilage scoring and mattress suturing so that the new conchoscaphal angle can be anchored in place. From this, you need variable amounts of cartilage rotation and excision (22).

It is also possible to perform combination pinnaplasty endoscopically which involves posterior cartilage scoring and scaphal and mastoid suturing. The argument behind this procedure is that you eliminate the need for a postauricular incision and reduce the risk of hypertrophic scar formation (23).

Post-operative care

Immediately after the procedure, a head bandage can be placed on the ear being treated. However, this remains controversial. In 2008, Shokrollhani advised the use of skin glue only broadly along the suture line to keep the ear in position until desquamation takes place (24). Norris et al in 2012 concluded from five reviewed studies that no bandage is required in most cases, with two out of the five studies in that review showed little evidence supporting the use of head bandaging for more than 24 hours after surgery (25).

The assessment of the success or failure of pinnaplasty is based solely on patient satisfaction. One study examined how surgeons assessed outcomes and found that the majority of surgeons will ask the patient how they feel. This is important in that patient satisfaction and the clinical outcomes such as complication rate and the need for revision surgery will not always agree (26).

Benefits

The motivation for pinnaplasty is predominantly psychological. One study assessed children undergoing pinnaplasty with most children citing "social distress" as their reason for the procedure. Following surgery, it was found that self-consciousness was the factor that was most significantly reduced following surgery followed by distress and anxiety. Bullying was also significantly reduced with 59% having a complete cessation. Therefore, pinnaplasty can be seen as extremely beneficial but awareness is needed for both the children and their families that there may not be a positive post-operative outcome and that there may be an increase in anxiety (27).

Complications

The most feared early complication is haematoma formation and infection. The common cause of haematoma formation is either insufficient haemostasis or errors in surgical technique. The less common causes can include; rebound vasodilatation from local anaesthetics, hypertension, post-operative trauma or pre-existing coagulopathy that is not well controlled. The danger is that if the haematoma is not drained, it can lead to cartilage necrosis as a result of pressure blocking blood flow. Anterior scoring techniques (Chongchet) pose a greater risk of anterior haematoma resulting from the anterior dissection performed on the cartilage (2).

Early Complications (<14 days)	Late Complications (>14 days)
Haematoma	Hypersensitivity
Bleeding	Scarring
Skin necrosis	Asymmetry
Wound dehiscence	Unsatisfactory aesthetic outcome
Wound infection	Suture extrusion

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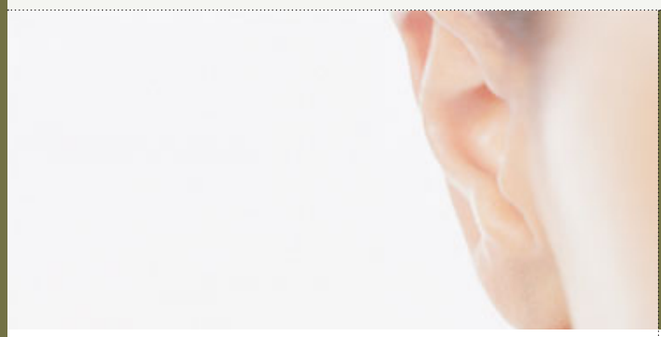

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Wound infection can begin as early as 12 hours after surgery. The presentation is either a deep boring pain or erythema with pus formation. If left untreated, the result is perichondritis leading to possible skin and cartilage necrosis (2).

Later complications include; suture extrusion, hypersensitivity, scarring, asymmetry and unsatisfactory results. Suture extrusion can result from incorrectly placed sutures in too close proximity to the skin or surplus tension on cartilage or infection. Hypersensitivity presents as post-auricular tenderness caused by axon regeneration and does lessen over time. Abnormal scar formation includes hypertrophic scarring. These can be prevented by avoiding excessive suture tension. The unsatisfactory aesthetic results can encompass a wide variety of sequelae but the most common is undercorrection or overcorrection (2).

In the UK, there is an increasing trend towards using the Horlock technique. It was found that up to 50% of plastic surgeons who perform pinnaplasty use this technique. The significant difference between this and the other cartilage sparing techniques is that the plane of dissection is at the dermal subcutaneous junction which allows you to leave the subcutaneous tissue on the posterior part of the auricular cartilage (28).

Comparison studies have been produced to assess the complication rates. Studies found that if Chongchet's technique was performed, there was an increased risk of developing early complications. This was compared to the complication rates of those patients having the Horlock procedure and that by switching to this technique; the risk of complication was reduced (29).

The long term results demonstrated that there was a recurrence rate of 4.3% at 4 years with the Horlock technique. Similar results were also found with the Mustarde technique. Therefore lower complication rates and low recurrence rates are found in cartilage sparing techniques (30).

Summary

After reading this article, the core trainee should now be able to:

1. Understand the anatomy of the ear together with the prevalence and definition of prominent ears plus perform a history and examination pertinent for pinnaplasty.

2. Understand the pinnaplasty techniques and that it is often the case that a combination technique is required. However, any procedure performed must be subject to the individual needs of the patient.

3. Be able to know the early and late complications that arise from pinnaplasty and assess them if and when they arise.

Acknowledgements

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Questions

1. What is the incidence of prominent ears in the UK?

a) 3%
b) 4%
c) 5%
d) 6%

2. What is the gender proportion for prominent ears?

a) Males > females
b) Males and females equally affected
c) Females > males

3. What is the defined concha-mastoid angle suggesting prominent ears?

a) 30°
b) 40°
c) 50°
d) 60°

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4. What is the most common pinnaplasty technique performed in the UK?

a) Mustarde's techniques
b) Chongchet's technique
c) Horlock technique
d) Furnas' technique

5. What is the most significant early complication of pinnaplasty?

a) Infection
b) Dehiscence
c) Haematoma
d) Bleeding

6. What is the most significant late complication of pinnaplasty?

a) Scarring
b) Suture extrusion
c) Hypersensitivity
d) Unsatisfactory aesthetic results

Answers

1 (d) 2 (b) 3 (b) 4 (c) 5 (a or c) 6 (b)

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Corresponding Author

Ben Green
King's College London School of Medicine,
London, UK/Craniofacial Unit,
Great Ormond Street Hospital for Children,
London, UK.

Email: ben.c.green@kcl.ac.uk

ANALGESIA IN THE SURGICAL PATIENT

Y Haroon

Abstract

Postoperative complications and chronic pain are associated with poor pain control in the post and peri-operative period (1). This review describes the factors influencing postoperative pain, the different types of analgesia available and their modes of administration. As part of this article, a surgical clinical vignette will explore several approaches to analgesic control, their complications and how these complications are managed. Additionally, there will be a discussion on common options in pain relief focusing on local and regional anaesthesia and systemic drugs, which include non-opioids, weak and strong opioids and adjuvant analgesia, also covering their methods of administration and modes of action.

Key words: Postoperative pain, analgesia

Clinical Case

A 50-year-old gentleman with increased weight loss and dysphagia was referred to hospital by his GP. He was subsequently put on the two week-wait referral system. Following assessment in clinic an urgent oesophagogastroduodenoscopy was arranged and biopsies were taken. He was a non-smoker and otherwise previously fit and well. No allergies were noted.

Histology results confirmed oesophageal cancer with no lymph node involvement or metastatic disease. After discussion with the patient, it was agreed that the best option would be to undergo surgery.

Later that week the surgical team performed an Ivor Lewis oesophagectomy, which had a successful outcome. The anaesthetist inserted a thoracic epidural catheter with local anaesthetic and fentanyl. He remained on the surgical high dependency unit whilst this intervention was in situ. He was also started on 1g of intravenous paracetamol regularly postoperatively.

His blood pressure was monitored regularly and he maintained a systolic pressure of 100 mmHg. Unfortunately he developed urinary retention over several hours and required catheterisation. Four days post operatively, the decision was made to remove the epidural and switch to PCA (patient-controlled analgesia). The patient had a pain score of 9/10 after the epidural catheter was removed. He subsequently required a background infusion of morphine onto his PCA.

Although his pain was better controlled on the background infusion, he still had difficulty taking deep breaths and soon after developed atelectasis. The chest physiotherapists worked hard with him to encourage deeper breaths and expectoration. He was assessed by the on-call anaesthetist and an intercostal block was administered for short term relief. Three days later the background infusion was reduced and weaned off, his chest drains were removed and transfer to a general surgical ward was deemed appropriate.

The acute pain team assessed the patient on the ward and observed that his PCA use had significantly reduced after the chest drains had been removed and decided that it was appropriate to commence as required 5-10 mg of subcutaneous morphine. He was trialled without a catheter at this stage, with intravenous and subcutaneous morphine being replaced by oral morphine. He was also on 100 mg tramadol four times daily. Following a review of his morphine requirements, slow release morphine sulphate tablets (MST) were commenced at 20 mg daily. He was then discharged from hospital with these medications in place and adequate follow up was arranged. The patient was satisfied with his level of pain relief on discharge and remained comfortable at home.

Introduction

Adequate pain relief in the post-operative patient is an essential part of a patient's care package, not only for their comfort but also to maintain pulmonary function and aid wound healing. Unfortunately, the management of postoperative pain relief is usually left to the most junior members of staff. This can result in suboptimal levels of analgesic control leading to poor patient satisfaction, as well as delayed recovery and discharge. Good postoperative pain relief aids early hospital discharges and can reduce the onset of chronic pain syndromes (2).

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Pain is a subjective experience and varies from patient to patient. The World Health Organisation defines pain as "an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage". Elements such as the patient's perception of pain, clinical factors, and the availability of local resources all contribute to the decisions clinicians make on the choice of analgesia and mode of administration (3). This means there is no hard and fast rule to the 'perfect' analgesic concoction. The Royal College of Surgeons and Anaesthetists recommend an analgesic ladder, as shown in figure 1 below. Further considerations for pain relief in children and the elderly are not covered in this review.

The World Federation of Societies of Anaesthesiologists have adapted the World Health Organisation (WHO) Pain Ladder for treating acute pain. Postoperative pain tends to decrease with time, as does the need for intravenous or subcutaneous analgesics. This differs from the original pain ladder designed by WHO for chronic pain in cancer patients. The WHO pain ladder goes in reverse to the acute pain ladder, ranging from simple analgesics to opioids at the other end of the scale.

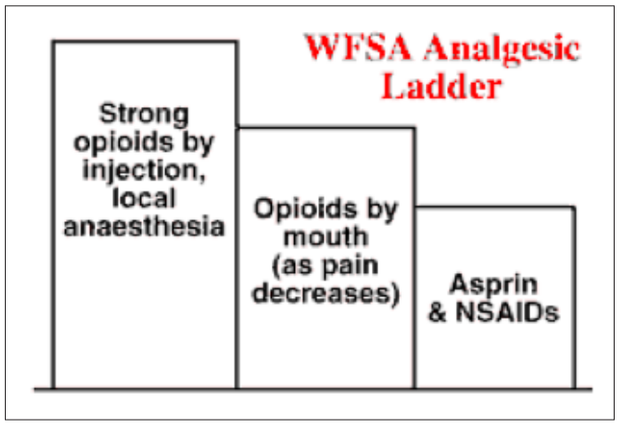
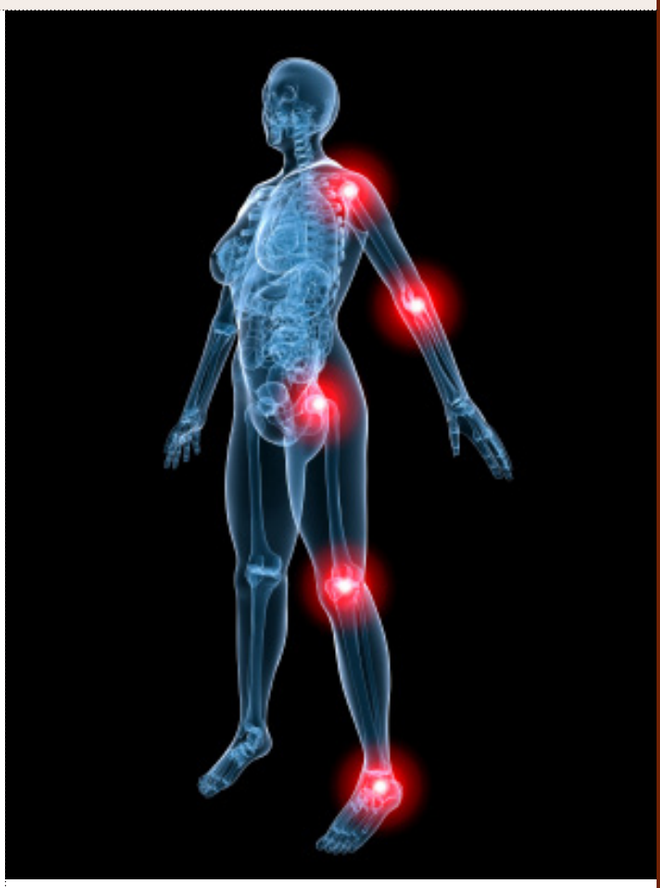


Figure 1: World Federation of Societies of Anaesthesiologists acute pain ladder (3). (Reproduced with permission from Charlton E. et al)

Types of analgesia available

The clinical vignette illustrates the wide variety of analgesics available in secondary care. A combination of pharmaceutical agents can be used, including opioid and non-opioid based analgesics, local anaesthetics and adjuvant analgesics.



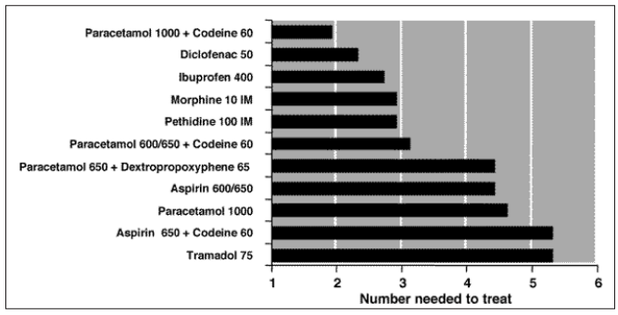


Figure 2: League table of the number-needed-to-treat (NNT) for a single patient with moderate to severe pain to achieve at least 50% pain relief over a 4-6 hour period. All are oral analgesics except intramuscular (IM) morphine and pethidine. (4) (Reproduced with permission from McQuay H. et al)

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Factors influencing choice of analgesia

There are surgical, patient and logistical factors which influence choice of analgesia.

Surgical factors include the operation and the incision site. The operation site can profoundly affect the level of pain a patient experiences. Thoracic and upper abdominal operations are more painful than lower abdominal surgery, which are in turn, more painful than peripheral limb operations (3).

Surgical incisions in the thoracic or upper abdominal region as described in the clinical vignette will result in changes to pulmonary function, increased abdominal muscle tone and subsequent decreased diaphragmatic function. This results in an inability to cough and clear upper airway secretions, leading to pneumonia and atelectasis, where part or all of the lung collapses (3).

Prolonged pain can lead to immobility which leads to stasis of blood and increases the risk of pulmonary embolism (5). Pain stimulates the sympathetic nervous system which leads to increased heart rate and thus cardiac output, resulting in high oxygen consumption. There can be further effects on gut motility, resulting in ileus with associated abdominal discomfort, nausea and vomiting. It can also have an impact on the urinary tract causing urinary retention (3).

Patient-related factors influencing analgesia include gender, age and level of understanding. Young women tend to have lower pain thresholds (3). Previous poor experiences in hospital, fear and anxiety can also result in poorer outcomes in pain control. Providing a good explanation of the surgical procedure and ensuring comprehension usually result in better outcomes in pain control (3).

Logistic factors to be considered include funding, established postoperative pathways and resources within the hospital trusts.

Once these factors have been considered it is worth using a pain score to gauge what mode of analgesia could be administered. This can be done using quantitative or qualitative scores. There are several pain scoring systems. Visual analogue scales (VAS) consist of a smiley face on one end and a sad face on the other: these serve as a useful tool in children. Alternatively there are numerical scores rated 0-10; where 0 is no pain experienced and 10 is the worst pain imaginable. For adults who struggle using numbers, it is possible to utilise face rating scales (FRS) which consist of 6 facial expressions displaying the various intensities of pain. There are also behavioural and functional rating scores for non-verbal patients. The subjective nature of pain and the different pain thresholds of each individual, poses huge limitations to these scales and should therefore be used as a guide only.

Local Anaesthetics

Local anaesthesia can have benefits on both the cardiovascular and the respiratory systems by reducing blood loss due to reductions in mean arterial pressure and venodilatation (6). It provides excellent pain control, reducing the risk of pneumonia and atalectasis (7). Local anaesthesia is dependent on the blockade of sodium channels. Unionised lipid-soluble drug can pass through the phospholipid membrane, and it is in the axoplasm (cytoplasm of an axon of a neuron) where it is protonated.

In this ionised form it can bind to the internal surface of the sodium channel, preventing it from leaving the inactive state. By blocking these sodium channels there is a decrease in sodium ion conductance, hence preventing depolarisation of the cell membranes and therefore inhibiting the transmission of the painful stimulus. (8)

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It can be administered by infiltrating the incision sites with long-acting agents such as bupivacaine, by peripheral nerve or plexus blockade, and by continuous peripheral or central blocks. Regional blocks can be administered around the brachial plexus, lumbar plexus, and the sciatic and femoral nerves, used predominantly in orthopaedic surgery, while intercostal blocks are appropriate for cardio-thoracic and abdominal surgery. These techniques are particularly useful where a specific area is operated on, to improve postoperative blood supply or when central blockade is contraindicated.

Spinal anaesthesia can be an alternative method for lower body surgery, including orthopaedic, colorectal, gynaecological and obstetric procedures. Pain relief can last for hours after the operation. Careful monitoring of respiratory rate is important, as a block that is too high can lead to respiratory depression. Epidural catheters can be used throughout the spinal cord; either cervical, thoracic or lumbar region.

When considering epidural analgesia it is important to be aware of the anatomy surrounding the spinal canal and how it differs from spinal analgesia. The epidural space is a potential space within the spinal canal. When siting an epidural, it is necessary to locate the boney landmarks (usually L3/4), and then penetrate through skin, subcutaneous tissue, supraspinous, and interspinous ligament.

The final layer is the ligamentum flavum, which is tough and difficult to penetrate. At this stage gentle advancement of the needle tip will enter the epidural space and there will be a complete loss of resistance. Local anaesthetic with an opioid can be injected in this site in gentle increments to bypass some of the side effects, which include hypotension, nausea, sensory and motor block, and urinary retention. (9)

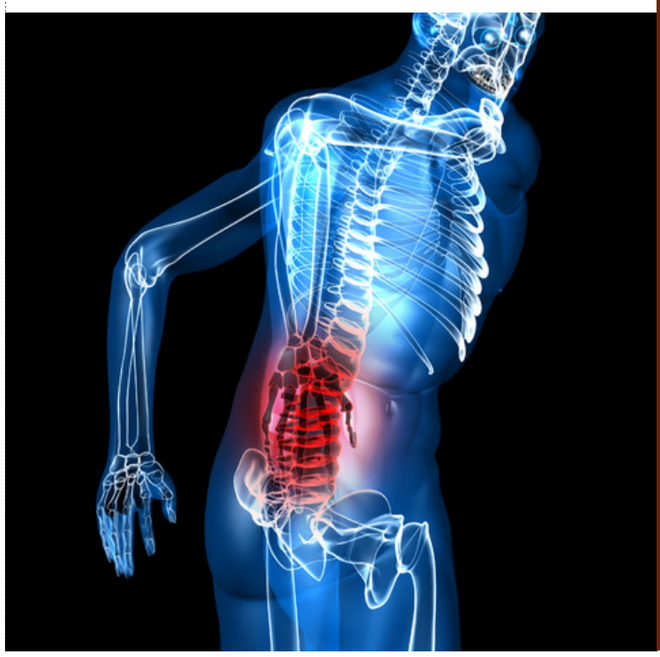
The vignette describes the thoracic epidural catheter, including some of the unwanted side effects involved with epidural blockade and how these may be overcome. Referring back to the clinical case, the patient maintained a systolic blood pressure of 100 mmHg - as expected when patients are given an epidural anaesthetic. It is important to review trends in systolic function and to be vigilant for the development of symptoms.

Hypotension with epidurals occurs due to sympathetic blockade; there is a fall in systemic vascular resistance resulting in reduced cardiac output and therefore hence, reduced blood pressure. There is also vasodilatation, which further reduces the blood pressure. Therefore, adminstering large amounts of fluids with little effect may not be the best treatment as most of these patients are adequately filled. Using potent sympathomimetic drugs such as metaraminol (0.5-5 mg) and ephedrine (dose 3-7.5 mg 3-4 minute intervals to max 30 mg) acting on alpha-1 and beta-1 adrenoceptors will sufficiently raise the blood pressure, but these drugs should be administered with caution.

Unfortunately, the patient developed urinary retention due to the blocking effect of the epidural on afferent and efferent nerve impulses to and from the bladder. It is vital to be aware that accidental intravenous or intrathecal injection of local anaesthetic can be lethal. Contraindications to epidural anaesthesia include coagulopathy, local sepsis and hypovolaemia (3). Other common postoperative complications such as dural tap can cause profound headaches, backache and potential neuropraxia. Less commonly, infection can be introduced into the epidural site and pressure sores can develop in the elderly population. The use of local anaesthetic should not be the sole mainstay of treatment, but part of a logical analgesic management plan.

Non-opioids

These include paracetamol, and non-steroidal anti-inflammatory drugs (NSAIDs) including aspirin. Paracetamol is a useful drug and in its oral form has a good bioavailability. In its oral preparation, the onset of action is slower than an intravenous preparation with a longer half-life and duration of action. Intravenous paracetamol has a quicker onset of action but a shorter half-life, so its effects are less sustainable (10). Paracetamol has anti-pyretic properties, inhibiting Prostaglandin E-1(PGE-1) acting on the thalamic temperature centre. This can be useful in postoperative pyrexia.



ANALGESIA IN THE SURGICAL PATIENT

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Non- steroidal anti-inflammatory drugs inhibit Prostaglandin E-2 (PGE-2). There is evidence that NSAIDs can cause impaired bone growth, and that they are associated with an increased thrombotic cardiovascular risk (2). Its use is contraindicated in patients with a gastro-intestinal haemorrhage due to its anti-platelet activity and direct PGE-2 inhibition. PGE-2 is important in regulating blood flow to the gastric mucosa and stimulating bicarbonate and mucus production (11). It is also contraindicated in hypovolaemia, and patients with impaired renal function, due to its nephrotoxic effects (2). It should be used with caution in asthmatics as it can increase the production of leukotrienes and cause bronchospasm (12).

NSAIDs would not be appropriate for someone who has just undergone an oesophagectomy, such as the patient in our scenario, due to the increased risk of haemorrhage and its effects on gastric mucosa (10).

However, there is a role for NSAIDs and COX2 inhibitors in peri and postoperative analgesia and it may be appropriate, particularly in an otherwise young, fit, healthy patient. Oral NSAIDs include ibuprofen, naproxen or diclofenac which can also be given per rectum, and intravenous preparations include paracoxib.

Aspirin is not commonly used in the postoperative acute setting for analgesic control in the UK, again due to bleeding risk and poor pain control (13).

Opioids

These drugs are an agonist at mu and kappa-opioid receptors. They appear to increase intracellular calcium concentrations which subsequently increases potassium conductance and results in hyperpolarisation of excitable cell membranes. The decrease in membrane excitability may then decrease pre and post-synaptic responses.

These can be subdivided into weak and strong opioids. The most commonly used weak opioid is codeine. It can provide good pain relief when given with paracetamol, prior to discharge. However, codeine should be prescribed with some caution, owing to its anti motility effects which can lead to constipation and ileus (3). There are also a significant proportion of patients who do not possess the enzyme cytochrome P450, to metabolise codeine into its effective metabolite, morphine; so it offers nothing but placebo effect. Considering the elderly and patients with severely impaired hepatic and renal function, it may be appropriate to use a lower dose, as it can precipitate delirium (14). The same applies to stronger opioids but to a greater degree. Nausea and vomiting precipitated by opioids can be counteracted with concomitant use of anti emetics, particularly cyclizine and ondansetron in the acute surgical patient.

The most common modes of administration are oral, subcutaneous, and intravenous. They can also be given concurrently with local anaesthetics in epidural catheters. With patient-controlled analgesia (PCA), patients can administer their own intravenous analgesia and titrate the dose to their own experience of pain using a small microprocessor controlled pump (15). The risk of respiratory depression is reduced by PCA with the lockout period safety mechanism, providing an on demand bolus injection of morphine. Overdose is therefore avoided by limiting the size of bolus and total dose that can be administered in a set period of time. This is usually 1 mg of morphine with a lockout period of 5 minutes on standard pumps. A background infusion can be given when pain is not adequately controlled with the individually self-administered boluses (16).

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In the case mentioned, this was a necessity for the patient when coming off the epidural, as his pain was not adequately controlled with a simple PCA. PCA is a very popular postoperative measure, as the patient can in theory, maintain a plasma concentration with good pain control and reduced side effects. Whilst a patient is on a PCA, all other forms of opioids are omitted from their drug chart to avoid overdose. It is usually hospital policy to prescribe oxygen and naloxone along side PCA prescriptions and it is good practice to include anti-emetics when required. The main disadvantage of PCA, is that due to the large variation in opioid requirements between each patient, some may not attain optimum pain relief due to the safety mechanism of PCA, where a maximum dose per hour is set to prevent inadvertent overdose. (17)

The step down administration of opioids in the postoperative period usually follows the process: epidural, PCA, subcutaneous and finally oral. The pain team estimated our patient's morphine tolerance prior to discharge and this was prescribed on a slow release equivalent (i.e. MST). The aim was to optimise the patient's pain relief for discharge.

Morphine is the most commonly prescribed strong opioid. Parenteral doses range from 2.5 mg to 20 mg and may be prescribed as frequent as hourly. Morphine has a short half-life with poor bioavailability, and is metabolized by the liver (3). Caution needs to be exercised when using such drugs due to the sedative effect, risk of hypotension, respiratory depression and delirium (18). Pethidine is a synthetic opioid with similar properties to morphine but an even shorter duration of action. Pethidine is useful in renal colic but is renally excreted and so should be used with caution in patients with renal dysfunction. Parenteral doses range from 25 mg to a maximum of 150 mg. Frequency of administration is 1 to 4 hourly (3). Opioids increase sphincter tone and can exacerbate biliary pain (19). Some patients can suffer from a histamine reaction, "pharmacologically induced histamine release" or a non-allergic reaction, which can result in a rash. (20).

Fentanyl is predominantly used intraoperatively but can be used in epidurals along with local anaesthetics, the so-called "float" combination (21). Usually the local anaesthetic and opiate of choice is 0.25% bupivicaine and fentanyl. Alternatively a longer acting opioid such as diamorphine can be added to the epidural float instead of fentanyl.

Adjuvant analgesia

These include tricyclic antidepressants such as amitriptyline, which is useful in patients who develop neuropathic pain postoperatively, and can also help patients with sleep disturbance. Anticonvulsants such as gabapentin are also a popular drug for neuropathic pain, particularly in chronic pain such as in cases resulting from sphincter of Oddi dysfunction and peripheral limb neuropathic pain postoperatively. Neurotransmitter modulators such as carbemazepine are also used to control pain (2).

Prescribing in special circumstances

Analgesia in the elderly needs to be treated with caution and reduced doses should be considered, particularly where there is liver or renal dysfunction. There are separate guidelines for postoperative analgesia in children that are adjusted for their physiology.

Conclusion

Each patient is different and it is essential to have a clear strategy in mind when dealing with postoperative analgesia, tailored to suit the patient's needs. This will aid a smooth discharge and reduce potentially avoidable secondary complications. The clinical vignette demonstrates the difficulty of managing postoperative pain, as well as methods for overcoming these challenges by following a logical step-wise plan such as the WFSA pain ladder for acute pain.

Questions (22) (23):

1. Which of the following produce reliable dynamic analgesia after thoracotomy?

a. Thoracic epidural local anaesthetic and opioid combinations.
b. Paravertebral nerve blockade.
c. I.V. opioid infusions.
d. Intrathecal morphine.
e. Lumbar epidural local anaesthetics with opioids.

2. Concerning the delivery of a pain service for post-thoracotomy pain:

a. The aim of pain control is to achieve low pain scores at rest.
b. Ordinal pain scores are the most reproducible.
c. A balanced technique and multidisciplinary input provides the best overall pain relief.
d. Dynamic analgesia is defined as when a patient is able to move freely and cough effectively with a low pain score.
e. Only dynamic analgesia decreases post-thoracotomy respiratory complications.

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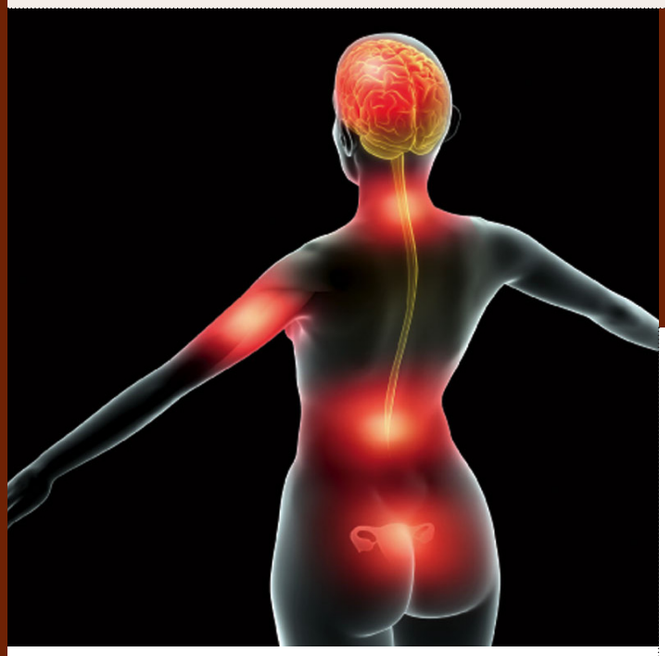

3. Advantages of patient-controlled analgesia (PCA) include:

a. Immediate medication delivery.
b. Less contact with nursing staff.
c. Rapid onset of analgesia.
d. Patient control over pain medication.
e. All of the above.

4. Advantages of epidural analgesia include:

a. Earlier mobilisation after surgery.
b. Earlier return of bowel function.
c. Shorter hospitalisations.
d. Decreased stress response to surgery.
e. All of the above.

5. Narcotics are commonly used in the administration of general anaesthesia. Which of the following statement(s) is/are true concerning this class of agents:

a. Narcotics have both profound analgesic and amnesic properties.
b. Narcotics can cause hypotension by direct myocardial depressive effects.
c. Naloxone should be used routinely for the reversal of narcotic analgesia.
d. Acutely injured hypovolemic patients are at significant risk for decreased blood pressure with the use of narcotic analgesics.
e. Propofol is a new intravenous short-acting narcotic used frequently in the outpatient setting.

Answers

1. The following produce reliable dynamic analgesia after thoracotomy: (a) True; (b) False; (c) False; (d) False; (e) False

Only thoracic epidural local anaesthetic and opioid combinations has been shown to offer reliable dynamic analgesia for acute pain in post-thoracotomy patients. Paravertebral nerve block, intravenous opioid infusions, intrathecal morphine and lumbar epidural local anaesthetics with opioids can produce good pain relief, but not reliable dynamic analgesia.

2. Concerning the delivery of a pain service for post-thoracotomy pain: (a) False; (b) False; (c) True; (d) True; (e) True

The aim of pain control is to achieve dynamic analgesia. Numerical rating scores have been shown to be the most accurate and easily reproducible.

3. Advantages of patient-controlled analgesia (PCA) include: (a) True; (b) False; (c)True; (d) True; (e) False

Advantages of PCA are immediate medication delivery, rapid onset of analgesic action, and patient control over pain medication administration. Disadvantages of PCA include less nursing staff contact and fears that they could inadvertently administer an overdose as a result of inappropriate use.

4. Advantages of epidural analgesia include: (a) False; (b) False; (c) False; (d) False; (e) True

Epidural analgesia provide excellent pain relief, decreased sedation with a more rapid recovery to pre-surgical levels of consciousness. They also enable earlier mobilisation after surgery with increased ability to co-operate with respiratory therapy and physical therapy. Following vascular surgery, epidural analgesia may also improve graft flow through mild sympathetic blockade. There is an earlier return of bowel function, decreased stress response, shorter hospitalisation, and decreased morbidity, all associated with epidural analgesia.

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5. Narcotics are commonly used in the administration of general anaesthesia. Which of the following statement(s) is/are true concerning this class of agents. (a) False (b) False; (c) False; (d) True; (e) False

Narcotics and synthetic analogues belong to the class of drugs called opioids. Narcotics produce profound analgesia and respiratory depression. They have no amnesic properties, no myocardial depressive effects, and no muscle relaxant properties. Narcotics may produce significant hemodynamic effects indirectly through the release of histamine and blunting of the patient's sympathetic vascular tone due to its analgesic properties. Acutely injured patients may be hypovolemic and in pain, with high sympathetic tone and peripheral resistance.

Such patients can experience a dramatic drop in systemic blood pressure with minimal doses of opioids. All opioids can be reversed with naloxone. Naloxone treatment has been associated with acute pulmonary oedema and myocardial ischemia and should not be used electively to reverse the effects of narcotic. Propofol is a lipid-soluble substitute isopropyl phenol non-narcotic agent that produces rapid induction of anaesthesia followed by awakening in 4-8 minutes.

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Author

Y Haroon
CT1 Anaesthetics
Queen's Hospital
Rom Valley Way
Romford
Essex. RM7 0AG

yumnaharoon@nhs.net

THE MISSED INJURY: BLADDER PERFORATION

H Raja, R Marri, SJ Srirangam

Abstract

This case based discussion concerns the a fit 37 year old male who presented to the emergency department following a fall. He initially described vague non-specific symptoms and was discharged from the emergency department without any basic investigations i.e. routine bloods or a surgical review. It was only when he re-presented with similar worsening symptoms that he was appropriately assessed and referred.

Through this case report, it is our aim to highlight how the signs and symptoms of bladder perforations are obscure and how this type of injury can be so easily missed in the assessment of a patient. We hope to be able to enlighten readers by identifying key aspects in the history and physical examination to increase their clinical acumen with regards to bladder injuries. We will also discuss diagnostic and management options for different types of bladder injury.

Keywords: Bladder, injury, perforation

Case

A previously fit and well 37 year old man presented to the emergency department with abdominal pain following a fall. He had consumed an unknown number of alcoholic drinks before the fall. Following initial assessment, he was discharged with simple analgesia but returned later with worsening right sided abdominal pain.

On physical examination, the patient was haemodynamically stable, but exhibited abdominal distension with tenderness over the right upper and lower quadrants. Blood tests revealed a normal full blood count but deranged renal function with a serum urea of 11.8 and Creatinine of 233. Frank haematuria was noted on catheterisation which first was thought to be secondary to trauma during catheter insertion.

Catheter drainage ceased after a few hours with no resolution despite bladder washout and catheter change. A non-contrast CT revealed moderate amounts of free fluid in the pelvis with no obvious cause. Based on the mode of injury, abdominal pain, persistent oliguria the following radiological investigation was requested:

The Missed Injury: Bladder Perforation
Urology

Questions

1) What is the investigation

2) What are your findings?

3) What is the diagnosis?

4) What are the classifications for this injury?

5) How should this patient be managed?

Short answer

1. Retrograde cystogram (insertion of water soluble contrast via a urethral catheter).

2. Extravasation of contrast from dome of the bladder into the peritoneal cavity.

3. Intraperitoneal bladder perforation secondary to blunt abdominal trauma.

4. Intraperitoneal and extraperitoneal bladder perforation.

5. Surgical exploration and primary closure of perforation is the mainstay of treatment (3).

THE MISSED INJURY: BLADDER PERFORATION

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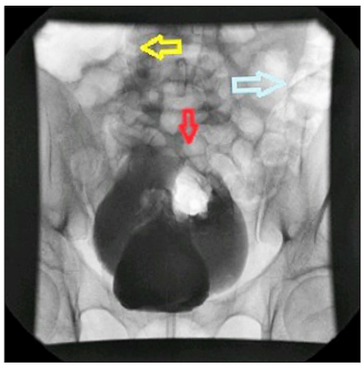
Long answer

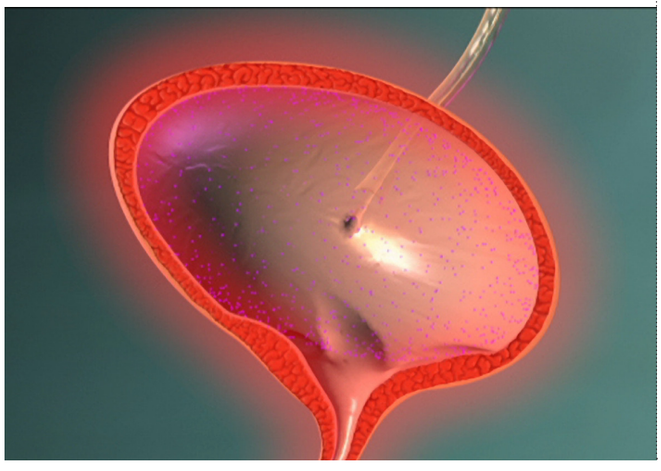
1) A retrograde cystogram is the standard diagnostic imaging for bladder injuries with a diagnostic accuracy of >85% (1) as long as the bladder is adequately distended (i.e. at least 200mls of contrast). Alternatively, a CT cystogram (abdominal CT scan after instillation of contrast via the urethral catheter) may be performed with a sensitivity approaching 100%

2) Extravasation of contrast into the peritoneal cavity (red arrow). Contrast can also be seen outlining bowel loops (blue arrow) and filling paracolic gutters (yellow arrow), (2) (4). Non-contrast CT scan can miss a bladder injury and may not be able to differentiate free intraperitoneal fluid as either haematoma, ascites or urine leak. However it's useful in identifying other associated injuries.



3) A bladder perforation is easily missed. Maintaining a high index of suspicion and prompt radiological investigations is crucial in establishing or excluding the diagnosis. Though patients may present with haematuria following blunt abdominal trauma, early clinical signs of bladder trauma are often non-specific. Bladder injury must be suspected in patients with history of blunt trauma to lower abdomen particularly with frank haematuria, a distended bladder (possibly due to alcohol intake) and an inability to void (1, 2).

Key points: clinical indicators of bladder injury (4)



4) Classification of bladder injury can be based on anatomical site, aetiological factors or cystographic patterns of extravasation. The table below classifies bladder injuries based on the American Association of Trauma Surgeons (AAST) grading (3)

Injury Severity Scale of the Bladder	
Grade	**Description**
1	Haematoma - Contusion, intramural haematoma Laceration - Partial thickness
2	Laceration - Extraperitoneal bladder wall laceration < 2 cm
3	Laceration - Extraperitoneal (> 2 cm) or intraperi-toneal (< 2 cm) bladder wall laceration
4	Laceration - Intraperitoneal bladder wall laceration > 2 cm
5	Laceration - Intraperitoneal or extraperitoneal bladder wall laceration extending into the bladder neck or ureteral orifice (trigone)

5) Patients with extraperitoneal bladder ruptures can be managed conservatively by prolonged catheterisation alone (3, 4). However, with intraperitoneal bladder injuries, urine escapes into the abdominal cavity, resulting in urinary ascities, peritonitis, sepsis and ultimately death. Therefore prompt surgical exploration is mandatory. Surgical repair is also indicated in extraperitoneal injuries where other associated injuries require open repair. e.g. pelvic fracture (to reduce infection of metalwork) or during laparotomy for other injuries. A suprapubic catheter is also often used to guarantee drainage during the healing process.

Outcome

Our patient underwent an uneventful post-operative recovery and was discharged home 5 days later. A repeat cystogram performed three weeks post-operatively revealed no leak from his bladder and his urethral catheter was then removed. Following catheter removal he voided satisfactorily and was discharged from our care.

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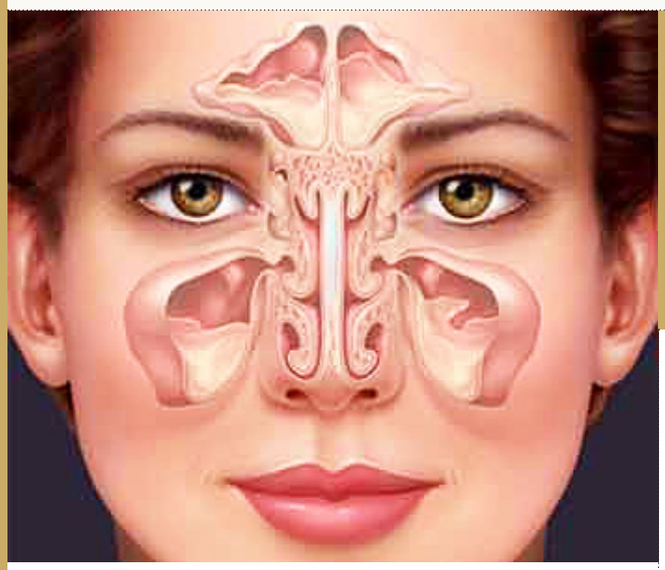
Corresponding author

Hary Raj
Core Surgical Trainee
North West Deanery

A GUIDE TO RHINOSINUSITIS

N Hamilton, Z Saloojee, E Alkizwini, A Hannan



Abstract

Rhinosinusitis refers to inflammation of the mucosa lining the paranasal sinuses and nasal cavity. It is a common condition affecting 15% of Western populations (1) resulting in an estimated 15 million health visits in the US alone (2). Whilst most cases are self-limiting and can be managed in the community, rhinosinusitis can lead to severe and debilitating symptoms that can result in fatal complications. A good understanding of this condition is therefore essential for all trainees in Otorhinolaryngology.

Key words: Rhinosinusitis, fuctional endoscopic sinus surgery (FESS)

Anatomy

The paranasal sinuses include the maxillary, ethmoidal, sphenoid and frontal sinuses (figure 1). They develop as diverticula of the nasal mucosa and are present at birth as small rudimentary cavities. The paranasal sinuses start to rapidly expand with the onset of dentition and reach full maturity at the end of adolescence. The paranasal sinuses and nasal cavity are lined by a mucous membrane consisting of respiratory epithelium composed of ciliated and non-ciliated pseudostratified columnar cells with interspersed mucus producing goblet cells (3).

The nasal cavity extends from the nares of the nostrils to the post-nasal space and is enclosed by the skull base superiorly and the hard palate inferiorly. It is divided into left and right cavities by the septum which acts as a midline partition. Along the lateral wall of the nasal cavity there are three mucosal lined irregular shaped bones known as the inferior, middle and superior turbinates. These divide the nasal cavity into the inferior meatus, middle meatus and superior meatus. The middle meatus is regarded as the most relevant in sinus pathology as it is the common drainage pathway for the maxillary, anterior ethmoid and frontal sinuses. This pathway is often referred to as the osteomeatal complex (OMC) (figure 2). The posterior ethmoid and sphenoid sinus drain into the sphenoethmoidal recess medial to the superior turbinate but can also be indirectly affected by obstruction at the OMC.

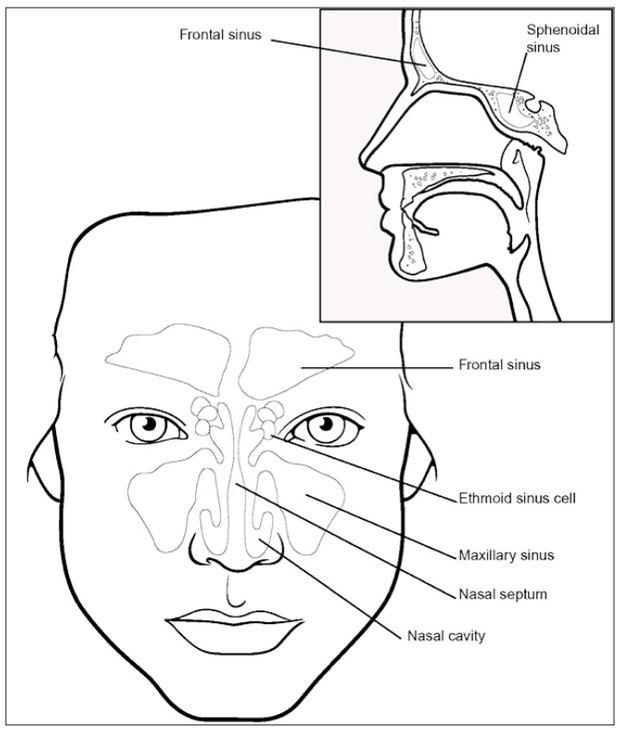


Figure 1: Paranasal sinuses.

A GUIDE TO RHINOSINUSITIS

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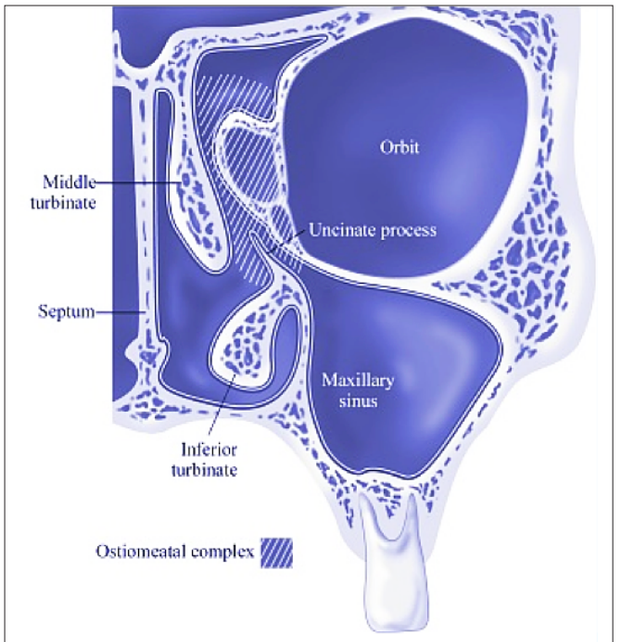

Osteomeatal complex (OMC) bound by the middle turbinate medially, the lamina papyracea laterally and the basal lamella superiorly and posteriorly. The inferior and anterior borders of the OMC are open.

Figure 2: Osteomeatal complex.

Pathophysiology

The common event in all causes of rhinosinusitis is inflammation of the nasal and sinus mucosa leading to obstruction of the sinus drainage pathways. This in turn reduces the oxygen tension within the sinus leading to reduced mucociliary transport and stasis of fluid which becomes more viscous and can in turn be colonised by bacteria (4). Causes of the initial inflammatory response are multiple and include allergic, infective, neoplastic and autoimmune events (table 1). In addition there are believed to be a number of predisposing factors to developing rhinosinusitis such as underlying anatomy, history of atopy and aspirin sensitivity (table 2).

Infective	Bacterial - acute • *Streptococcus pneumoniae* • *Haemophilus influenzae* • *Strep species* • *Anaerobes* Bacterial chronic • *Moraxella catarrhalis* • *Staphylococcus aureas* • *TB: Mycobacterium tuberculosis* • *Syphillus: Treponema pallidum* • *Respiratory scleroma: Klebsiella rhinoscleromatis* • *Mycobacterium leprae (leprosy)* Viral Fungal
Allergic	House dust mites Pollen Pet dander Mould spores
Autoimmune	Wegener's granulomatosis Sarcoidosis
Neoplastic	
Other	Atrophic rhinitis Gastrooesophageal reflux Medication Irritants Idiopathic

Table 1: Causes of rhinosinusitis.

Genetic factors	Immotile cilia syndrome Cystic fibrosis
Anatomical abnormailities	Concha bullosa Septal spurs Paradoxical turbinate
Systemic disease predisposing to infections	
Atopic individuals	
Immune disorders	
Neoplastic disease	
Iatrogenic factors	Surgery Medications Nasal packing Nasogastric tube placement
Environmental factors	Bacterial infections Viral infections Fungal infections Fungal or bacterial colonization
Exposure to tobacco smoke	Primary Secondary
Exposure to irritants or noxious chemicals	Acute or chronic exposure
Trauma	

Table 2: Predisposing factors to developing rhinosinusitis.

A GUIDE TO RHINOSINUSITIS

N Hamilton, Z Saloojee, E Alkizwini, A Hannan

A Guide to Rhinosinusitis
Otorhinolaryngology & Neck Surgery

Rhinosinusitis can be either acute or chronic. Acute forms tend to be infective with Streptococcus pneumonia and Haemophilus influenzae being the predominant organisms although a viral induced upper respiratory tract infection often precedes (5). In chronic rhinosinusitis the picture is more mixed with a number of different organisms showing prevalence including fungal organisms (6). Chronic rhinosinusitis does not necessarily have to have an infective component and the exact pathophysiology is still a source of great debate. It should therefore be thought of as a chronic inflammatory response with varying causes which are often multifactorial such as a secondary chronic fungal infection in a patient with Wegener's granulomatosis.

History

A full history should be taken to help diagnose the cause of rhinosinusitis with a full ENT systems review (table 3).

Ears	Pain/pressure/fullness
	Ottorhoea
	Hearing problems/deafness
	Tinnitus/vertigo
Nose	Blockage
	Anterior discharge
	Posterior discharge
	Sneezing/itching
	Hyposmia/anosmia
	Pain over sinuses
Throat	Pain
	Lymphadenopathy
	Odynophagia/dysphagia
	Reflux
	Change in voice

Table 3: Review of ENT symptoms.

It is important to enquire about eye symptoms when faced with rhinosinusitis as part of the orbital floor and medial wall represent the roof of the maxillary sinus and lateral ethmoidal sinus respectively.

When taking a history from a patient with symptoms of rhinosinusitis it is important to look out for red flag symptoms that suggest the possibility of serious pathology (table 4). Should these symptoms be present further investigation is warranted as discussed below.

Presence of any of these symptoms warrants **urgent referral, investigation and intervention**	Unilateral symptoms
	Bleeding
	Crusting
	Cacosmia
	Orbital symptoms
	-periorbital oedema
	-displaced globe
	-double vision
	-reduced visual acuity
	-ophthalmolegia
	Severe frontal headache (unilateral or bilateral)
	Frontal swelling
	Signs of meningitis
	Focal neurological signs

Table 4: Symptoms suggesting serious underlying pathology.

Examination

Examination of the ears

The tympanic membrane should be assessed to look for signs of Eustachian tube dysfunction secondary to sinonasal disease. This will manifest as retraction of the membrane due to chronic middle ear negative pressure or a dull bulging membrane secondary to effusion.

Examination of the head and neck

The neck should be examined for evidence of lymphadenopathy that could suggest an infective or neoplastic cause for the rhinosinusitis.

Examination of the nose and paranasal sinuses

The nose should be examined in a systematic fashion. A useful technique is to use an outside-to-in approach.

1. General inspection to assess for external signs of infection.
2. Palpation of the sinuses to examine for tenderness.
3. Assess the nasal airway by occluding one nostril and asking the patient to sniff.
4. Anterior rhinoscopy to assess whether the nasal mucosa is inflamed or whether there are any obvious masses or lesions such as intranasal polyps.
5. Rigid / flexible endoscopy. Endoscopic examination should be performed to examine the inferior, middle and superior meati as well as the post-nasal space, and assess for inflammation of the mucosa, pus, polyps and lesions.

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Examination of the orbit

The orbit should be examined for an external signs of infection such as swelling and erythema. Occulomotor function, pupillary responses, visual acuity and colour vision should be assessed.

Diagnosis

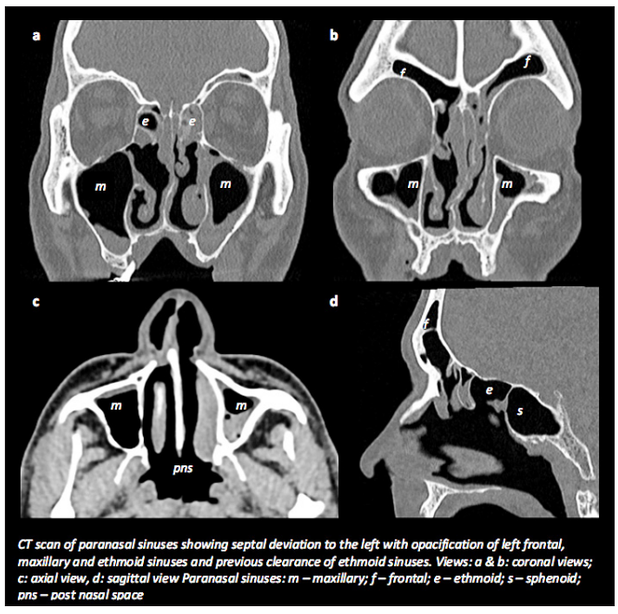
The European Position Paper on Rhinosinusitis and Nasal Polyps published in 2012 (7) defined rhinosinusitis as inflammation of the nose and the paranasal sinuses characterised by two or more symptoms:

- *one of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior/posterior nasal drip)*
- *± facial pain/pressure, ± reduction or loss of smell*
- *and either endoscopic signs of: nasal polyps, and/or mucopurulent discharge primarily from middle meatus and/or oedema/mucosal obstruction primarily in middle meatus*
- *and/or CT changes: mucosal changes within the osteomeatal complex and/or sinuses*

Investigation

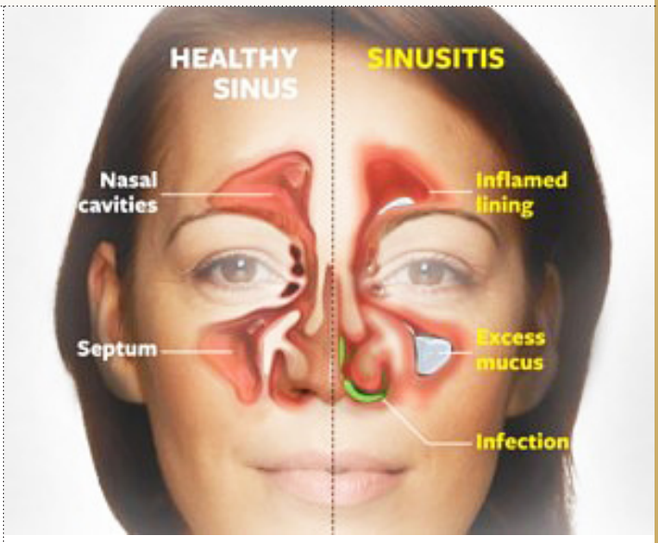
Imaging

The gold standard radiological investigation for rhinosinusitis is computed tomography scanning. Axial, coronal and sagittal views should be requested in order to examine in detail the paranasal sinuses and plan for potential surgery (figure 3). CT sinus scanning is recommended in symptoms of rhinosinusitis that fail to respond to medical management or in the presence of red flag symptoms or signs (7).



CT scan of paranasal sinuses showing septal deviation to the left with opacification of left frontal, maxillary and ethmoid sinuses and previous clearance of ethmoid sinuses. Views: a & b: coronal views; c: axial view, d: sagittal view Paranasal sinuses: m – maxillary; f – frontal; e – ethmoid; s – sphenoid; pns – post nasal space

Figure 3: CT of paranasal sinuses.



Skin prick allergy tests

All patients with a diagnosis of rhinosinusitis should undergo allergy testing to detect and treat any co-existing allergy that is likely to be contributing to the sinonasal inflammatory response.

Blood sampling

Blood tests can be useful to detect autoimmune conditions that can drive rhinosinusitis. FBC, ESR, ANA, ACE, cANCA are the most useful to investigate Wegeners granulomatosis and sarcoidosis but tend to be reserved for cases of rhinosinusitis that do not improve with treatment or if there are other features suspicious of an autoimmune condition.

Microbiology

Nasal swabs should be taken from nasal secretions especially during surgery when mucus is drained from the sinuses. This helps to guide antibacterial therapy and detects existing fungal colonisation.

Treatment

Medical

The first line of treatment for rhinosinusitis is medical and has been shown to be as effective in treating symptoms when compared to endoscopic sinus surgery (8). Tables 5 & 6 detail the range of different medical treatments and the evidence supporting their use as reported in the European Position Paper on Rhinosinusitis and Nasal Polyps which bought together a pan-European consensus on the most effective treatment regimes for both acute and chronic rhinosinusitis. In addition figures 4 & 5 detail treatment pathways suggested by the consensus document.

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Treatment	Level of evidence	Grade of recommendation	Relevance
Oral antibiotics	Ia	A	Yes in ABRS
Topical corsticosteroids	Ia	A	Yes mainly in post viral ARS
Addition of topical steroid to antibiotic	Ia	A	Yes in ABRS
Addition of oral steroid to antibiotic	Ia	A	Yes in ABRS
Saline irrigation	Ia	A	Yes
Antihistamine analgesic-decongetion combination	Ia	A	Yes in viral ARS
Ipratopium bromide	Ia	A	In viral ARS
Probiotics	Ia	A	To prevent viral ARS
Zinc	Ia	C	No
Vitamin C	Ia	C	No
Echinacea	Ia	C	No
Herbal medicine (pelargonium sidoides, Myrtol)	Ib	A	Yes in viral and postviral ARS
Aspirin / NSAID	Ib	A	Yes in viral and postviral ARS
Acetaminophen (paracetamol)	Ib	A	Yes in viral and postviral ARS
Oral Antihistamine added in allergic patients	Ib (1 study)	B	No
Steam inhalation	1a(-)[x]	A(-)	No
Cromoglycate	1b(-)[y]	A(-)	No
Decongestion	No data for single use	D	No
Mucolytics	No data	D	No

Table 5: Recommended treatment & evidence for adults with acute rhinosinusitis (EPOS 2012).

ABRS – Acute bacterial rhinosinusitis
1b (-)y: 1b study with negative outcome
Ia(-)x Ia level of evidence that treatment is not effective.

Treatment	Level of evidence	Grade of recommendation	Relevance
Steroid – topical	Ia	A	Yes
Nasal saline irrigation	Ia	A	Yes
Bacterial Lysates (OM-85 BV)	Ib	A	Unclear
Oral antibiotic therapy short term < 4weeks	II	B	During exacebrations
Oral antibiotic therapy long term >12 weeks **	Ib	C	Yes, especially if IgE is not elevated
Steroid – oral	IV	C	Unclear
Mucolytics	III	C	No
Proton pump inhibitors	III	D	No
Decongestant oral / topical	No data on single use	D	No
Allergen avoidance in allergic patients	IV	D	Yes
Oral antihistamine added in allergic patients	No data	D	No
Herbal en probiotics	No data	D	No
Immunotherapy	No data	D	No
Probiotics	Ib(-)	A(-)	No
Antimycotics - topical	Ib (-)	A(-)	No
Antimycotics – systemic	No data	A(-)	No
Antibioitcs - topical	1b(-)	A(-)[$]	No

Table 6: Recommended treatment & evidence for adults with chronic rhinosinusitis without nasal polyps (EPOS 2012).

** Some of these studies also included patients with CRS with nasal polyps*
% Acute exacerbations of CRS should be treated like acute rhinosinusitis

 # Ib (-): Ib study with a negative outcome

$ A(-): grade A recommendation not to use

*** Level of evidence for macrolides in all patients with CRSsNP is Ib, and strength of recommendation C, because the two double blind placebo controlled studies are contradictory; indication exist for better efficacy in CRSsNP patients with normal IgE the recommendation A. No RCTs exist for other antibiotics.*

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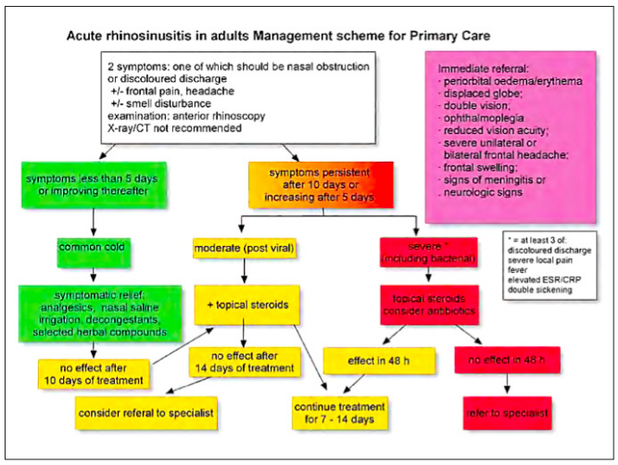

Figure 4: Management of adults with acute rhinosinusitis in primary care taken from EPOS 2012.

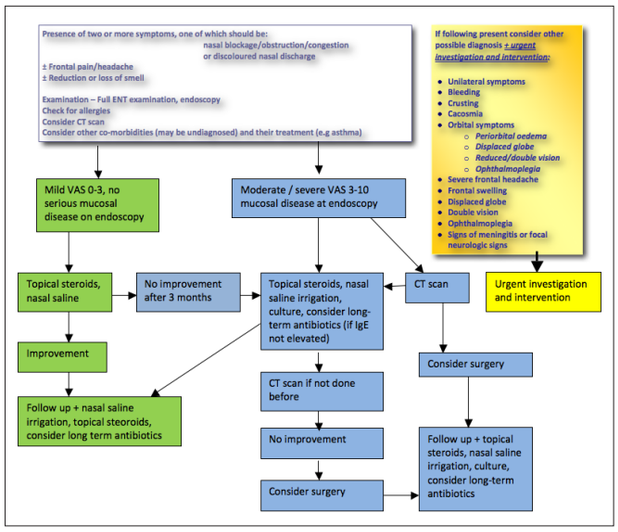

Figure 5: Management of adults with CRS without nasal polyps by ENT specialists taken from EPOS 2012.

Surgical

Surgery is indicated when medical treatment fails to improve a patient's symptoms or if there are symptoms or signs that warrant obtaining tissue for histology without delay such as unilateral sinus opacification or suspicious features on CT scanning.

Sinus surgery can be performed via an open or endoscopic approach. The evolution of the operating endoscope and a better understanding of sinus anatomy has meant the majority of sinus surgery for rhinosinusitis is now performed using an endoscopic approach known as Functional Endoscopic Sinus Surgery (FESS). The aim of FESS is to address the underlying pathophysiology by removing disease from the osteomeatal complex and in doing so restore the ventilation and drainage pathways of the sinuses.

This usually involves an infundibulotomy where part of the uncinate process is removed, maxillary antrostomy to open the maxillary sinus and an anterior ethmoidectomy by opening the ethmoid bulla. A number of different surgical books exist that detail the different stages of FESS and are recommended for the interested reader (9).

Complications

Complications of rhinosinusitis occur when bacterial infection spreads beyond the sinonasal mucosa. These can be divided into acute and chronic complications.

Acute

Acute rhinosinusitis can spread locally to structures surrounding the sinus. The most common complication involves spread of infection from the lateral wall of the ethmoid sinus (lamina papyracea) to the orbit. This can lead periorbital cellulitis and eventually a periorbital abscess that can threaten vision and track further posteriorly resulting in a cavernous sinus thrombosis (figures 6 & 7). Chandler's classification describes the different stages of a periorbital infection as shown in table 7.

Figure 6: Pre-septal cellulitis.

Figure 7: Stage III/IV.

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Stage I	Inflammatory Oedema - Preseptal
Stage II	Orbital cellulitis – postseptal
Stage III	Subperiosteal abscess
Stage IV	Orbital abscess
Stage V	Complication due to posterior extension

Table 7: Chandlers classification.

Local spread from the anterior wall of the frontal sinuses can result in a subperiosteal frontal abscess if infection spreads through the outer table of the skull. This results in soft tissue oedema and a collection over the frontal sinus and is referred to a Pott's Puffy tumour (figures 8a and b). If the infection spreads posteriorly an intracranial abscess or meningitis can result.

Figure 8a: Potts puffy tumour.

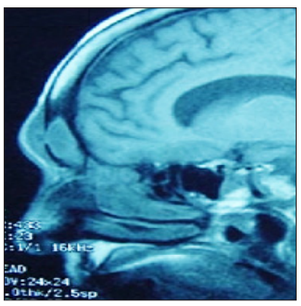

Figure 8b: Sagittal MRI cuts show fluid in the frontal sinus communicating with the subperiosteal abscess through a defect in the anterior table of the sinus

Local spread from the sphenoid sinus can result in a cavernous sinus thrombosis and pressure over the optic nerves from inflammatory debris can lead to visual loss secondary to compression of the optic nerve as it runs through the sphenoid sinus in the optic canal.

Local spread from the maxillary sinus can result in a dental infection with swelling of the cheek although more commonly dental infections lead to acute maxillary sinusitis.

More distant acute complications can also occur such as septicaemia and brain abscesses from heterogenous spread of infection.

Chronic

The most common chronic complication of rhinosinusitis is the formation of a mucocele. A mucocele is a mucus cyst that can expand within the sinus and become locally erosive. If this then becomes infected the mucous can turn purulent and is described as a pyrocele.

Questions

1. A patient is referred to you in clinic with a three month history of nasal blockage, postnasal drip and heaviness over both sinuses. No sinister features were identified on examination and this is his first presentation. What is the recommended initial management for this patient?

a) Saline rinse for the nose
b) Saline rinse and topical steroids
c) Saline rinse, topical steroid and investigate with CT scan
d) Saline rinse, topical steroid, CT scan and book for surgery

2. You see a patient back in clinic following a four month course of topical nasal steroid and saline rinse for the nose for symptoms of chronic rhinosinusitis. The symptoms are still just as bad but no new clinical findings are found on examination. How do you manage this patient?

a) Continue with a further two month course of saline rinse and topical steroids.
b) Continue with saline rinse and convert topical steroids to a short course of oral steroids
c) Continue with saline rinse and topical steroids and request a CT sinus scan
d) Continue with saline rinse and topical steroids and list the patient for surgery.

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3. You attend to a patient in A&E with swollen right orbit and a five day history of nasal congestion and sinus pain. On examination there is a mild degree of proptosis but no change in visual acuity and no neurological signs. A CT sinus scan demonstrates a small subperiosteal collection within the right orbit. How would you classify this complication?

a) Chandler's I
b) Chandler's II
c) Chandler's III
d) Chandler's IV
e) Chandler's V

4. Which of the below is not a red flag symptom

a) Unilateral epistaxis
b) Unilateral sinus pain
c) Visual changes
d) Reduced sense of smell
e) Neurological signs

5. The nasal cavities and paranasal sinuses are predominantly lined by

a) Stratified squamous epithelium
b) Ciliated and non-ciliated pseudostratified columnar epithelium
c) Ciliated pseudostratified columnar epithelium
d) Stratified squamous epithelium and ciliated
pseudostratified columnar epithelium

Answers

1. B 2. C 3. C 4. D 5. B

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Corresponding author

Mr. Nick Hamilton
ST4, ENT,
Royal Free Hospital,
North Thames

Email: nick.hamilton@doctors.org.uk

BILIARY ATRESIA AND CHOLEDOCHAL CYSTS IN CHILDREN: A CLINICAL REVIEW

M Patel, AG Buchanan

Biliary Atresia and Choledochal Cysts in children: a clinical review
Paediatric Surgery

Abstract

Biliary atresia and choledochal cysts are rare but important causes of neonatal jaundice. They are the commonest causes of surgically treatable cholestasis in the newborn period. Without intervention these infants will invariably develop hepatic cirrhosis which will result in death from liver failure. A high index of suspicion is key to making a timely diagnosis. Prompt surgical treatment has clearly been shown to improve the likelihood of establishing bile flow and in preventing the development of irreversible biliary cirrhosis (1).

Keywords: Biliary atresia, choledochal cyst, jaundice

Case Presentation

A 25 day old term female neonate presents with jaundice since birth which has been progressive over the last week. Her parents report a one week history of pale stools and noticeably dark urine. On examination she appears well but is deeply jaundiced with palpable firm hepatomegaly. What are the differential diagnoses? How would you investigate this child further

Biliary Atresia

Epidemiology & Aetiology

Biliary atresia occurs with a frequency of between 1 in 8,000 and 1 in 16,000 live births (1,2). The aetiology of biliary atresia remains obscure and current evidence suggests genetic defects may be involved in approximately 20% of cases (2). The other 80% include viral, autoimmune and immune-mediated processes in addition to damage to the biliary tract by toxic monohydroxy bile acids (3).

Pathogenesis

The disease is a result of a sclerosing inflammatory process that affects both intra- and extra-hepatic bile ducts causing luminal obstruction. Severe destruction and occlusion of the extra-hepatic biliary tree leads to widening of portal tracts with oedema, and eventual destruction of liver architecture.

Classification

The Japanese Society of Paediatric Surgeons has classified the lesions of the extrahepatic biliary system into three principal types based on the predominant site of atresia (Figure 1).

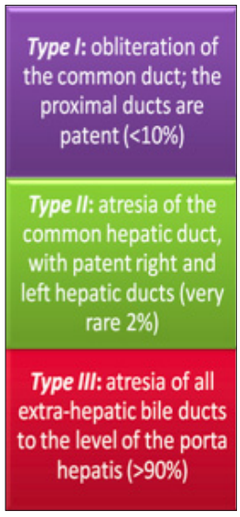
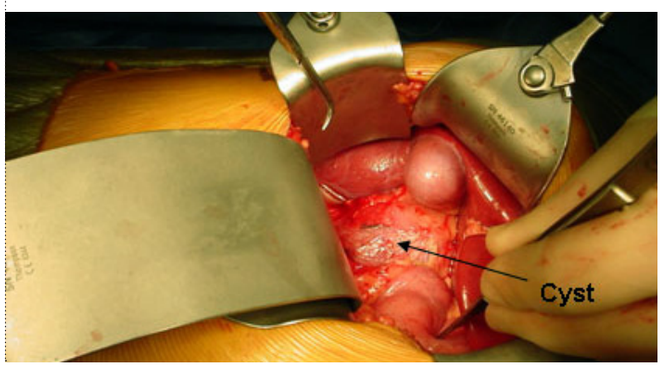


Figure 1. Classification of Biliary atresia (Japanese Society of Paediatric Surgeons) (4)

An average of 20% of children with biliary atresia have additional abnormalities outside of the hepatobiliary system (2). Cardiac abnormalities are most frequent. Others include situs invertus and splenic abnormalities. A variety of splenic malformations have been described which include polysplenia syndrome (multiple spleens, situs invertus, preduodenal portal vein and malformations of the inferior vena cava); others include double spleen and asplenia. In these cases a genetic defect is likely (5).



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Clinical presentation

Infants with prolonged jaundice must be evaluated for other causes e.g. infective, metabolic, endocrine and drug-related causes so surgery can be performed within the first ten weeks of life. The most common cause of neonatal jaundice is physiological; this unconjugated hyperbilirubinaemia will rarely persist beyond 2 weeks (conjugated hyperbilirubinaemia is never physiological). Infants with biliary atresia are typically full term and most often manifest normal growth and weight gain during the first few weeks of life. On examination there will be clinical signs of jaundice, hepatosplenomegaly and a possibility of cardiac murmurs in the presence of cardiac anomalies.

Obstructive cholestasis
Biliary atresia
Choledochal cyst
Gallstones or biliary sludge
Inspissated bile
Neonatal sclerosing cholangitis
Cystic fibrosis
Alagille syndrome
Congenital hepatic fibrosis/Caroli's disease
Hepatocellular cholestasis
Idiopathic neonatal hepatitis
Viral infection
Cytomegalovirus
HIV
Bacterial infection
Urinary tract infection
Sepsis
Syphilis
Genetic/metabolic disorders
α-1-antitrypsin deficiency
Tyrosinemia, Galactosemia, Hypothyroidism
Progressive familial intrahepatic

Table 1: Most likely causes of cholestasis in infants less than 2 months old (6)

Investigation

Any infant who is persistently jaundiced beyond the first two weeks of life should be investigated further. Biliary atresia must be considered in those with a conjugated bilirubin fraction >20% (2). Early diagnosis is essential to improve infantile outcomes. Other causes of infantile cholestasis should be rapidly excluded so that plans for surgical intervention can be implemented within the first 8-10 weeks of life (1,2). It is not unusual to face diagnostic challenges in these infants who can present with clinical and biochemical features (liver function tests) which are very similar to those in hepatocellular disease and surgical/non-surgical causes of obstructive cholestasis (See Table 1). These conditions will clinically manifest with jaundice, pale stools, dark urine and possibly complications of bleeding as a consequence of coagulopathy associated with acute liver failure. No single pre-operative investigation can enable the diagnosis of biliary atresia to be made with certainty (2). The diagnosis is ultimately confirmed by surgical exploration and operative cholangiography, but the following investigations can aid in the diagnostic work-up:

Ultrasound is not diagnostic in biliary atresia but it can be used to assess for choledochal cysts, inspissated bile, gall stones, absent gall bladder and splenic anatomy. Some studies have found irregularities within the wall and shape of the gall bladder, as highly sensitive radiological signs when identifying infants with biliary atresia. The 'triangular cord sign' is another sensitive sign demonstrated on ultrasound which corresponds to a triangular area of high reflectivity at the porta hepatis; corresponding to fibrotic ductal remnants (7,8). Biliary radionuclide excretion scanning involves the use of a radiolabelled iminodiacetic acid derivative which is intravenously injected. In children with biliary atresia this scan would demonstrate a reduction in uptake of the label by the reticuloendothelial cells of the liver and excretion into the bowel via the biliary tree. Percutaneous liver biopsy is central to achieving the diagnosis and histology results of hepatic fibrosis and cellular infiltration are in-keeping with a diagnosis of biliary atresia (9).

Endoscopic retrograde cholangiopancreatography (ERCP) may be indicated in infants who show no excretion of isotope and in whom histology results are inconclusive. ERCP has been demonstrated to be an effective method of evaluating the extrahepatic biliary tree and diagnosing biliary atresia (10). These investigative tools can all be helpful, but their results are not individually diagnostic. Results are reviewed collectively and the diagnosis should be confirmed at laparotomy.

Surgical Management

The aim of surgical intervention is to restore bile flow and this may be achieved by the the Kasai portoenterostomy procedure (11) . The surgery involves creating a Roux-en-Y anastomsis (the name is derived from the surgeon César Roux who first described it and the 'Y' formation which results) between the porta hepatis and small bowel. The rationale for this approach is that microscopic biliary channels within tissue at the porta hepatis exist, and thus provide direct connection with the intrahepatic ductule system to allow bile drainage (2,11).

A transverse supra-umbilical incision is made and the first step of the procedure is to confirm the diagnosis by inspection of the liver and biliary tract. If there is any doubt on table, cholangiography is performed via a catheter in the gall bladder and should clarify ductal patency. The falciform and left triangular ligaments are incised and the liver is exteriorised through the incision and rotated to expose the porta hepatis. The extrahepatic biliary tree is completely excised and the tract is dissected free from underlying portal vein and hepatic artery and transected at the porta hepatis. A 45 cm Roux-en-Y loop is prepared and passed through the mesocolon to the liver hilum where an anastomsis is fashioned between the cut edge of the transected tissue in the porta hepatis and the antimesenteric side of the Roux loop (2,11).

BILIARY ATRESIA AND CHOLEDOCHAL CYSTS IN CHILDREN: A CLINICAL REVIEW

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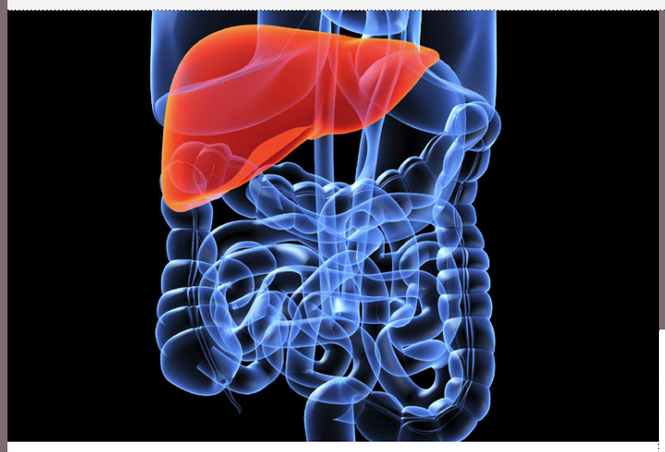

The Kasai Portoenterostomy

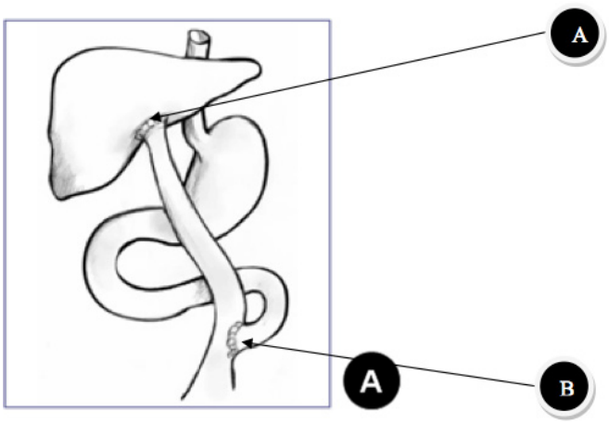

Figure 2 (16): demonstrates the anastomoses which are created once the bilary tract is excised. Heptico-jejunostomy (A) and Jejuno-jejunal anastomoses (B) are created. The Kasai Procedure- http://digestive.niddk.nih.gov/ddiseases/pubs/atresia/

Surgical treatment with the Kasai portoenterostomy will restore bile flow and alleviate jaundice but will not reverse the liver damage that has already occurred or prevent any low-grade ongoing damage (12). If successful they will achieve a 10-year survival of 90% with a native liver (13).

Post operative care and complications

Jaundice and malabsorption will slowly improve after portoenterostomy but this will depend on the adequacy of bile flow. The consequences of malabsorption can be reduced by supplementing fat soluble vitamins (A,D, E and K) as well as using triglyceride rich formula feeds to prevent metabolic and coagulation abnormalities. Choleretic agents (phenobarbital, ursodeoxycholic acid, possibly corticosteroids) are used to improve bile flow however no evidence exists to support any definite advantage with the use of these agents (2). During the perioperative period most children are treated with prophylactic antibiotics to prevent bacterial cholangitis.

Biliary Atresia and Choledochal Cysts in children: a clinical review
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Following portoenterostomy, 30-60% of infants will experience episodes of infection which can cause a transient deterioration in liver function (14). Many children who have undergone portoenterestomy will still go onto develop portal hypertension and some will present with variceal haemorrhage (2). Progressive liver disease, hepatopulmonary syndrome, cholelithiasis and malignant change within the liver are all recognised as complications in long term survivors (2). Biliary atresia is the most common indication for liver transplant during childhood and two thirds of these children develop chronic liver disease requiring liver transplantation (15). Indications for transplant include growth failure, hepatic synthetic dysfunction and sequelae of portal hypertension.

Choledochal cysts

These were first reported by Douglas in 1852. A choledochal cyst is a congenital dilatation of the common bile duct, with malignant potentiality. They may or may not be associated with dilatation of the intrahepatic ducts.

Epidemiology and Aetiology

Choledochal cysts are rare with an incidence of 1: 100,000 – 150,000. There is a 3:1 female preponderence and although the condition may be diagnosed at any age, two thirds of all cases are diagnosed in children under the age of ten (17). Genetic factors may account for the female preponderance and the higher incidence in the Far East than in Western European populations (17,18).

Pathogenesis

The cause of these congenital cysts is unknown, however their presence from birth may indicate abnormal development of the biliary tree in the foetus.

BILIARY ATRESIA AND CHOLEDOCHAL CYSTS IN CHILDREN: A CLINICAL REVIEW

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Anatomy and classification

The most commonly used classification, developed by Alonso-Lej et al and modified by Todani et al, describes five broad types of choledochal cysts (19). The two relatively common categories of cyst are types I and IV-A. Type I, the most commonly reported overall, consists of dilatation of the common bile duct, which may be cystic, focal, or fusiform (subtypes A, B, and C, respectively). Type IV-A cysts comprise multiple cystic dilations of the extra- and intrahepatic bile ducts. The remaining types are considerably rarer. Type II is a cystic diverticulum of the distal common bile duct. Type III (choledococele) is represented by a cystic dilatation of the intraduodenal portion of the common bile duct. The rare type IV-B malformation consists of multiple extrahepatic cysts. Type V is synonymous with Caroli's disease, in the presence of multiple intrahepatic biliary dilatations. Choledochal cysts are mostly associated with an abnormal common bile duct-pancreatic duct junction; this malunion allows the reflux of pancreatic secretions into the biliary tree and bile to flow into the pancreatic duct (17). Figure 3 depicts the varios types of choledochal cysts.

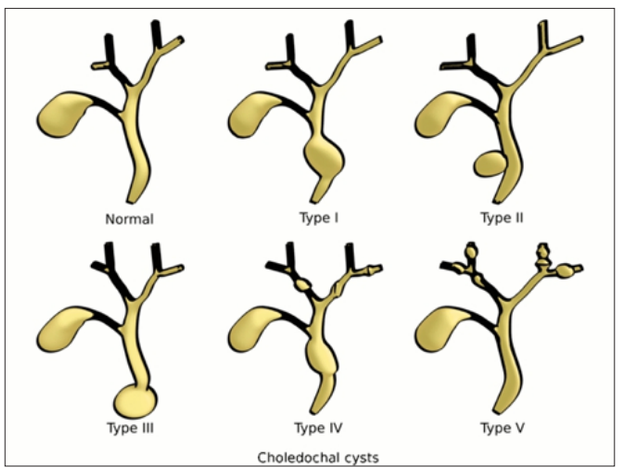


Figure 3: Choledochal cyst types. http://radiopaedia.org/articles/choledochal_cyst

Clinical presentation

The classic triad of intermittent abdominal pain, jaundice and a palpable right upper quadrant abdominal mass occurs in fewer than 20% of patients, although almost two thirds of patients present with two of the three symptoms (17,18). They may present in the neonatal or infantile period with obstructive jaundice with or without an abdominal mass. Although diagnostic accuracy is low, antenatal diagnosis can be made using ultrasound with cysts demonstrated as early as 12-15 weeks gestation (20). Left untreated, choledochal cysts are prone to complications including those listed in table 2.

- Cholangitis
- Spontaneous rupture causing biliary peritonitis
- Pancreatitis; may be recurrent
- Gallstones
- Liver cirrhosis leading to portal hypertension
- Cholangiocarcinoma

Table 2: Complications of untreated choledochal cysts.

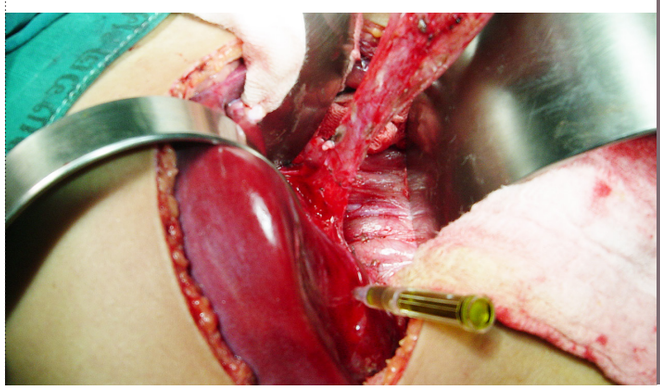
Investigations

Liver function tests may be normal or show obstructive hepatic dysfunction depending on whether the cyst(s) are causing biliary obstruction. Serum amylase should be checked if the patient is experiencing abdominal pain. As always, all patients who are jaundiced should have their clotting profile measured. Ultrasound can diagnose choledochal cysts with a specificity of 97% in children (21). It is therefore an excellent first-line investigation of neonatal jaundice persisting more than 2 weeks after birth, and may help to differentiate choledochal cyst from biliary atresia (22).

As concurrent abnormalities of the pancreatic duct and intrahepatic ducts are almost always present, preoperative planning must involve investigations which aid in the delineation of the relevant anatomy. MRCP and ERCP are useful investigative tools which allow the anatomy of the hepato-biliary-pancreatic ductal system to be visualised. MRCP is considered reliable in children aged over 3 years (1,17). However in the younger child, pacreaticobiliary malunion may not be demonstrated clearly (17). If pancreatitis is present, ERCP is contraindicated and in this situation intraoperative cholangiography would be used for obtaining the anatomical information required (1).

Surgical Management

Radical cyst excision and hepatico-enterostomy is the optimum treatment for the common types of choledochal cyst. If the anatomy of a choledochal cyst has not been clearly delineated pre-operatively on table cholangiogram is performed. Bile is aspirated from the cyst and sent for culture and measurement of amylase.



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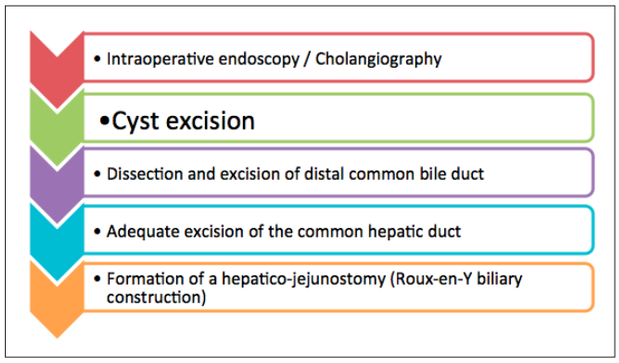
The major steps in the surgical management of choledochal cyst:



Some centres have successfully performed laparoscopic-assisted and laparoscopic total cyst excision with Roux-en-Y hepatoenterostomy, with complication rates comparable to those of the open procedure (23). Post-surgical complications include cholangitis, biliary stone formation, anastomotic strictures and rarely malignancy (24). However since improvement in surgical techniques, the frequency of such complications, particularly malignancy, has significantly decreased. Patients remain under long term follow up to detect late complications.

Conclusions

Infants with biliary atresia and choledochal cyst causing cholestasis can appear deceptively well. A prolonged conjugated hyperbilirubinaemia in the neonatal period must be investigated in a timely fashion. Biliary atresia and choledochal cysts are the commonest causes of surgically treatable cholestasis and prompt surgery has been proven to prevent the development of irreversible liver cirrhosis.

Questions

1. A 25 day old baby has been diagnosed with biliary atresia. Which of the following statements is incorrect:

a. Ultrasound is the first line radiological investigation which is used to investigate infantile cholestasis
b. Portoenterostomy is the procedure of choice
c. Surgery should take place within the first 8-10 weeks of life
d. Diagnosis is ultimately confirmed at laparotomy with operative cholangiography
e. Approximately one third of patients managed with portoenterostomy will develop chronic liver disease sufficient to indicate liver transplantation

2. The following statements about choledochal cyst are correct except:

a. It is also called choledochocele
b. It is more common in males
c. It is more common in Asians
d. Aeitiology is unknown
e. The majority are detected within the first decade of life

3. The most common type of choledochal cyst is:

a. Type I
b. Type II
c. Type III
d. Type IV
e. Type V

4. Which of the following statements about the complications of untreated choledochal cysts is incorrect?

a. Pacreatitis
b. Liver cirrhosis
c. Pancreatic cancer
d. Peritonitis
e. Gallstones

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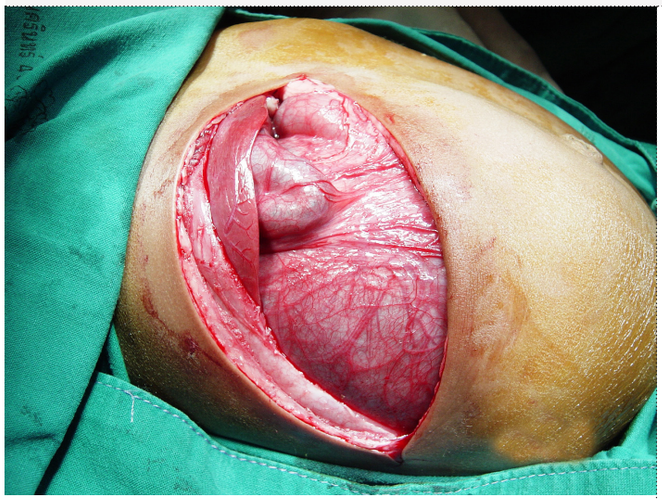

Answers

1. e **2. b** **3. a** **4. c**

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Corresponding Author

M Patel
CT2 Paediatric Surgery
Leicester General Hospital
Email: meerapatel@doctors.org.uk

LUMBAR PUNCTURE - THE BASICS

J Sangha, L Richardson

Abstract

The introduction of the lumbar puncture (LP) is largely credited to Heinrich Quincke, who first reported the procedure in 1891. Although others had previously described methods for accessing the subarachnoid space, it was Quincke who first utilised the technique for diagnostic purposes and introduced it into routine clinical practice. Today, lumbar puncture is widely performed in order to access the subarachnoid space to sample cerebrospinal fluid (CSF).

The procedure involves the introduction of a needle below the termination of the spinal cord. The needle traverses the skin, subcutaneous tissue, supraspinous ligament, interspinous ligament, ligamentum flavum, epidural space (containing the internal vertebral venous plexus), dura and arachnoid mater, before entering the subarachnoid space.

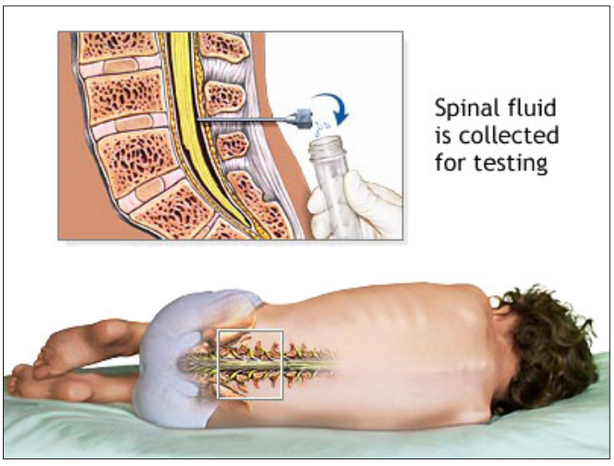
Keywords: Lumbar puncture, cerebrospinal fluid, subarachnoid space.

Indications

In the UK, the three most common indications for LP are to evaluate the patient for CNS infection, usually meningitis, and the diagnosis of subarachnoid haemorrhage (SAH) or Guillian-ÐBarré syndrome. Although CT is primarily used to diagnose SAH, LP is particularly useful when bleeds are very small, or in cases where bleeds occurred greater than 12 hours prior to CT scanning - this allows red blood cells sufficient time to lyse thus permitting distinction from a traumatic tap. LP is also utilised for the delivery of spinal anaesthesia, chemotherapy and contrast agents (myelography). Less commonly, LP is indicated in the treatment of idiopathic intracranial hypertension, evaluation of inflammatory and/or demyelinating disorders (e.g. oligoclonal bands in multiple sclerosis), and meningeal malignancies (cytology).

Contraindications

LP is an invasive technique and potential complications can be minimised by diligent pre-procedure clinical evaluation of the patient. There are a number of definitive contraindications (Table 1).



Definitive Contraindication	Explanation
Thrombocytopenia or increased international normalised ratio (INR)	Coagulation abnormalities increase risk of spinal epidural haematoma formation. There is no consensus on the exact definition of bleeding diathesis in this context however as a guide, platelet count <40 x 10^9/L and INR >1.5 are contraindications.
Local superficial infection near site of LP	This increases the risk of CNS infection, and in cases of suspected CNS infection, the validity of the results is reduced.
Local developmental abnormality	Developmental abnormalities such as myelomeningocele and other forms of spina bifida are associated with spinal cord tethering. Particular attention should be paid to abnormal tufts of hair, dimples and other local skin changes.
Raised intracranial pressure (ICP) with a pressure gradient between the supratentorial and infratentorial compartments	This is associated with a risk of cerebral herniation. Withdrawal of CSF via LP lowers the pressure in the spinal canal, exacerbating the existing pressure gradient and potentially causing movement of CNS tissue. An abnormal neurological history and/or examination will indicate whether there is a risk of a pressure gradient and in this case, imaging is essential prior to LP.

In general, it is routine practice to CT or MR scan all patients prior to LP. This definitively excludes a structural contraindication, and hence the possibility of CNS herniation.

Gaining Informed Consent

Written consent should be obtained before LP (Consent form 1 or 3 for adults and 2 for paediatric cases and 4 for patients lacking capacity). Information leaflets and an explanation of the procedure and indication should be given.

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Risks of the procedure and their treatment including:

• Bleeding from puncture wound - usually stops with local pressure at the site of bleed.
• Infection is very rare although cases of iatrogenic meningitis have been reported, usually presenting with typical symptoms (headache, meningism, neck stiffness, photophobia, pyrexia).
• Post-ÐLP headache affects approximately one third of patients and is thought to be caused by persistent CSF leakage leading to intracranial hypotension (1). It is characteristically postural, worsening within 15 minutes of sitting or standing (3) and is usually mild (2), with severe pain occurring in approximately 5% of patients, and prolonged pain requiring readmission to hospital in just 1-Ð2%. Patients are asked to lie flat for an hour and later drink coffee post procedure which helps to reduce post LP headache.
• Back pain is common but usually self limiting.
• Risk of failure: approximately one third of LPs either produce a traumatic tap (blood in collection fluid) or are unsuccessful on first attempt.
• There is a theorectical risk of neurological damage. Reassure the patient that the needle is inserted below the termination of the spinal cord to prevent injury, and that it is almost impossible to pierce one of the nerve roots. Inform the patient that it is very common to experience a sharp, shooting pain down one leg when the LP needle reaches the correct place, and that this does not indicate that the procedure has gone wrong.

Other rare risks include:

• Allergic reaction to local anaesthetic: type 1 (anaphylactic) reactions affect <1% of patients but are important to remember. Delayed reactions such as contact dermatitis around the site are slightly more common.
• Cerebral herniation leading to coning: a serious complication with a high mortality rate, it arises due to pressure differences between the supra-Ð and infra-Ðtentorial compartments. Older literature quotes a rate of 1.2% (4) however with modern imaging this has reduced.
• Spinal epidural haematoma is caused by more severe bleeding, producing symptoms of cauda equina compression including severe or prolonged back pain, new sensory or motor symptoms, sphincter disturbance or meningism. It typically presents within 48 hours and requires urgent investigation with an MRI scan as it can result in permanent neurological deficits if not addressed promptly (5).
• Spinal subdural haematoma and subarachnoid haemorrhage have all been reported in the literature, most commonly in conjunction with coagulopathies.
• Intracranial subdural haematoma: initially difficult to recognise as symptoms are similar to post-ÐLP headache, though often lacking the characteristic postural changes. It is particularly common when draining fluid for treatment of intracranial hypertension.
• Dermoid cyst formation: an extremely rare late complication of lumbar puncture, arising due to disruption of skin and local tissues

Equipment

Acquire a suitable (clean) trolley and assemble the following:

• Personal protective equipment (sterile gloves, surgical gown)
• Sterile pack (containing drape, gauze and container)
• Surgical marker pen
• Antiseptic solution (e.g. chlorhexidine or povidone-Ðiodine)
• Local anaesthetic (2 X 5mL 1% lidocaine)
• 10 mL syringe
• Hypodermic needles -Ð 25G (orange) and 21G (green)
• 22G lumbar puncture needles -Ð 1.5 inches
for infants, 2.5 for children and 3.5 for adults
• CSF manometer
• Sterile collection vials
• Biochemistry tube for glucose
• Adhesive dressing
• Sharps container
• Bag for soiled disposables

Atraumatic LP needles, although more expensive, are preferable because they are associated with lower rates of post-ÐLP headache. This is because atraumatic needles disrupt the dura to a lesser degree than Quincke needles, thus facilitating the closure of the dural puncture site.

Patient positioning, sterile field preparation and local anaesthesia

Correct patient positioning is the key to a successful LP. The patient should be positioned in the left lateral recumbent position with the neck, knees, and hips maximally flexed. A pillow is placed between the patients knees to prevent the pelvis from tilting and the patient is asked to clasp their hands around their knees. The patient's back should be at the edge of the bed, and their head should be on a pillow so that the entire cranio-Ðspinal axis is parallel to the bed. To avoid rotation of the vertebral column, the patient's shoulders and pelvis should be aligned in a plane perpendicular to the bed. Ensure that the patient can hold this position comfortably.

In this position, a line connecting the superior border of the posterior iliac crests (the supracristal line) will cross the L4 spinous process. The L3/L4 interspace is located cranially to the L4 spinous process and the L4/L5 interspace is caudal -Ð both are suitable sites for LP (the conus medullaris terminates at the level of L1). Mark the intended LP location.

Alternatively, the patient may adopt the 'sitting position'. Importantly, this position cannot be used to measure the CSF pressure. The patient is asked to sit on the edge of the bed and adopt a knee-Ðchest position with the neck flexed. The patient's head rests on a pillow such that the cranio-Ð spinal axis is parallel to the bed. This position may be more suitable for very obese or dysphoric patients.

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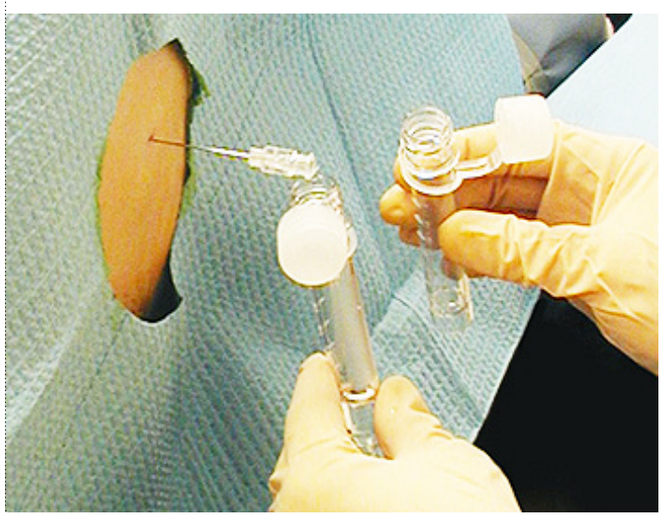
Lumbar Puncture - The Basics
Neurosurgery

Although infection is a very rare complication of LP, it is important to utilise the antiseptic non touch technique (ANTT), to minimise the potential risk. The clinician must wash their hands prior to putting on sterile gloves, and the draping should extend beneath the patient. Antiseptic solution should be applied in a progressively widening spiral motion.

Local anaesthesia, applied correctly, will minimise pain and reassure the patient when undergoing any future invasive procedures. Draw 5-Ð10 mL of local anaesthetic (1% lidocaine) and then replace the needle with a 25G orange needle. Infiltrate the skin intradermally at the chosen site to raise a small wheal and then confirm that the area is anaesthetised. Infiltrate deeper with a 21G green needle with 1-Ð2 mL of the local anaesthetic, in 1-Ð2 cm intervals. Ensure that you aspirate before injecting to avoid blood vessels or CSF. Wait for approximately one minute for the anaesthetic to take effect.

Procedure

· If using a Quincke needle, insert with the stylet in situ, angling towards the umbilicus. The point of entry should be at the superior border of the inferior spinous process.
· If using an atraumatic needle, an introducer (e.g. 18G needle) is used -Ð the needle is inserted up to its hub because it is too short to enter the spinal canal. The atraumatic LP needle is then advanced through this introducer.
· With both needles, a give will be felt as the needle penetrates through the ligamentum flavum and dura mater into the subarachnoid space. Withdraw stylet and wait for CSF to appear at the needle cuff.
· Connect the manometer tubing to the end of the needle via the 3-Ðway stopcock.
· Hold the gauge upright at the level of the needle. It may take a few minutes for the pressure to settle.
· Once the meniscus settles, gently tap the tube, then ask the patient to inspire and expire several times. Watch for respiration-Ðrelated movement of the CSF column -Ð this confirms that peak pressure has been reached.
· Ask the patient to breath normally, and to relax their knees a little to obtain an accurate opening pressure (normally 10-Ð20 cm H20 in adults). Manometers have a maximum of 34 cm H20, anything greater should be documented as >34c m H20.
· Turn the 3-Ðway stopcock to allow free drainage of CSF for sample collection.
· Fill the collecting vials with CSF; 5-Ð10 drops for each sample is sufficient.
· Reconnect the manometer and measure the closing pressure. This is important because the change from the opening pressure gives an indication of the pressure-Ðvolume relationship. For example, an elevated opening pressure followed by a similarly elevated closing pressure may suggest communicating hydrocephalus.
· Reinsert stylet to halt CSF flow. Remove needle and apply pressure for 1-2 minutes before applying sterile adhesive dressing.
· Advise the patient to lie flat for 1 hour and ask nurses to check CNS observations twice during that time.
· Send CSF for analyses:
- Microscopy and cell count - bottles 1 and 3
- Culture and sensitivities - bottles 1 and 3
- Biochemistry (glucose and protein) - bottle 2
- Additional tests - bottle 4
- If subarachnoid haemorrhage is suspected, only three CSF bottles are collected.
· The samples are analysed for the presence of xanthochromia via spectrophotometry.
· This process detects the bilirubin and oxyhaemoglobin formed due to red blood cell breakdown.
· It is important to shield samples from light.
· Remember to take paired blood glucose and/or serum oligoclonal bands.
· Document the procedure, take care to mention that potential complications were explained to the patient, ANTT was utilised, record the type of LP needle used, and state whether it was a traumatic tap.



LUMBAR PUNCTURE - THE BASICS

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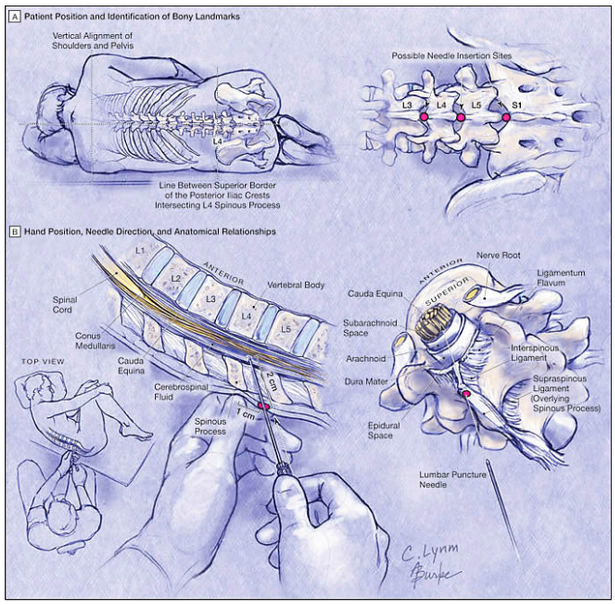

Questions

1) Which of these is not an indication for lumbar puncture?

a) Investigation for a suspected small subarachnoid haemorrhage (SAH) B) Spinal anaesthesia for a caesarean section

b) Suspected bacterial meningitis

c) Investigation of recent seizures

d) Investigation of potential MS

2) Which of these is a definite contraindication to lumbar puncture even following imaging?

a) History of recent seizures

b) INR 1.4

c) Patient has suspected bacteraemia

d) Patient has a GCS <8

e) Local infection overlying the lumbar region

3) Which of the following is incorrect regarding the procedure of performing a lumbar puncture?

a) The patient usually lies in the left lateral recumbent position with spine, hips and knees maximally flexed

b) The ideal location of needle insertion is the L4/5 junction as the spinal cord ends at L1

c) Monitoring of CSF opening pressure and collection of samples can be performed in the

d) "sitting" position if the patient cannot maintain the left lateral recumbent position

e) After infiltrating with Lidocaine 1% wait at least 1 minute for the anaesthetic effect

f) Sedation with 5 mg Diazepam may be helpful in particularly anxious patients

4) Which is not true concerning sample collection during LP?

a) Four bottles of CSF are normally taken for analysis

b) Bottles 1 and 3 are used for microscopy, cell count, culture and sensitivities

c) Glucose and protein are tested from bottle 2

d) Blood glucose and/or serum oligoclonal bands must be taken alongside the LP if indicated

e) Each collection vial requires at least 10 ml of fluid for analysis

5) Which of these is incorrect regarding complications of lumbar puncture?

a) Atraumatic needles are associated with a reduced incidence of post LP headache compared to traditional Quincke needles

b) Routine bed rest >1 hour is not beneficial in reducing the incidence of post LP headache

c) Post LP headache can usually be treated conservatively

d) Infection is a common complication of LP and can be treated by antibiotics according to local microbiology guidelines

e) Spinal haematoma can result in permanent neurological deficits from spinal cord or cauda equine compression

Answers

1. D **2. B** **3. C** **4. E** **5. D**

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Corresponding Author

Jason Sangha
University of Birmingham,
Birmingham.

CLINICAL TRIALS

M Singh

Clinical Trials is a one day course run by the Centre for Applied Medical Statistics (CAMS) from the University of Cambridge. The course is designed to give candidates a background in the structure of clinical trials and aims to cover all aspects of design, from randomization, blinding and ethical issues to statistical analysis of results.

What stage would you do it?

The course is designed to provide the candidates with a thorough understanding of the design and implementation of a randomized controlled trial. It would be useful not only to those involved in research, but also to those who review published trials, as a better understanding of the methodology involved would lead to a greater ability to critique the results. Most surgical trainees will have reviewed such papers, either in journal clubs or their own time. In fact, some higher surgical training interviews now include a timed review of a paper. As such, I think it can appeal to a vast audience, from foundation year trainees and above, although it may be of more benefit to core surgical trainees.

Clinical Trials
Career Focus

Why did you do it?

As evidence based medicine is increasingly practiced across specialties, having a sound understanding of clinical trials will become essential. I wanted to gain a better understanding of study design and the statistical analyses used. For anyone considering full time clinical research after their core training, this course will be invaluable, teaching them the methods needed to run a successful clinical trial.

How is it structured?

It is a one day course taught by a single instructor. Courses are run by the Centre for Applied Medical Statistics (CAMS), University of Cambridge, based next to Addenbrookes Hospital in Cambridge.

The course consists of teaching the basic steps involved in conducting a clinical trial and how to design the best form of trial. It takes you through the entire process from the initial design to ethical considerations, recruitment, randomization techniques and statistical analysis. It also allows candidates to practice simple power calculations to gain a better understanding of sample sizes.

CLINICAL TRIALS

M Singh

How are candidates assessed?

There is no formal examination or evaluation at the end of the course.

How much did it cost?

The cost varies depending on the candidate:

Cambridge University staff:	**£150**
NHS staff:	**£175**
Externals:	**£200**

Was it worth it?

Those who are undertaking research or involved in recruitment for clinical trials will gain the most benefit from this course. However, anyone who has used the results of clinical trials to affect their practice would benefit from a greater understanding of the process and be better at being able to critique published trials.

Further information:

Contact
Marianne Blanc, Administrator, via e-mail (cams@medschl.cam.ac.uk)

Website
http://www.phpc.cam.ac.uk/cams/cams-introductory-statistics-courses/

Phone Number
01223 330 335

Corresponding author

Masha Singh
Plastic Surgery Trainee
Bradford Royal Infirmary
West Yorkshire
Email: mashasingh@doctors.org.uk

Clinical Trials
Career Focus

WORKING IN SOUTH AFRICA BETWEEN CORE & HIGHER SURGICAL TRAINING

L Wicks

Introduction

The transition from core to higher surgical training is competitive and for those candidates who are successful, it can be a daunting increase in responsibility. I decided to delay my application to higher orthopaedic surgical training and spent 18 months working in South Africa after completion of core surgical training in the West Midlands.

Background

Ngwelezana hospital is situated on the north coast of Kwa-Zulu Natal, South Africa. Serving a population of around 3 million, with referrals from 13 other district hospitals, the Trauma and Orthopaedic department is never quiet. Run by UK born and trained surgeon Paul Rollinson for the past 2 decades, this chronically under-staffed department has been helped by a trickle of UK doctors passing through its doors over the years.

I started work in the department on the 1st January 2011 having completed core surgical training the previous year, and with an aim to secure orthopaedic registrar training (ST3) and return to the UK in 2012. I was assisted greatly by Africa Health Placements, an organisation helping foreign doctors find placements in rural parts of South Africa, where ever there is a need. (www.ahp.org.za)

At the time of leaving the UK, the public sector was facing major cuts and working in the NHS was not entirely satisfying. I was frustrated by increasing amounts of paperwork, management driven initiatives and the problems created by the European Working Time Directive, all of which seemed to me to be affecting the amount of good clinical care that could be provided. Coming to South Africa would, I hoped, be a perfect antidote for my negative impression of medicine as I flew away from an icy cold Britain and into sunny, warm southern Africa.

Working in South Africa between core and higher surgical training
Current Training Issues

An entirely different experience

January is the busiest time of year for South African orthopaedic departments and so I was quickly introduced to the main clinical problems dealt with in this part of the world. Over Christmas there are around 1,000 deaths on the road nationally. The survivors of these incidents fill the wards with multiple injuries as they patiently wait for their place in the queue for theatre. The summer weather of January brings in hoards of children who have fallen from fruit trees sustaining upper limb injuries. This hot and humid climate also seems to increase the rate of pyogenic bone and joint sepsis in children, with wrong diagnoses and late presentations sadly causing unnecessary morbidity on a regular basis. In addition to motor vehicle trauma, gunshot wounds and injuries with bush knives are dealt with frequently. Other conditions that are seen on a regular basis include musculoskeletal manifestations of tuberculosis (increasingly so with the spread of HIV), Blount's disease and clubbed feet for which I helped run a dedicated clinic treating children by the Ponseti method.

As well as becoming familiar with the mix of clinical cases, different skills are acquired soon after arriving. Plaster casting techniques are quickly improved, operating the image intensifier in theatre becomes routine and not having plastic surgeons readily available results in much experience with wound management and skin grafting. Many of these skills are surely invaluable to an orthopaedic trainee, yet cannot be fully developed through a purely UK based training programme. Working in this setting doesn't mean that my methods of treating patients are old fashioned, outdated, or below par for the UK though. The department performs around 300 femoral nails a year, regularly uses locking plates in various peri-articular fractures and circular frames are used in deformity correction. We also regularly used an improvised method of topical negative pressure dressings in wound management. In the management of severe open lower limb fractures, an audit of the department's practice showed favourable results compared to British standards published by the BOA and BAPRAS.

WORKING IN SOUTH AFRICA BETWEEN CORE & HIGHER SURGICAL TRAINING

L Wicks

A major difference has been the frequent shifts of 24 hours or more. I probably averaged 70 hours a week there, but despite working far more than would be legal under European Working Time Directive (EWTD) I felt no more tired on a day to day basis. Furthermore, continuity of patient care is improved by the lack of constant handovers that have become a necessary evil with shorter shifts to achieve a 48 hour week in the UK. Whilst I agree that tired, overworked doctors will not care for patients optimally, I am less convinced of EWTD's success than when I left the UK.

Overall, whether it is through a lack of resources or if it is a typically South African trait, there is a 'can do' attitude about the work here that hasn't always been present in hospitals I've experienced in the UK. If the department ran short of basic equipment, we made a plan. If a vital service such as radiology or anaesthesia was in meltdown, we made a plan. When water, power, or sterilisation facilities failed, we made a plan. This commitment to keep going no matter what impressed me hugely and will always make me think twice when told it's not possible to get something done.

Other real highs for me have been involvement in teaching and research. Despite the constant demands for service provision, there is a regular educational programme, and time is always made to pass on knowledge in the wards, clinic and theatre. There is a wealth of opportunity to start research projects here. I have been helping run a repeat observational study of the effects of HIV status on outcomes in open fractures; and prospectively studied management and outcomes of distal femoral physis fractures.
Aside from the stimulating and satisfying work, living on South Africa's north coast, with the Indian Ocean on my door step, was like being in paradise. The weather was always good, monkeys and zebras roamed around the town we lived in. Playing touch rugby on the beach against South Aficans at sunset was always a good end to a days work. Away from the busy city life I have known for so long in the UK, I have enjoyed spending much more time with my wife and twin boys than before. Being here has strengthened my marriage and allowed my boys to experience a world many children will never enjoy. On returning to England we do not want to forget some of the lessons we have learnt about the joys of simple living and quality family time.

Final thoughts

To conclude, this had been the most fruitful chapter of my short working life. I am now back in the UK, having started as an ST3 in Orthopaedics in the East Midlands. Working in South Africa has boosted my knowledge, confidence and surgical skills and I firmly believe that this has helped me secure a higher surgical training post, despite many warnings to the contrary before I left the UK. I have returned to the NHS and UK training system feeling refreshed and enthusiastic.

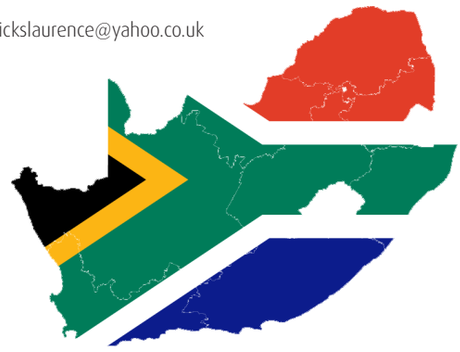
I am determined to make work of this nature a significant part of my future career. This experience has been an invaluable part of my orthopaedic training and I hope I will be able to take further opportunities to step out of a training programme at various intervals and work in the developing world. Indeed, I feel that all UK trainees should spend time in such a setting to increase their knowledge base and versatility. Surely this will benefit not only the countries they visit, but also the NHS when they return.

I would like to thank Dr Paul Rollinson for his time and dedication in teaching me and many other UK surgical trainees over the years. I also thank World Orthopaedic Concern UK (www.wocuk.org) for supporting me through the Treloar Gauvain Fellowship; and Africa Health Placements (www.ahp.org.za) for helping organise my appointment at Ngwelezana hospital.

Corresponding author

Laurence Wicks, MRCS, MBChB
ST3 Trauma and Orthopaedics,
East Midlands South/ Department of Orthopaedics,
Ngwelezana hospital, Empangeni, KwaZulu Natal, South Africa

Email: wickslaurence@yahoo.co.uk



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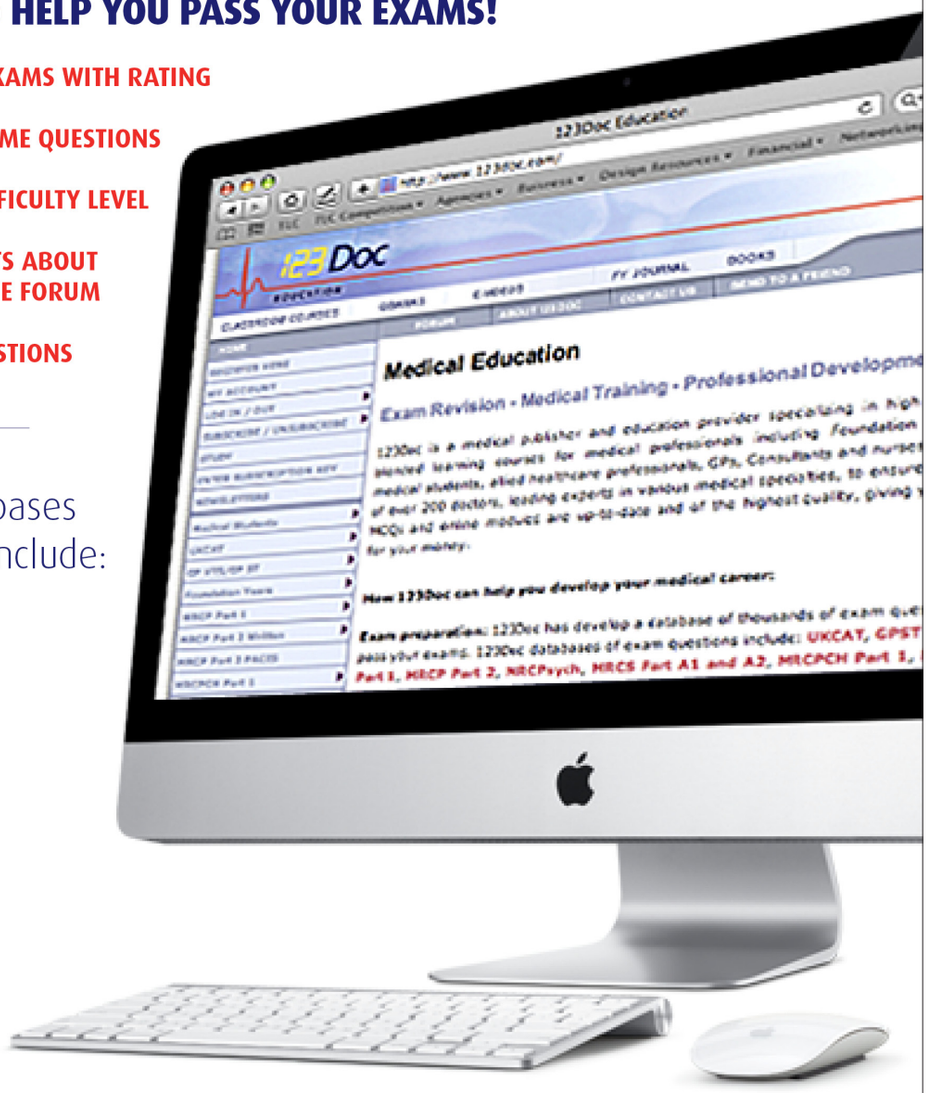

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