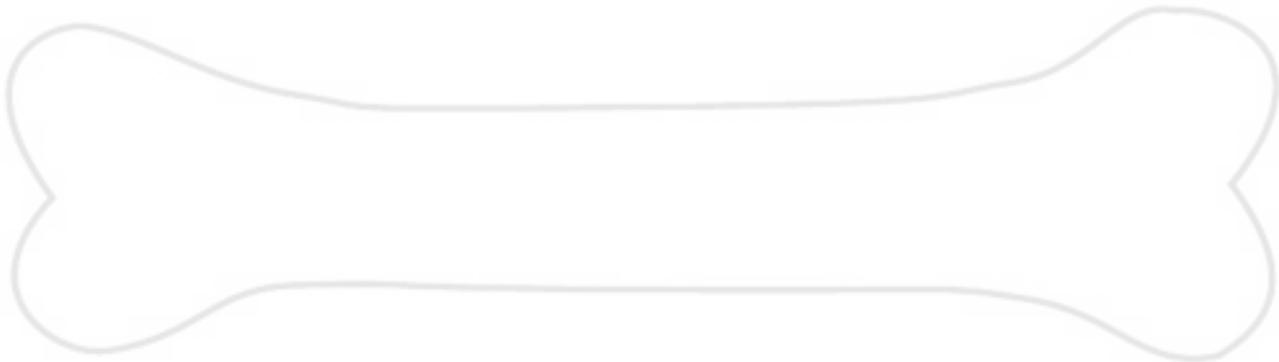


# JUTO

THE JOURNAL OF UNDERGRADUATE TRAUMA AND ORTHOPAEDIC SURGERY



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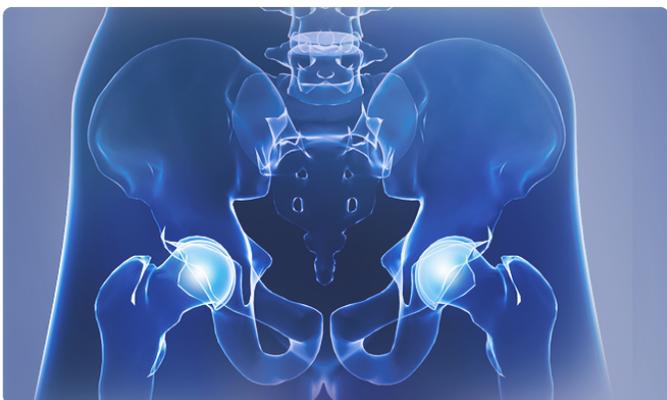
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# FROM THE EDITOR



## WELCOME TO JUTO

Welcome to the first issue of the Journal of Undergraduate Trauma and Orthopaedic Surgery (JUTO) the official journal of the Future Orthopaedic Surgeons' society (FOS). The journal is aimed at medical students, foundation doctors and core trainees with an interest in trauma and orthopaedic surgery.

JUTO is a peer-reviewed journal and will be published online twice a year. Together with the resources on the society website and the Future Orthopaedic Surgeons' Conference (FOSC) we aim to educate and maximise selection into the competitive specialty of trauma and orthopaedic surgery.

Alexander Young MBChB MRCS MSc PGCME

Editor-In-Chief



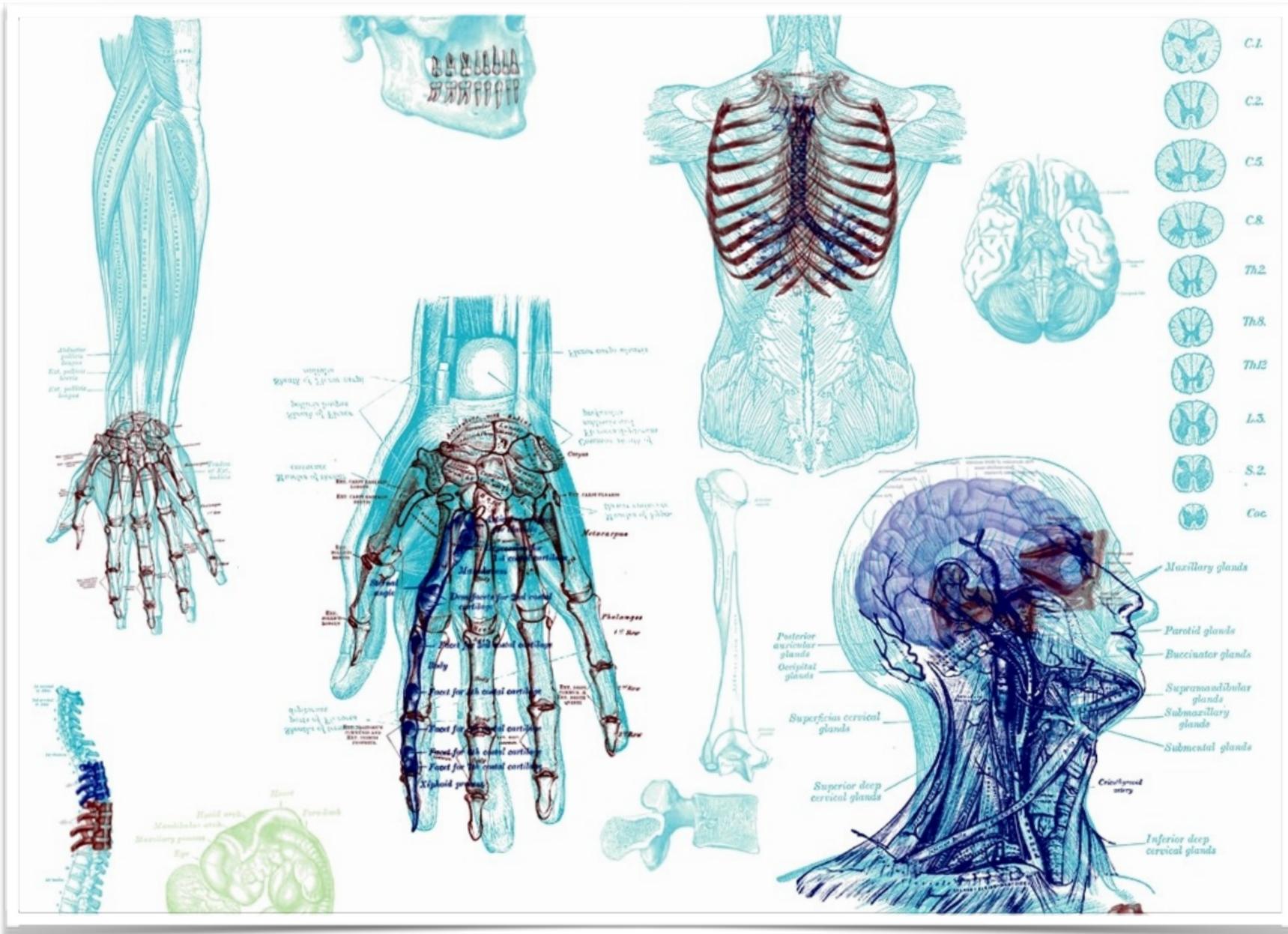


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# NEWS AND UPDATES

## GET PUBLISHED IN JUTO

The *Journal of Undergraduate Trauma and Orthopaedic Surgery (JUTO)* is a peer-reviewed, open access, online journal aimed at medical students and junior doctors.

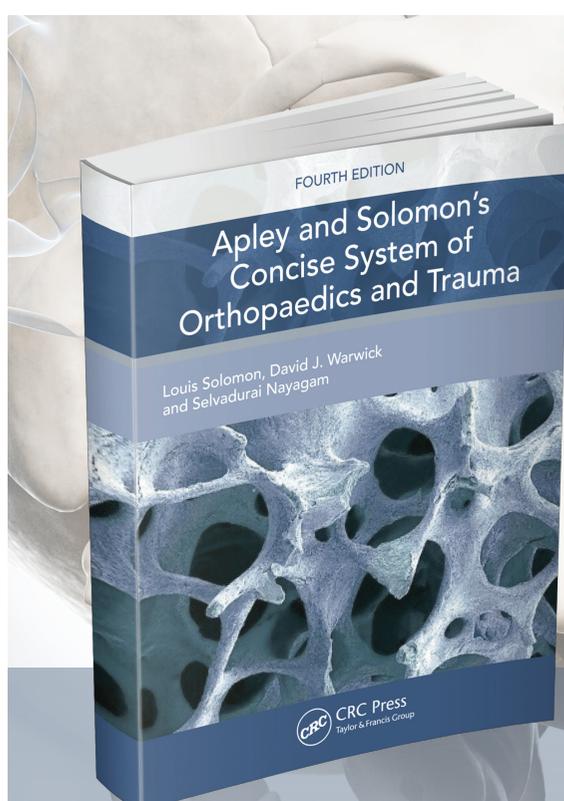
The journal aims to offer publication opportunities and experience to those pursuing a career in trauma and orthopaedic surgery.

JUTO welcomes the submission of original, previously unpublished manuscripts in one of the following sections of the journal:

- **Original Articles** This section includes original research articles, reviews, quality improvement projects and a summary of recently published articles from the major orthopaedic journals.
- **Education** The education section features summaries of core orthopaedic knowledge topics, anatomy, guidelines and operative techniques.

- **Case Reports** This section contains cases of patients with a discussion at the end, incorporating literature. This section provides an insight into orthopaedic clinical perspective.
- **Electives and Careers** Elective reports and reflections on research placements together with advice on applying for specialist training.
- **Views and Reviews** Letters to the editor, personal accounts of training, patient perspectives of diseases, book reviews and event reviews are accepted.
- **Abstracts** accepted abstracts from the society's Future Orthopaedic Surgeons' Conference together with Essay Prize winners will be published.
- **Conference Listings** Listings for student orthopaedic events for the following quarter will be included.

**Deadline for JUTO Vol1 Issue 2: November 2014**



## New edition – out now

June 2014 | 9781444174311 | Book & eBook | 504pp | £34.99 £27.99

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## FOS EVENTS AND DEADLINES 2014/15

### FOSC 2014 Abstract Deadline

- September 26th 2014

### FOSC 2014 The Royal Society of Medicine, London

- November 8th 2014

### JUTO Issue 2 Submission Deadline

- November 28th 2014

### FOSC Essay Prize Deadline

- January 1st 2015

# JOIN FOS

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# FOSC 2013 REPORT

## F O S C 2 0 1 3

### 5<sup>TH</sup> ANNUAL FUTURE ORTHOPAEDIC SURGEONS CONFERENCE

**FOSC 2013 took place at The Royal Society of Medicine, London on 7-8th December 2013.**

**Now in its 6th year FOSC continues to be the premier national conference for medical students and junior doctors interested to pursuing a career in trauma and orthopaedic surgery.**

The fifth annual Future Orthopaedic Surgeons Conference (FOSC) 2013 was held at the Royal Society of Medicine in London on 7-8th December 2013. The annual conference is aimed at medical students and foundation doctors wishing to pursue a career in trauma and orthopaedic surgery and is designed to provide a feel for what life as an orthopaedic surgeon is like.

FOSC 2013 built on the success of the previous years' events with a two-day programme held over a Saturday and Sunday. One hundred and thirty-two medical students and junior doctors attended FOSC on the Saturday with numbers limited to sixty for practical workshops on Sunday. Students and junior doctors travelled from across the UK for the event held at the RSM in London.

Day one featured interactive lectures given by orthopaedic consultants and registrars covering the individual subspecialties together with the latest information on ST3 selection and tips on CV building while in medical school and as a junior doctor.

Day Two featured practical and educational workshops providing delegates with hands on experience of orthopaedic techniques together with interactive tutorials covering basic orthopaedic principles.

Attendees were encouraged to submit abstracts for poster presentation on the day of the conference with the winning entry receiving the annual FOSC Poster Prize Certificate.



**Figure 1.** The Royal Society of Medicine, 1 Wimpole Street

#### Saturday Lectures

The day itself began at 8:30 with a welcome and introduction to the conference. Each orthopaedic subspecialty was then covered in a series of thirty-minute lectures given by orthopaedic surgeons with delegates encouraged to put questions to the speakers at the end of each talk.

Lectures included:

- Foot & Ankle Surgery
- Hip Surgery
- Paediatric Surgery
- Knee Surgery
- Spinal Surgery
- Upper Limb Surgery

- Training, Selection and Getting a Job
- Life as an Orthopaedic Trainee
- Academic Orthopaedic Surgery
- The Role of The BOA
- The Role of BOTA

Speakers gave delegates an idea of their career paths together with honest opinions on the pros and cons of each sub-specialty.

Jeya Palan (BOTA President) updated delegates on the work of BOTA and promoted the BOTA Junior membership to final year medical students and foundation doctors.

Professor Ashley Blom gave a very entertaining lecture on academic orthopaedics and was followed later in the day by Professor Fares Haddad, RSM Orthopaedic section president and Editor-in-Chief of the Bone and Joint Journal.

Feedback from delegates was overwhelmingly positive with each sub-specialty talk both educating and inspiring medical students and junior doctors to pursue a career in that sub-specialty.

This years' poster competition featured thirty-five posters shortlisted and displayed throughout the Saturday of the conference. Posters included orthopaedic audits and research projects undertaken by students and junior doctors and were judged on the day by consultants and registrars.

## Sunday

The day two programme was designed to give an immersive experience of life as an orthopaedic surgeon. Numbers were limited to sixty delegates to allow for small groups for the educational and practical workshops. The day began with an entertaining educational lecture given by registrars covering common on call presentations and orthopaedic emergencies. This was especially useful to final year students and junior doctors working on orthopaedic firms.

Groups of 15 then rotated through four one hour-long workshops:

- Orthopaedic Examination & Trauma Scenarios
- Radiology Interpretation & Cases
- Smith & Nephew InterTan Principles of IM Nailing
- Heraeus and JRI Cementing and Hemiarthroplasty

The practical workshops gave participants hands on experience of hemiarthroplasty and IM Nailing while the educational workshops gave participants the opportunity to receive feedback on their examination and radiological descriptive techniques from registrars together with practice in managing trauma scenarios.

Delegates received a copy of the BOA Undergraduate Guide and advice from both registrars and core surgical trainees on the current application system.

Smith & Nephew, Heraeus and JRI again provided excellent hands-on practical workshops allowing students to practice IM nailing and distal locking and mixing cement and performing hemiarthroplasty on saw bones.

FOS would like to thank all the speakers for giving up their time for the conference together with the continued support of the RSM, BOA, BOTA, RCSEd and orthopaedic industry.

FOSC 2014 will be held at the RSM on Saturday 8th November 2014. Abstract submission and registration are now open via the FOS website and RSM respectively.

**Save the Date: FOSC 2014 8th November 2014**

**Abstract Submission Deadline: 26th September 2014**

# FOS UNDERGRADUATE REPRESENTATIVE REPORT 2013-14

Gurnam Virdi  
University of Glasgow  
FOS Undergraduate Rep 2013-14

Firstly, I would like to express my gratitude to the committee of Future Orthopaedic Surgeons for allowing myself this great opportunity to be an integral part of this society as the national undergraduate representative.

For those of you that do not know me, I shall start by introducing myself. My name is Gurnam Virdi and I am currently in my final year of the MBChB programme at the University of Glasgow.

My interest in trauma and orthopaedics was sparked from early exposure to the speciality prior to embarking on the medical degree. As a keen bodybuilder, I have always been fascinated by the musculoskeletal system and by the plethora of ways in which orthopaedic conditions present and are managed, from conservative management right through to utilisation of surgical instruments for intervention. Furthermore, my clinical experience has been strengthened throughout medical school and I am now involved in various projects within the field of orthopaedics.

It was only after becoming involved with FOS, that I have really gained an insight into what a surgical career will entail. This has been invaluable, and now feel it is only right that I give a little back via my role as an undergraduate representative so others can gain the same



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perspective. This is now my second year running in this role, with the aim to introduce more students to what a career in trauma and orthopaedics entails as well as pushing boundaries of our society to see what else we can achieve.

The opportunity to work with fellow reps and students has been incredibly rewarding. In fact, listening to the student voice is an integral part of how we develop our teaching and learning and the wider student academic experience. Part of my role involved compiling a list of contacts of surgical societies and medical school mailing lists which allowed me to promote prizes and conferences with ease. I believe effective communication is the backbone of good representation. Thus, the official FOS Facebook page was recently created which now has almost 100 members – this is one of many ways (as well as Twitter) we can disseminate information about FOS.

I am extremely privileged to have helped in the organisation of the successful fifth FOS conference, by way of promoting online via social networking with other surgical societies as well as shout-outs at the beginning or end of lectures. Helping to promote the fifth FOS (my first), undergraduate conference in London this year, was a

big milestone for the society and something that has inspired me to do my very best. With the great committee, I am sure we will be able to offer many brilliant events for our members and hopefully introduce them all to something new.

This year, I hope to cement FOS as the key interface between universities and institutes such as the BOTA and BOA by providing regular, quality updates via social media networking as well as access to prominent speakers at our national conferences. I strive to improve upon my role as the link between professional associations and student surgical societies all over the UK. With the help of FOS, I aim to ensure there is a specific trauma and orthopaedic-related society at every medical school in the UK, which will only further raise awareness of future career options in orthopaedics.

## Follow FOS

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# ST3 TRAUMA AND ORTHOPAEDIC UK NATIONAL SELECTION 2014

**ST3 T&O selection remains competitive in 2014 195 ST3 training number were filled from national selection.**

**We look at the interview process and offer tips for anyone applying in the future.**

Trauma and orthopaedic surgery remains one of the most popular career choices for specialty training in the UK with average competition ratios of 5:1 nation wide and up to 22:1 for posts in specific deaneries. In 2014 195 ST3 training posts were filled from around 500 candidates. This is an increase in available posts from 2013 when 120 posts were successfully filled from 569 eligible candidates.<sup>1</sup>

This is the second year that national selection has been implemented with all eligible candidates called for interview in Leeds over a week in March. The process was co-ordinated by the Yorkshire and Humber Deanery.

## **The Application**

Trauma and Orthopaedic ST3 application applications opened at the beginning of February and closed at the beginning of March in 2014. Applications are processed through the Intrepid:Pathway<sup>2</sup> online application system.

The application focuses on the essential criteria for Orthopaedic ST3 as outlined in the Person Specification<sup>3</sup>.

It is important to be aware of the specific wording of the eligibility requirements and make sure you have attained the required examinations and courses by the set deadlines. In particular completion of the MRCS together with BSS, CRiSP and ATLS courses is required by the time of interview.

The final part of the online application featured a self-assessment section in which candidates had to select options from a list regarding their experiences of operating, audits, research, publications and teaching.

The self-assessment section was scored and added to the portfolio station score at the interview, making it an important section to get right.

The application scoring was similar to previous years and corresponded with the person specification with points awarded for audit, research, postgraduate degrees, teaching, commitment to the specialty and number of dynamic hip screws performed either alone or with supervision.

## **The Interview**

The interviews consisted of five stations each lasting 15 minutes, an increase by two from 2013. Each station was designed to assess the selection criteria based on the Person Specification. The stations were: Portfolio, Interactive/Communication, Clinical, Technical Skills and Presentation/List Planning.

Candidates rotated round all five stations during the interview process with 1 minute between stations.

Candidate performance at each station was scored using a structured scoring system. The scores from each interview station were combined to produce an overall interview score out of 300.

LETB / Deanery	ST3 Vacancies	LAT Vacancies
Health Education East Midlands	7	3
Health Education East of England	8	2
Health Education Kent, Surrey & Sussex	14	0
Health Education North, Central and East London	48	0
Health Education North West London		
Health Education South London		
Health Education North East	18	7
Health Education North West	32	1
NHS Education for Scotland	8 (West)	1 (North)
Health Education South West - Severn	9	8
Health Education South West - Peninsula	5	0
Health Education Thames Valley	4	2
Health Education Wessex	1	3
Health Education West Midlands	15	5
Health Education Yorkshire and the Humber	21	0

**Figure 1. ST3 and LAT vacancies by Deanery 2014**

Each station was scored by two consultant interviewers. The portfolio station was made up of two scores: a score for the application self-assessment answers and a score for performance at the station itself.

### Preparing for Interview

Knowing how to prepare for ST3 interviews can be very difficult. Treating the process like an exam is sensible and most candidates begin preparing over the Christmas period.

Organising your portfolio ahead of time and knowing how points are scored are easy ways to prepare.

Revision of orthopaedic principles, emergencies and key papers is key to succeeding at the clinical station and may help you feel more confident going into the interview.

Practising interview questions with consultants and colleagues is the best way to prepare. The best type of practice is done in a formal, realistic environment that simulates the pressures of the interview, such as on an interview course.

### After the Interviews

In 2014 candidates' scores were compared and candidates were asked to rank their preferred deaneries and posts using the UK Offers website. Choice of post corresponded with score with the highest scoring candidate getting the first choice.

After 195 training number posts were filled LAT posts were offered. For candidates not fortunate enough to receive either a training number or a LAT post Academic Clinical Fellow, CT3 and LAS jobs were advertised.

### Top Tips (from [www.ortho-interview.com](http://www.ortho-interview.com))

#### Portfolio:

- Construct a contents page that mirrors your CV and add sub-contents pages at the beginning of each section to make it easy for the interviewers to find your documents
- Know your Portfolio inside-out and make sure that you can direct interviewers to important publications and evidence quickly

- Questions focus on why you should get the job and probing you on what you have achieved. Being able to sell yourself while not appearing arrogant is key.

#### Interactive/Communication:

- The interactive station involves communicating with an actor while interviewers assess your interaction.
- The Interactive Station tends to be what separates the very best candidates. Preparation can be challenging and it is recommended that you look back through your MRCS and medical school communication skills notes.
- Scenarios often fall into 'types' of communication skills such as breaking bad news, dealing with an angry relative, dealing with a failing colleague or explaining a diagnosis.

#### Clinical:

- The interactive station tests your core understanding of clinical orthopaedics. Together with direct questions you may be asked to describe an X-ray or demonstrate how you would reduce a fracture or examine for a specific pathology

- Practise common orthopaedic presentations to ensure you are confident and prepared for the real thing.

### *Presentation/List Planning:*

- New for 2014 this station was divided into two parts: a short 5-minute presentation on orthopaedic surgery in war-time followed by questions and then a 7-minute list planning exercise.
- The presentation topic is emailed out in advance and candidates can use a single acetate slide.
- The list planning exercise involves organizing a theatre list as might appear in a MRCS station.

### *Technical Skills:*

- New for 2014 candidates were asked to perform a DHS, lag screw or compression plate on saw bones while being assessed.
- Revising these techniques at the AO website and looking through company op-techs (online technical manuals) is a good way to prepare and hopefully candidates should be able to confidently complete the tasks from work-based experiences.

### **Key Points**

If you a medical student or will not be applying in the next few years it is likely that the interview process will change between now and then as it has changed almost annually over the last five years.

However, although the interview format has changed the marking criteria and Person Specification has remained almost unchanged over this period of time. This means that no matter what stage you are at enhancing your CV with audits, research, teaching, management and prizes and improving your logbook will stand you in good stead for doing well provided you prepare for the interview as you would for an exam.

### **References**

1. Modernising Medical Careers. Competition ratios by specialty: T&O 2013 <https://www.mmc.nhs.uk/pdf/YHD%20T&O.pdf>
2. [www.intrepidpathway.co.uk](http://www.intrepidpathway.co.uk)
3. T&O Person Specification [http://www.mmc.nhs.uk/pdf/PS 2013 ST3 T&O Surgeryv3.pdf](http://www.mmc.nhs.uk/pdf/PS%202013%20T&O%20Surgeryv3.pdf)



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**6<sup>TH</sup> ANNUAL FUTURE ORTHOPAEDIC SURGEONS CONFERENCE**

**ROYAL SOCIETY OF MEDICINE LONDON**

**SATURDAY 1<sup>ST</sup> NOVEMBER 2014**

**ABSTRACT DEADLINE: 26TH SEPT**



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# MOTIVATING AND DETERRING FACTORS BEHIND ORTHOPAEDIC SURGERY AS A CAREER CHOICE IN UK MEDICAL STUDENTS

Young, AF. Mason, W. Curwen, CH.

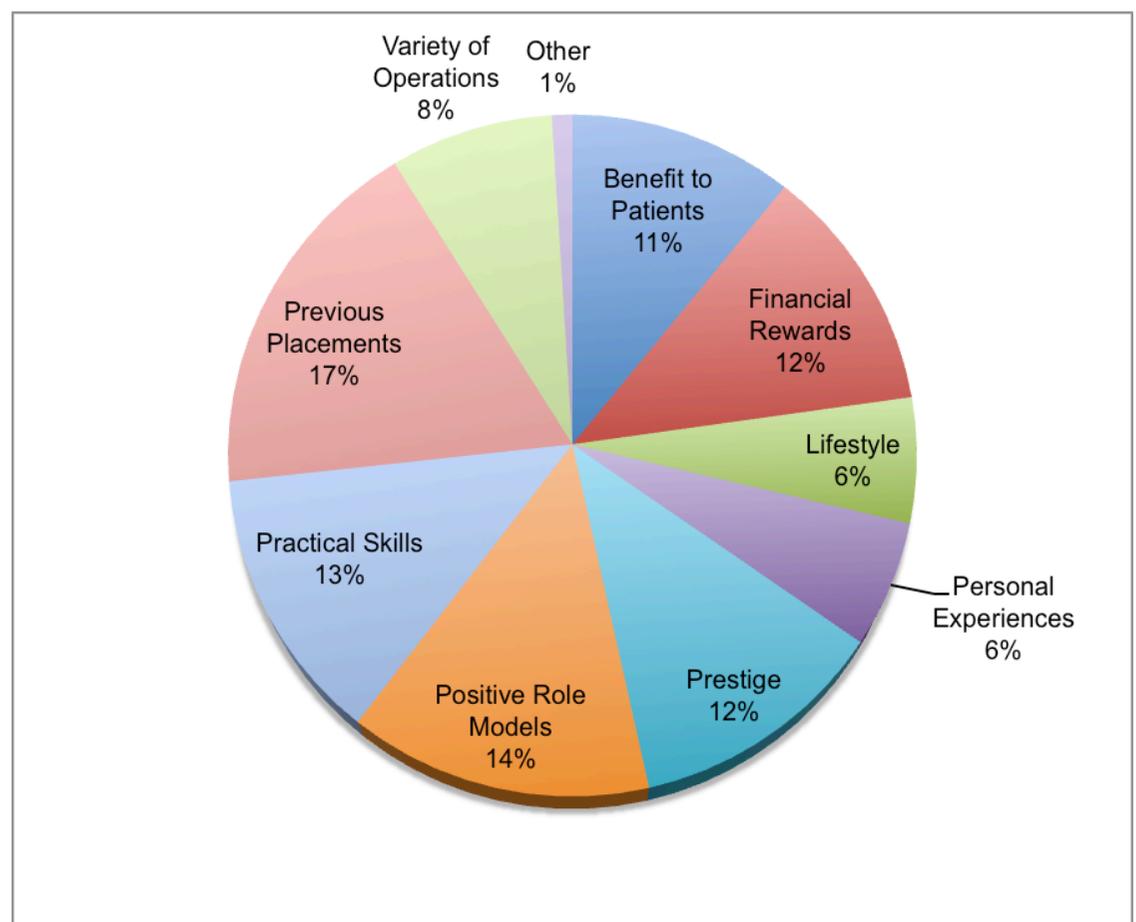
University of Edinburgh and Trauma and Orthopaedic Department  
Gloucester Royal Infirmary, United Kingdom

## Introduction

In the United Kingdom trauma and orthopaedic surgeons make up roughly a third of the surgical workforce and account for 43% of all surgical episodes. Selection into the specialty takes place at ST3 level following completion of two-years of Foundation Training and two-years of Core Surgical Training. Competition ratios for selection at ST3 level are currently 1:6 (one job to six applicants). It is vital that applicants are aware of both the competitive nature of selection and what is required at application to avoid disappointment and to plan realistic career choices.<sup>1-8</sup>

### *Choosing a Career in Trauma and Orthopaedic Surgery*

The existing literature reports that career choices are made at various stages of medical training and are influenced by a variety of factors. It has been shown that even in the early stages of medical training students may have a strong preference for a particular specialty.<sup>9-10</sup> Factors such as parent occupation, prestige, financial rewards, intellectual challenge, working hours, positive role models, personal experiences of injuries or illness and positive undergraduate exposure have all been shown to influence the career choices of medical students when selecting a career path.<sup>11-17</sup>



**Figure 1** Primary Motivating Factors by Percentage of Medical Students

Trauma and orthopaedic surgery has historically been shown to be a male-dominated specialty with more males than females showing interest at undergraduate level and applying for postgraduate positions. Studies have suggested that female medical students are more likely to select careers in general practice than surgical specialties due to better work-life balance and a shorter period of training together with accessibility to time out of training to care for children.<sup>16-17</sup>

Studies have also looked at medical student personality types suggesting that those wishing to pursue a surgical career possess a distinct 'surgical personality' and certain individuals

may decide their career path prior to entering medical school based on personal experiences or pre-conceived notions of what that career offers.

### *Making an Informed Career Choice*

Due to the short time following graduation that decisions regarding future career and job applications need to be made it is vitally important that medical students have access to accurate information relating to their chosen specialty. Selection into trauma and orthopaedic surgery is very competitive and it is important that students are aware of this for several reasons:

- They are able to formulate a back-up plan should they be unsuccessful at application (this may involve taking an extra year to enhance their curriculum vitae (CV) or to pursue an alternative career path)
- They are able to identify what is necessary to be successful at application and begin to build their CV towards this at an early stage

This study aims to examine the motivating factors behind choosing a career in trauma and orthopaedic surgery in the UK. The study looks at the demographic variance together with student opinions relating to why they wish to pursue a career in trauma and orthopaedic surgery.

## Methods

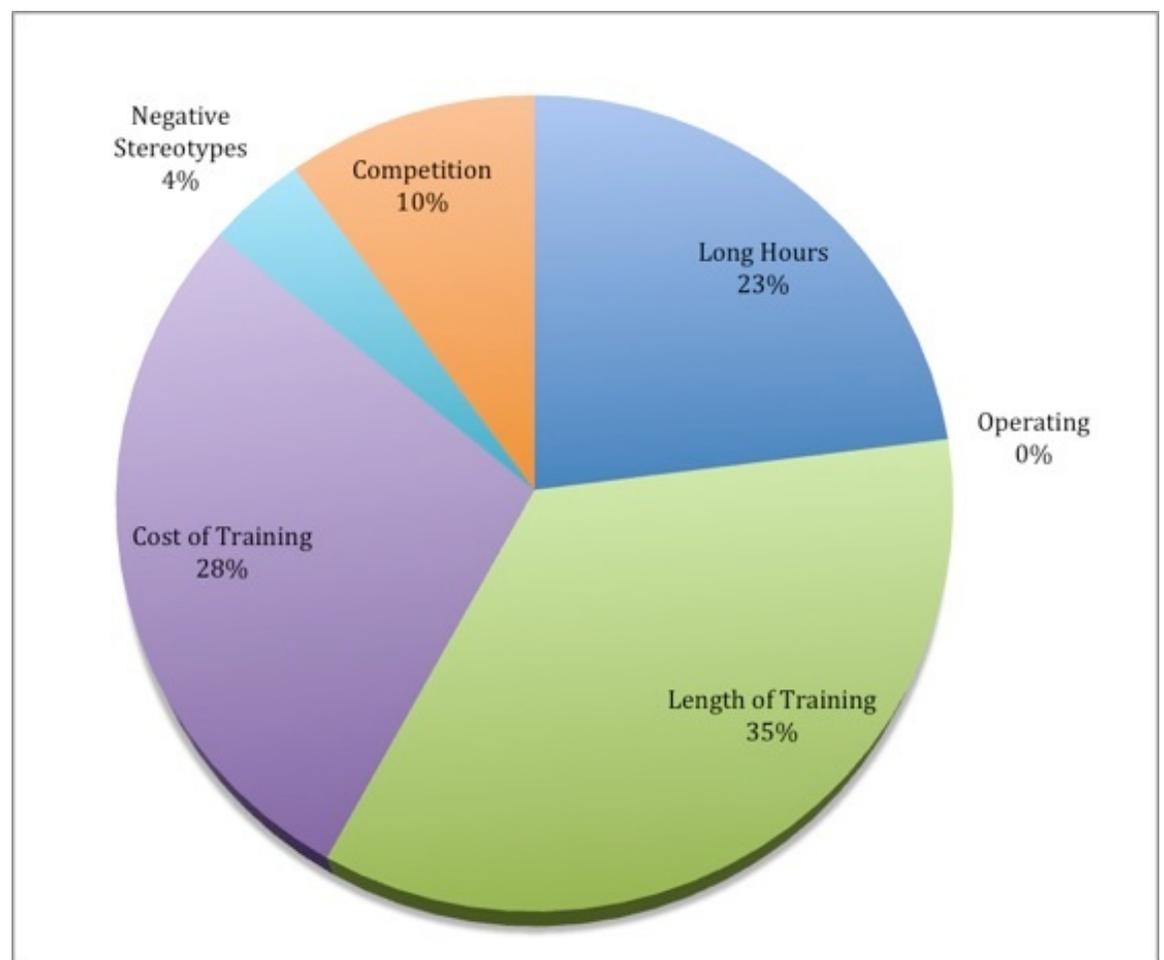
A structured questionnaire was distributed to all UK medical students with questions focused on those interested in pursuing a career in trauma and orthopaedic surgery in the UK over a six-month period.

A questionnaire was designed based on evidence from existing literature together with anecdotal evidence from students and consultant orthopaedic surgeons.

The initial questionnaire was piloted to 72 medical students and reviewed for accessibility and appropriateness of questions and answers by orthopaedic trainees and consultants. The questionnaire was then modified based on this feedback and validation.

The questionnaires featured direct questions regarding awareness of competition ratios and selection process together with responder demographics.

Questionnaires were distributed to all



**Figure 2** Primary Detering Factors by Percentage of Medical Students

UK medical students via email with a link to an online questionnaire.

Inclusion criteria for the study were fully completed questionnaire responses completed by UK medical students.

A sample size calculation was performed to estimate the number of responses required to ensure statistical significance (95% confidence interval with 5% error margin) for an estimated population of 35,000 medical students at UK medical schools. This indicated that 380 completed questionnaires were required.

## Results

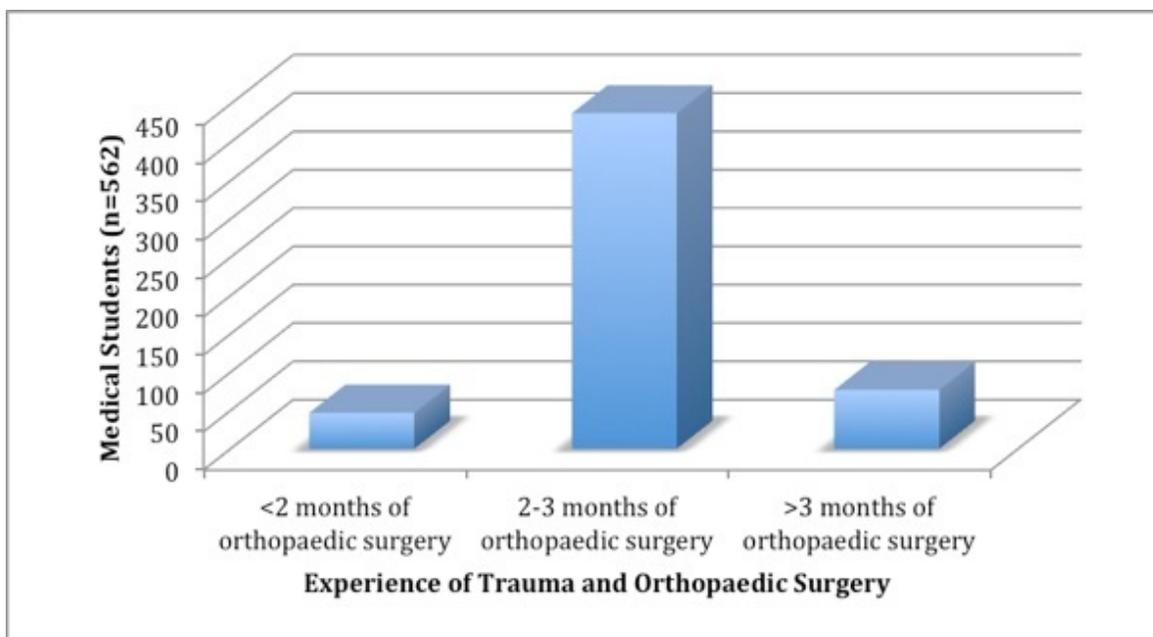
1054 medical students responded to the questionnaire. 105 questionnaires were excluded because they were only partially completed and therefore did not meet the inclusion criteria for the study. Of the remaining 949 responses 562/949 (59%) of students identified

themselves as hoping to pursue a career in trauma and orthopaedic surgery.

The mean age of valid survey responders was 23.2 years (22-32) and 405/562 (72%) were male. 215/562 (38%) of students had family members or friends who were doctors and 118/562 (21%) had undertaken an intercalated degree.

20/562 (4%) were first year medical students, 15/562 (3%) were second year medical students, 48/562 (9%) were third year medical students, 52/562 (9%) were fourth year medical students and 427/562 (76%) were final year medical students.

The primary motivating factors for pursuing a career in orthopedic surgery are demonstrated in **Figure 1**. Other reasons included 'instant feedback of operation technique using X-ray', 'links



**Figure 3** Medical student experience of trauma and orthopaedic surgery

to sports medicine' and 'research opportunities'.

Deterring factors for medical students wishing to pursue a career in trauma and orthopaedic are shown in **Figure 2**.

#### *Experience of Trauma and Orthopaedic Surgery*

**Figure 3** summarises the time that medical students spent in trauma and orthopaedic surgery placements with the majority spending between 2-3 months on an orthopaedic firm.

**Figure 4** highlights the number of operations that students observed during this time.

250/562 (44%) medical students stated that they were aware of the competitive nature of orthopaedic selection however only 188/562 (33%) demonstrated that they were aware of current orthopedic competition ratios by selecting 1:6 as the correct competition ratio.

## Discussion

### *Motivating Factors*

Experiences of previous placements and surgeons as positive role mod-

els have been shown to be the primary motivating factors for a significant proportion of students. This suggests that exposure to trauma and orthopaedic surgery and surgeons during orthopaedic placements at medical school plays a vital role in influencing the career choice of medical students.

Positive experiences of undergraduate placements and positive interaction with orthopaedic surgeons are variables that can be influenced by orthopaedic surgeons themselves. <sup>16-17</sup>

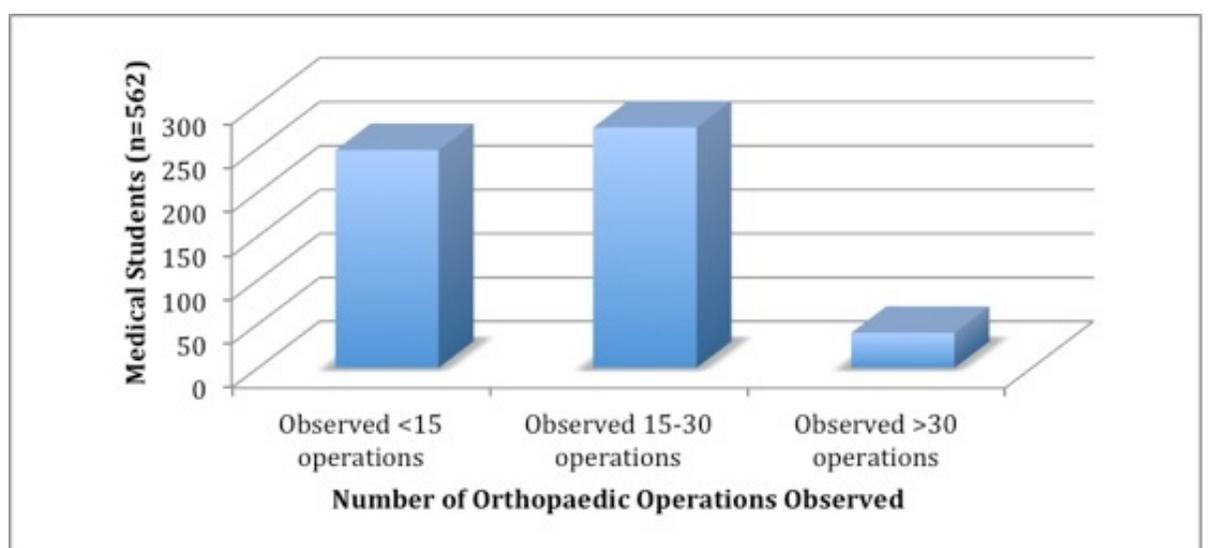
Motivating factors such as the use of practical skills, variety of operations and benefit to patients are also per-

ceived as appealing by medical students when selecting their chosen career. This is may be due to certain students having an innate enjoyment of practical skills and possessing good manual dexterity and consequently enjoyment of practical specialties. <sup>12-13</sup>

Student perceptions of financial rewards and prestige were more important motivating factors than benefit to patients, perceived lifestyle, variety of operations and personal experience of injury. Interaction with orthopaedic surgeons plays an important role in giving students realistic expectations of what to expect from financial reward. Prestige is more arbitrary and studies have shown that different personality types may be influenced differently by how their future career is viewed by their peers and what financial rewards will bring them. <sup>14-16</sup>

### *Deterring Factors*

Medical students who wished to pursue a career in trauma and orthopaedic surgery were most deterred by the long period of training and cost of surgical training with long working hours also off-putting to a significant number of students. Perceived negative stereotypes and the competitive selection process were the most off-putting to a



**Figure 4** Medical student orthopaedic operations observed

small percentage of medical students. Due to economic constraints it is expected that students will be put-off specialties by mounting debt and financial implications. Long hours and poor work-life balance is also understandable.

## Conclusions

The selection of orthopaedics as a career results from an interplay between various motivating factors. Positive role models and enjoyment of orthopaedic placements are major motivating factors for many students wishing to become orthopaedic surgeons in the future. Long training time and associated costs are factors that deter students from pursuing a career in trauma and orthopaedic surgery.

While some medical students demonstrate knowledge of the competitive nature of selection into the specialty and awareness of what is required for successful entry into orthopaedic specialty training many do not. This group of students who are unaware of the competitive selection and what is required at application are at a high risk of disappointment and stress when it comes to postgraduate career choice eighteen months after graduation.

This study has highlighted the ongoing need for specialty-specific careers advice and resources for today's medical students who must make career choices soon after graduation and with less exposure to surgical specialties than has traditionally been the case due to a reduction in working hours. It is therefore vital that medical students are directed towards online careers resources and specialty-specific careers events to ensure they make informed, realistic career choices and maximize their chances of selection into their chosen specialty when they do so.

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# HOW MUCH DOES YOUR SURGICAL TRAINING COST?

Gough A. T, Poole W. E. C, Biggs T.C, Crook T. B

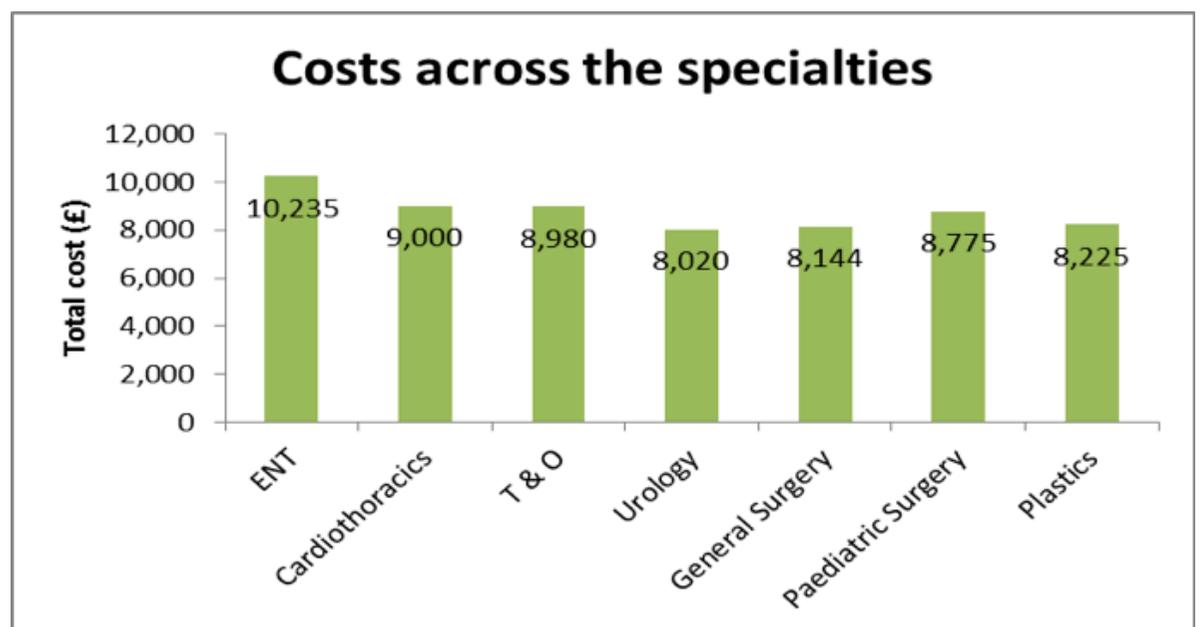
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## Introduction

Core surgical training is a time of great change for all aspiring surgeons. The age range of most core surgical trainees is between 25 and 30 years of age, depending on the age of entry in to medical school and career progression following foundation training. This is a significant period, both financially and socially as trainees are often in the midst of other major life events (marriage, owning a property).

In order to become eligible to enter higher surgical training (commencing at ST3) a doctor needs to fulfil a list of mandatory and desirable selection criteria, referred to as a person specification. This document is unique to each surgical specialty and includes a number of expensive requirements e.g. obtaining membership of the Royal College of Surgeons, attendance at key specialty courses, evidence of academic achievements through presentations at national and international conferences<sup>1</sup>. Therefore the cost implications of completing foundation and core surgical training in order to become fully competitive for higher specialty selection can be daunting. This has become especially pertinent with increasing graduate debt in conjunction with ever shrinking deanery allocated study budgets.

A few reports have been published within the literature detailing the



**Figure 1** Total training costs to ST3 across the surgical specialties

impact of costs placed on individuals wishing to train as surgeons<sup>2</sup>. However none have been undertaken examining the difference across the seven different surgical specialties or whether the cost of surgical training has changed over previous years. Therefore this study aims to evaluate the individual costs incurred whilst trying to obtaining a surgical specialist registrar post, the ultimate goal of a core trainee.

## Methods

The 2013 Specialist Trainee year 3 (ST3) person specification for all surgical specialties (Otolaryngology, Trauma and Orthopaedics, Urology, General Surgery, Paediatric Surgery, Plastic and Cardiothoracic Surgery) was obtained from the Modernising Medical Careers website<sup>1</sup>. The listed mandatory and desirable criteria within these documents were taken and costs for completing these activi-

ties calculated for each specialty individually. These were then combined with additional work related trainee costs (GMC fees, indemnity insurance etc.) during the four year period from foundation year 1 to core surgery year 2, arriving at a total cost required to be competitive for ST3 selection. Although requirements are split into mandatory and desirable activity it is the authors belief that trainees would be expected to complete both activities to obtain a highly competitive ST3 position. Therefore both mandatory and desirable activities were included within the final figures. Calculations did not include travel and subsistence; therefore these values are likely to be an under-representation of the true costs involved.

## Results

**Table 1** details the breakdown of costs associated within each surgical

specialty. The most expensive specialty to attain an ST3 post was ENT with the cheapest being Urology. Total costs ranged from £8,020 - £10,315. Figure 1 compares graphically the differing total costs for all surgical specialties. Figure 2 reveals estimated graduate debt from 1997 to 2025.

## Discussion

### Summary of key findings

This study has revealed that training to become a surgeon can be an expensive business. In fact the average individual cost to a trainee by the time they have arrived at ST3 is £8,779 with a range of £8,020 to £10,315, depending ultimately upon the chosen specialty. Training as a surgeon is as much a vocation as it is a career, and many individuals see this as an investment in both time and money, to achieve fulfilment in future clinical practice. Despite this little has been done to quantify the exact individual financial contribution made towards surgical training, which may be of value when negotiating salaries, pay increases or deanery funding in the future.

### Most significant training related costs

Membership of the Royal College of Surgeons is a basic mandatory requirement for all surgical specialties. However even this can be associated with significant costs. The pass rates of the last six sittings (Sep2010 to Apr 2012) for Part A of the examination reveals a 43% pass rate, with that of Part B standing at 56%. The cost of sitting Part A is £480 and sitting Part B is £870 with a further completion fee of £150 and an annual membership subscription rate of £300 per annum<sup>3</sup>. These costs fur-

	ENT	Cardiothoracic Surgery	T & O	Urology	General Surgery	Paediatric Surgery	Plastic Surgery
<b>Exam fees</b>	£ 4,075	£2,900	£2,900	£2,900	£2,900	£2,900	£2,900
MRCS Part A	£480	✓	✓	✓	✓	✓	✓
MRCS Part B	£870	✓	✓	✓	✓	✓	✓
MCQ subscription	£100	✓	✓	✓	✓	✓	✓
Revision course	£1000	✓	✓	✓	✓	✓	✓
Completion Fee	£150	✓	✓	✓	✓	✓	✓
Annual sub.	£300	✓	✓	✓	✓	✓	✓
DOHNS part 1	£350	X	X	X	X	X	X
DOHNS part 2	£825	X	X	X	X	X	X
<b>Course fees</b>	£3,395	£3,445	£3,500	£2,600	£2,600	£3,150	£2,600
ATLS, BSS, Crisp courses	£2,100	✓	✓	✓	✓	✓	✓
Teach the teachers	£400	✓	✓	✓	✓	✓	✓
Risk management	£100	✓	✓	✓	✓	✓	✓
Introduction to ENT course	£100	X	X	X	X	X	X
Airway Course	£100	X	X	X	X	X	X
ALERT	£95	X	X	X	X	X	X
ALS	£400	X	X	X	X	X	X
Speciality skills in Cardiothoracics	X	£845	X	X	X	X	X
AO trauma basics	X	X	£800	X	X	X	X
IT course	X	X	£100	X	X	X	X
APLS	X	X	X	X	X	£550	X
<b>Subscriptions</b>	£2,320	£2,320	£2,320	£2,320	£2,320	£2,320	£2,320
GMC (4 years)	£1,560	✓	✓	✓	✓	✓	✓
Medical indemnity (4 years)	£160	✓	✓	✓	✓	✓	✓
JCST (2 years)	£300	✓	✓	✓	✓	✓	✓
MRCS (1 year)	£300	✓	✓	✓	✓	✓	✓
<b>Conferences</b>	£525	£335	£260	£200	£324	£405	£405
<b>Total Costs</b>	<b>£10,315</b>	<b>£9,000</b>	<b>£8,980</b>	<b>£8,020</b>	<b>£8,144</b>	<b>£8,775</b>	<b>£8,225</b>

**Table 1** Breakdown of costs by each surgical specialty

ther rise with the addition of an online MCQ subscription (£100) and a Part B revision course with the Royal College (£1000). However, these figures assume the candidate is one of the statistical 23.6% who passes both parts of their membership exams at the first sitting, something that potentially can increase the cost by an additional £480 - £1350 if not. ENT trainees differ to the other specialties in their requirements to sit a combined examination, the MRCS (ENT), which is Part A of the MRCS and the OSCE part of the DOHNS. It was tradition that they previously sat both the full MRCS and full

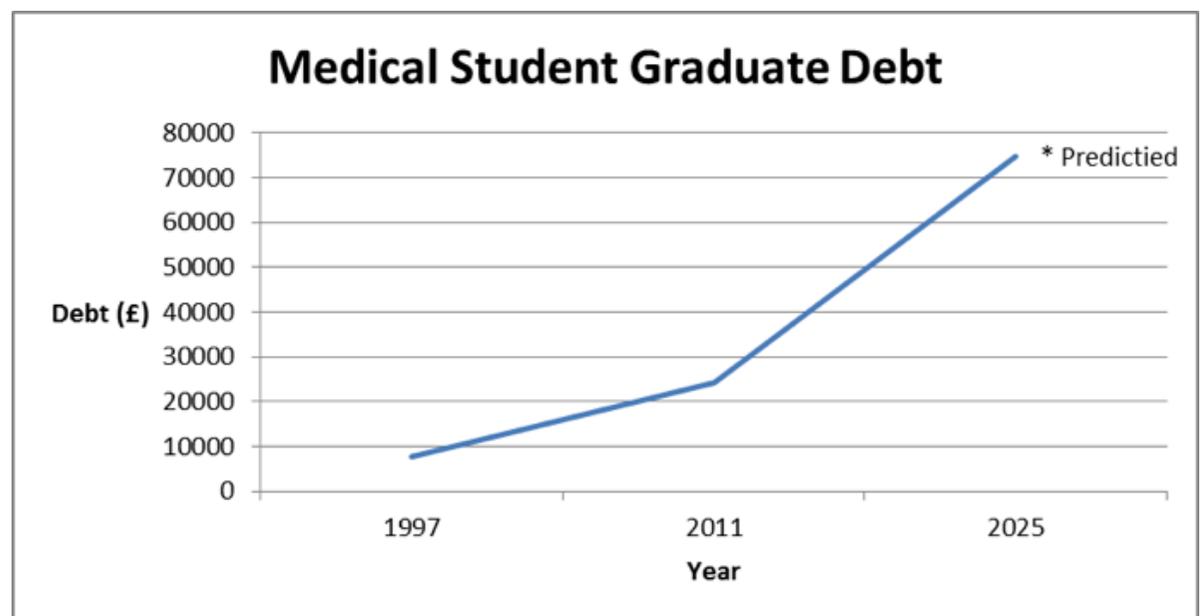
DOHNS examination until the process was changed in 2011. Many ENT trainees continue to sit both qualifications, the DOHNS adding a further £1095 in exam fees.

Specialty courses are another significant cost to the junior surgical trainee. Several courses are universally required by all surgical specialties for completion of Core Training; Advanced Trauma Life Support, Basic Surgical Skills and Care of the Critically Ill Surgical Patient. The cost of all three totals £2,100.

All specialties indicate a requirement to show understanding and involvement in risk management and teaching. Some deaneries run reduced rate courses covering various aspects of these topics but otherwise the most widely accepted courses to attend would be a Teach the Teachers course (£400) and a generic risk management course (£100). Many of the surgical specialties also require more specialist individual courses which range in price from the Acute Life-Threatening Events Recognition (ALERT) course at £95 through to the AO principles of practical fracture management at £800 (the early bird rate).

All specialties apart from Urology require attendance of a specialty specific national or international meeting. Costs ranged from £200 for the Association of Surgeons in Training (ASIT) conference to £525 attending British Academic Conference in Otolaryngology for the budding ENT surgeon. In order to minimise costs the trainee would need to have their work accepted for presentation at the national conference they planned to attend, negating the need to present at an additional conference in order to cover the presentation section of their application form.

Additional costs (not necessarily contained within the person specification) include the annual General Medical Council fee (£390 per annum), Joint Committee on Surgical Training fee (£300 during core training), indemnity insurance subscription (£40 per annum) and college membership (£300 per annum). Trusts do provide limited funding, in the region of £400 - £600 per academic year, but this does not really make a huge impact on total individual trainee expenditure.



**Figure 2** Graduate debt on leaving medical school since 1997

### Rising graduate debt

An issue becoming ever more important is the debt that is accumulated while attending medical school, which is set to increase dramatically. The average final year student debt has risen from an average of £7,768 in 1997 to £24,092 in 2011<sup>4, 5</sup>. The introduction of higher tuition fees in 2012 of £9,000 per annum will take graduation costs from tuition fees alone to £45,000 without taking into account the living expenses over the undergraduate five or six years. Currently the amount of student loan deducted is a percentage of earnings. With this level of debt set to rise sharply, accounting for added costs of surgical training could potentially prevent prospective junior doctors from thinking of and choosing a surgical career.

### The realities of junior doctors spending

A CT1 currently earns £29,705 and a CT2 £31,523 gross salary with banding according to working hours<sup>6</sup>. The mean cost of attaining all the mandatory and desirable facets to the registrar application forms is £8,779 – approximately 14% of the trainees pre-tax basic salary over the two core training years. This figure includes the membership examinations being attained on the first sit-

ting of both parts, although this only accounts for just over 23% of candidates. It leaves the majority of trainees having to use a greater percentage of their salary. This is even more significant with recent wage freezes and the public sector under increased pressure to limit spending.

Hospital trusts currently provide varying degrees of support to facilitate training of junior doctors. However study budgets vary widely between trusts but are also dwindling faster than the increase in course fees. The Association of Surgeons in Training calculated in 2007, using figures from 2005, that the cost of passing the MRCS was £1070 in total and the cost for mandatory courses (Basic surgical skills, Advanced trauma life support and Care of the critically ill surgical patient) was £17252. These figures have risen 26% and 21% respectively in the past 8 years and this increase is certainly not offset by similar increases in study budgets or means available to trainees.

Buying your own house along with getting married, changing jobs and managing debt are all listed in life's top 40 most stressful events<sup>7</sup>. It is plausible a trainee will experience all of these within a 24 month period, not taking into account logbook numbers, re-

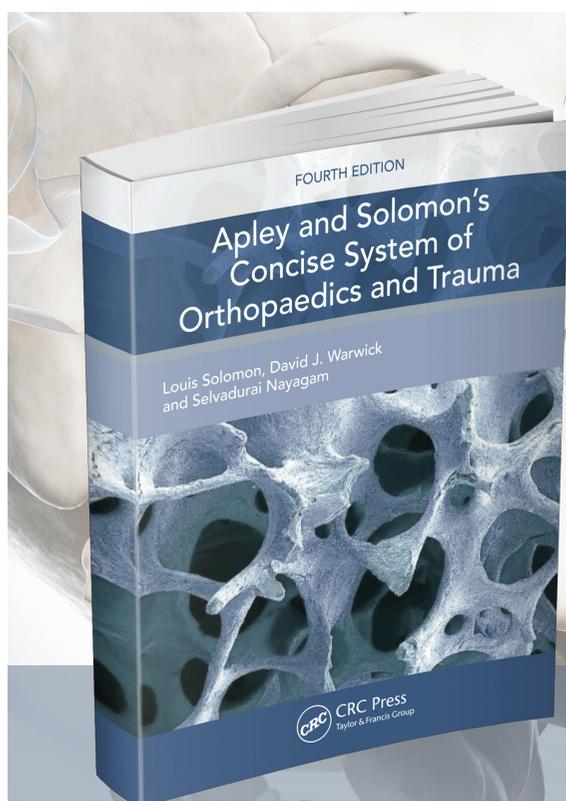
search and assessments. Currently there is ever increasing uncertainty experienced by trainees of progression from core training to specialist training to attaining CCT and beyond<sup>4</sup>. The added obstacle of increasing costs to training should not be underestimated.

## Conclusions

This study was undertaken to stimulate discussion for the best methods of training and funding the next generation of surgeons in an ever changing financial climate. It would be a concern for the surgical profession if costs in training were to put off some of the brightest but not financially stable candidates. Therefore we hope these results will be of value when negotiating future junior doctor salaries, pay increases and deanery training budgets to fully acknowledge the financial commitment made by budding future surgeons across the UK.

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# FOS ESSAY PRIZE 2014: WHAT HAS BEEN THE MOST IMPORTANT ORTHOPAEDIC ADVANCEMENT IN THE LAST 100 YEARS?

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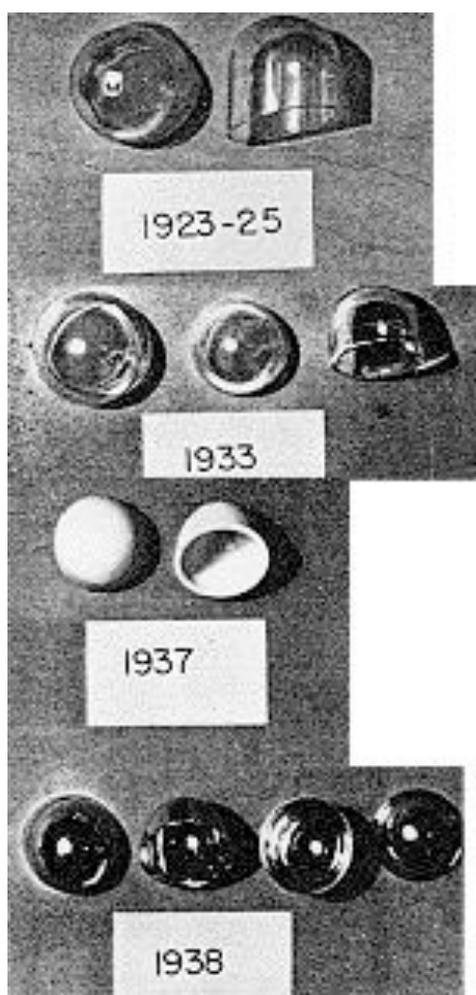
## 2014 Essay Prize Winner

Osteoarthritis (OA) is estimated to affect more than 8 million people in the United Kingdom and presents a significant epidemiological challenge, demonstrating an increasing prevalence with age.<sup>1</sup> Characterized by pain, functional limitation and radiographic changes, the knees, hands and hips are the most frequently affected joints.<sup>2</sup>

Paleopathological studies have also recognised the significant incidence of OA in ancient skeletons.<sup>3,4</sup> The definitive treatment of end-stage disease, however, remained beyond the scope of orthopaedics until the twentieth century.



**Figure 1** Marius Smith-Petersen (1886-1953), Chief of Orthopaedic Surgery, Massachusetts General Hospital.



**Figure 2** The evolution of Smith-Petersen's interpositional hip arthroplasty implants. 1923-25: glass; 1933: Pyrex; 1937: Bakelite; 1938: Vitallium.

Although early attempts at treating degenerative joint changes in the nineteenth century were a springboard for the innovations to come, they carried significant intraoperative risks and unpredictable outcomes. Noteworthy surgeons of the time included John Rhea Barton, who performed the first intertrochanteric osteotomy on an ankylosed hip,<sup>5</sup> and Louis Léopold Ollier, who popularised the concept of interpositional hip arthroplasty (IPA), using adipose tissue.<sup>6</sup> Around the turn of the cen-

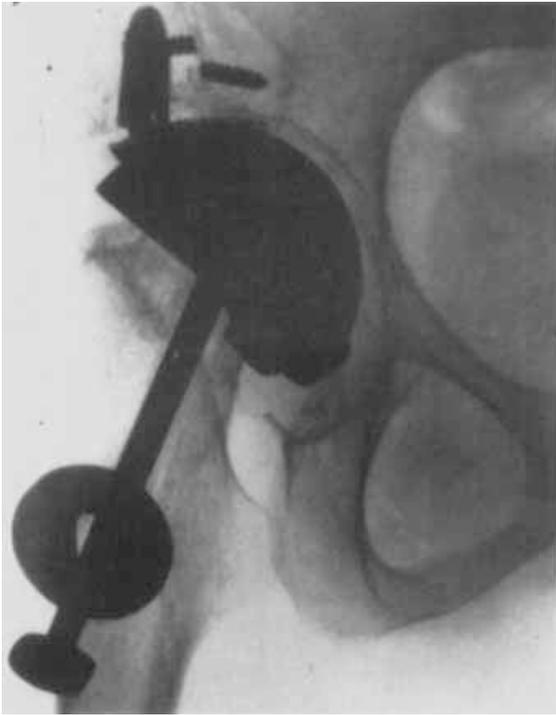
ture, others experimented with various materials, such as pig bladder and autologous fascia lata, facilitated by significant improvements in anaesthesia.<sup>7</sup>



**Figure 3** Philip Wiles (1899-1966), Consultant Orthopaedic Surgeon, Middlesex Hospital.

Having performed IPAs using synthetics including Pyrex and Bakelite with limited success, Marius Smith-Petersen (**Figure 1**) reached a turning point in the 1937 when his dentist, John Cooke, suggested trying Vitallium moulds (**Figure 2**).<sup>8</sup> Smith-Petersen performed the first Vitallium IPA in 1938, and successfully implanted more than 500 over the following decade. There are cases where these arthroplasties have lasted for almost 50 years.<sup>9,10</sup>

A pioneer of total hip arthroplasty (THA), Philip Wiles (**Figure 3**) de-



**Figure 4** Wiles' ball and cup stainless steel hip arthroplasty performed in 1938. 'Radiograph 13 years later. The lug and screws retaining the metal acetabulum have disintegrated, much of the neck of the femur has been absorbed, and the bolt has broken away from the head'.<sup>[11]</sup>

scribed reasons for failure in early examples, such as the difficulty in designing 'a strong enough prosthesis' (**Figure 4**).<sup>11</sup> Perhaps the most important orthopaedic advancement over the last century can be attributed to John Charnley (**Figure 5**), who revolutionised THA by recognising that reducing friction in the joint would improve outcomes.<sup>12</sup> He replaced the femoral head with a small metallic prosthesis, selected high-density polyethylene for the acetabular bearing, and fixed the components to bone with polymethylmethacrylate cement. Utilising a lateral transtrochanteric approach,<sup>13</sup> Charnley performed the first low-frictional torque arthroplasty (LFA) in 1962, publishing his results a decade later. Range of movement had improved in all cases and late mechanical failure from all causes was only 1.3% in cemented implants.<sup>14</sup>



**Figure 5** Professor Sir John Charnley (1911-1982), Consultant Orthopaedic Surgeon, Manchester Royal Infirmary and Wrightington Hospital.

Recent studies have attested to the long-term reliability (**Figure 6**) of Charnley's innovation.<sup>15,16</sup> A detailed follow-up of LFAs performed between 1970 and 1972 identified that 83 of 98 arthro-



**Figure 6** Radiograph shows no detectable wear after 30 years follow-up with original Charnley's LFA.<sup>[17]</sup> Note the small size of the femoral head prosthesis in relation to the acetabular cup

plasties (85%) had lasted in patients still alive twenty years later.<sup>17</sup> Although there have been recent trends towards using cementless implants and ceramic-on-metal articulations, the fundamental principle remains unchanged. As a paradigm for the replacement of other joints, perhaps most notably the knee, THA has been appropriately described as "the orthopaedic operation of the century."<sup>18</sup>

I wonder if the likes of Smith-Petersen, Wiles and Charnley might have imagined the prodigious influence of their endeavours. Whilst we have certainly not yet perfected arthroplasty, increasingly successful outcomes are being achieved, particularly as new prostheses and surgical techniques are developed.<sup>19,20</sup> If we can shape the future of orthopaedics, it is by standing on the shoulders of giants.

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# FOS ESSAY PRIZE 2014: WHAT HAS BEEN THE MOST IMPORTANT ORTHOPAEDIC ADVANCEMENT IN THE LAST 100 YEARS?

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## Essay Prize Highly Commended Entry

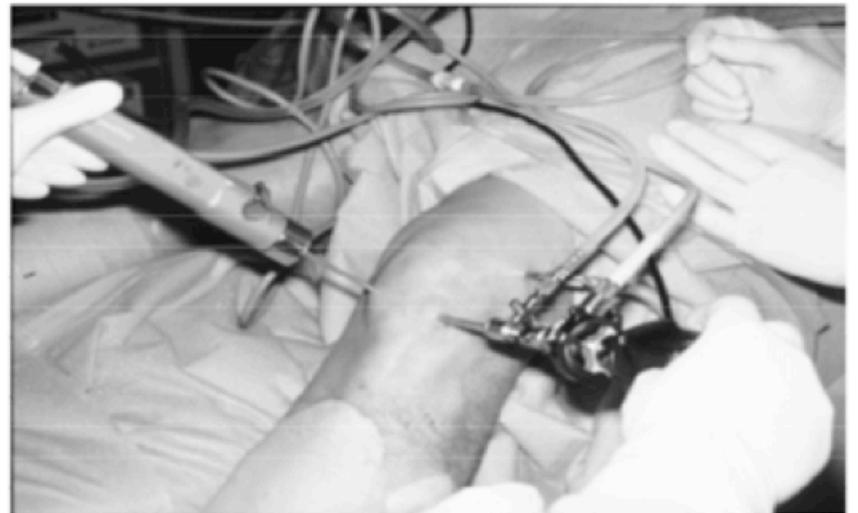
### Arthroscopy: The Minimally Invasive Option

Orthopaedic surgery, similar to most other surgical departments, has encountered a remarkable advancement in the last century. Arthroscopy is a less invasive substitute to traditional invasive operating methods. At present, it is one of the most frequently executed orthopaedic operations, and also one of the most important innovations in orthopaedic surgery. Furthermore, it has developed the physicians' knowledge of, and competency in managing joint disorders. The last 100 years have seen the progression of arthroscopic surgery, from a diagnostic to a therapeutic tool by achieving better clinical outcomes in patients diagnosed with a wide range of previously unidentified joint pathology. In 1958, Watanabe announced the production of the first truly successful arthroscope <sup>1</sup>. Soon after consulting with Watanabe, in 1976, Dr. Robert Jackson became the first to pioneer arthroscopy in North America, and later printed the original

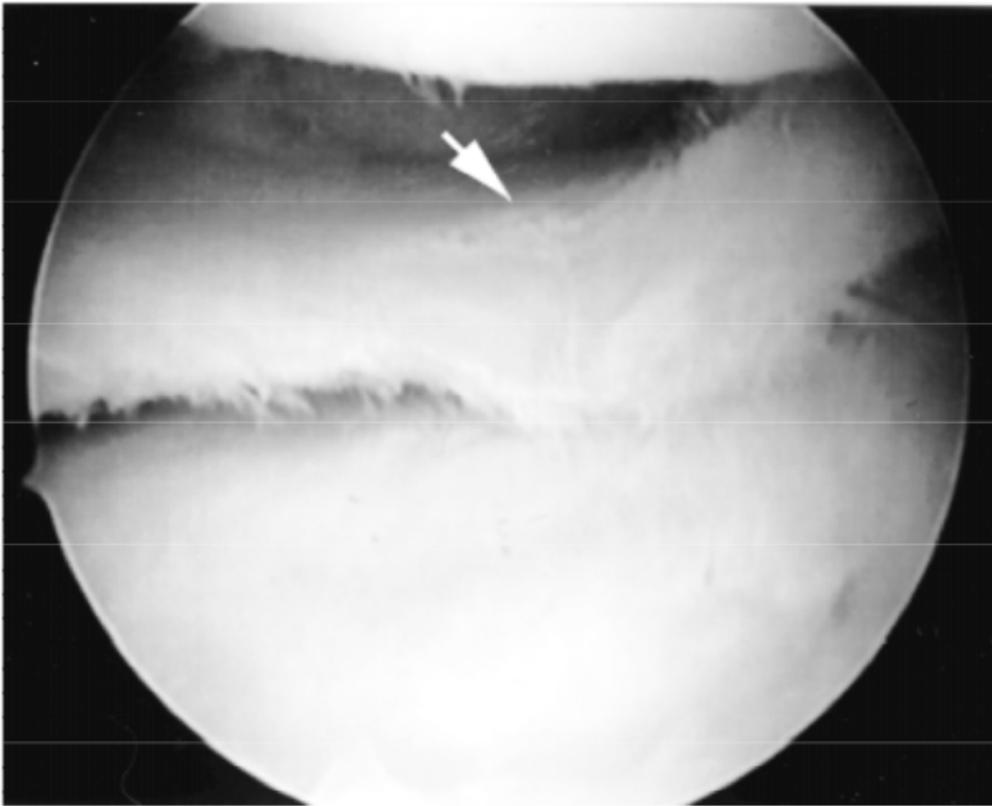
English article on this topic <sup>2</sup>. Meanwhile, the primary learning programme outlining the fundamentals of arthroscopy was being offered in Pennsylvania. The advancements in the fields of fibre-optics and hi-tech small-screen cameras were both key mechanical milestones, which facilitated today's extensive application of arthroscopy.

Decreased post-operative swelling, reduced pain and risk of complications are all proven advantages over open techniques. Hence, individuals who are managed arthroscopically are more likely to heal quickly and achieve faster rehabilitation rates and, the resulting socio-economic benefit includes a speedy recovery by returning to physiological function and work promptly. In addition, majority of the arthroscopic surgical tech-

niques do not require an inpatient admission. Despite its unaccompanied use as a surgical method of treatment, arthroscopy has largely caused a decline in morbidity when weighed against open procedures. However, as with any invasive technique, there are associated potential risks. Back in 1983, a national study which reviewed 118,590 arthroscopic interventions, accounted 930 complications with a 0.8% incidence rate <sup>3</sup>. This report documented that 17% of the unexpected complications were in direct affiliation with tools malfunctioning. From a technological stand-point, arthroscopy involves expert handling of a variety of instruments including: a small fibre-optic camera; television screen; surgical equipment; irrigation pump system; amongst others, which may be damaged or become dysfunctional at the time of an ongoing opera-



**Figure 1.** An American surgeon carrying out knee arthroscopy



**Figure 2.** Images from a knee arthroscopy performed by the same surgeon as figure 1 illustrating a degenerative meniscal tear (white arrow)

tion (**Figure.1**). Therefore, it is important for a surgeon to be specialised and accustomed with the handling of the devices and routinely exercise with the purpose-built equipment. The corresponding risk of anaesthetic complications is parallel with any other surgery.

Classically, the knee joint was simulated as the prototype in the advancement of arthroscopy; the two menisci within each of our knee are triangular in cross-section and lie in between the thigh bone (femur) and lower leg (tibia), formed the chief anatomical landmark for knee surgeons during early arthroscopies <sup>4</sup>. They are two pads of living cartilaginous tissue which aid the dispersion of weights placed upon our knees (**Figure. 2**). In the previous three decades arthroscopy of the shoulder was established as an intervention which can diagnose and treat shoulder pathology, and Ogilvie-Harris and Wiley found a relatively small risk of complications <sup>5</sup>. Advancements in technology which provided miniature arthroscopic equipment coupled with a

sound knowledge of safer entry sites; alongside the discovery of joint distraction frames which enable the surgeon to gain access into a degenerated joint, have together rectified the shortcomings of using arthroscopy in much smaller ankle and wrist joints. A thorough assessment of both these joints may be challenging due to the confined spaces exhibited by their musculoskeletal architecture. Bain et al. implied that wrist arthroscopy is used as the gold standard for diagnosing patients with wrist injuries involving the joint space <sup>6</sup>. Inventions such as arthroscopy have already ensured better clinical outcomes following minimally invasive treatment, and future breakthroughs in technology may increase their indications for usage, serving as the single most important advancement in orthopaedic surgery.

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# FOS ESSAY PRIZE 2014: WHAT HAS BEEN THE MOST IMPORTANT ORTHOPAEDIC ADVANCEMENT IN THE LAST 100 YEARS?

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## Essay Prize Highly Commended Entry

29th August 1911 - A date that would come to define the future of orthopaedic surgery.

This is not a day associated with a discovery, innovation or revelation; but rather the birth of John Charnley; who later would go on to become perhaps the most famous orthopaedic surgeon of all-time. His tireless pursuit of surgical excellence and innovation led to the greatest single surgical advancement of the last 100 years – the Charnley total hip replacement <sup>1</sup>.

Pre-Charnley patients with osteoarthritis of the hip had two treatment options; osteotomy for the elderly and arthrodesis for the young. Unsatisfied with the poor outcomes from these procedures Charnley quickly realised that the only way to adequately restore hip function and provide satisfactory analgesia was through reconstruction of a normal joint or “arthroplasty”. He understood that for the procedure to work the joint had to provide minimal friction and wear, as well as having adequate fixation to the surrounding tissue.

Building on the prior work of Girdlestone, Smith-Peterson, McKee and J & R Judet, Charnley started developing prostheses in the attic of his house before eventually developing a biomechanical laboratory



**Figure 1** Professor Sir John Charnley (1911-1982), Consultant Orthopaedic Surgeon, Manchester Royal Infirmary and Wrightington Hospital.

at Wrightington. Along with his technician Harry Craven (a turner-fitter by trade) Charnley worked through endless trials and tribulations with various prosthetic compounds, techniques of joint lubrication, fixation devices and femoral head sizes. It was through their endeavour that Ultra-high-molecular weight polyethylene

(UHMWP) was first trialled as the load bearing socket in total hip replacement; material that is still used to today (although in the modified form of cross-linked UHMWP). This, along with a small 22.2mm metal femoral head prosthesis and acrylic cement fixation, formed the first Charnley hip replacement inserted on 23rd Novem-

ber 1962; revolutionising orthopaedic surgery forever <sup>2</sup>.

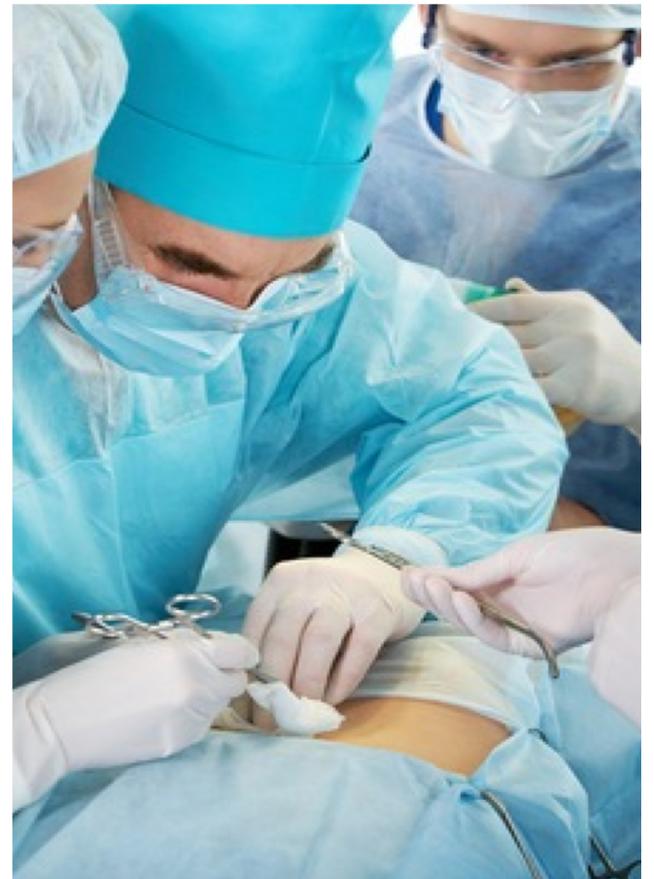
The impact of Charnley's operation did also not stop with the prosthesis – his understanding regarding the risk of infection and its serious consequences led to the development of several successful antisepsis techniques. Some of these, such as laminar airflow systems, are still commonly used in modern operating theatres <sup>3</sup>.

Even today, 51 years later, only minor adjustments have been to the pioneering work of Charnley at the hip. Long term results are excellent – studies have suggested survivorship rates of 85% at 25 years and 78% after 35 years <sup>4</sup>, with complete patient satisfaction at above 80% <sup>5</sup>. Comparisons to total knee replacement, where the 15 year survival is just 81% <sup>6</sup>, only emphasise the brilliance of Charnley's design.

Currently over 70,000 people in the U.K. receive a total hip replacement each year <sup>7</sup> and the impact of Charnley's work is likely only going to further grow too; with a suspected 174% rise in the number of primary total hip replacements performed by 2030 <sup>8</sup> – a testament to the degree of improvement in quality of life following such a procedure. Above all else it is this, the unparalleled impact on daily human life and resonance through time, which marks the operation out as undoubtedly the most important orthopaedic advancement in the last 100 years.

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Online September 2014

# ALCOHOLIC CHARCOT ARTHROPATHY OF THE FOOT

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## INTRODUCTION

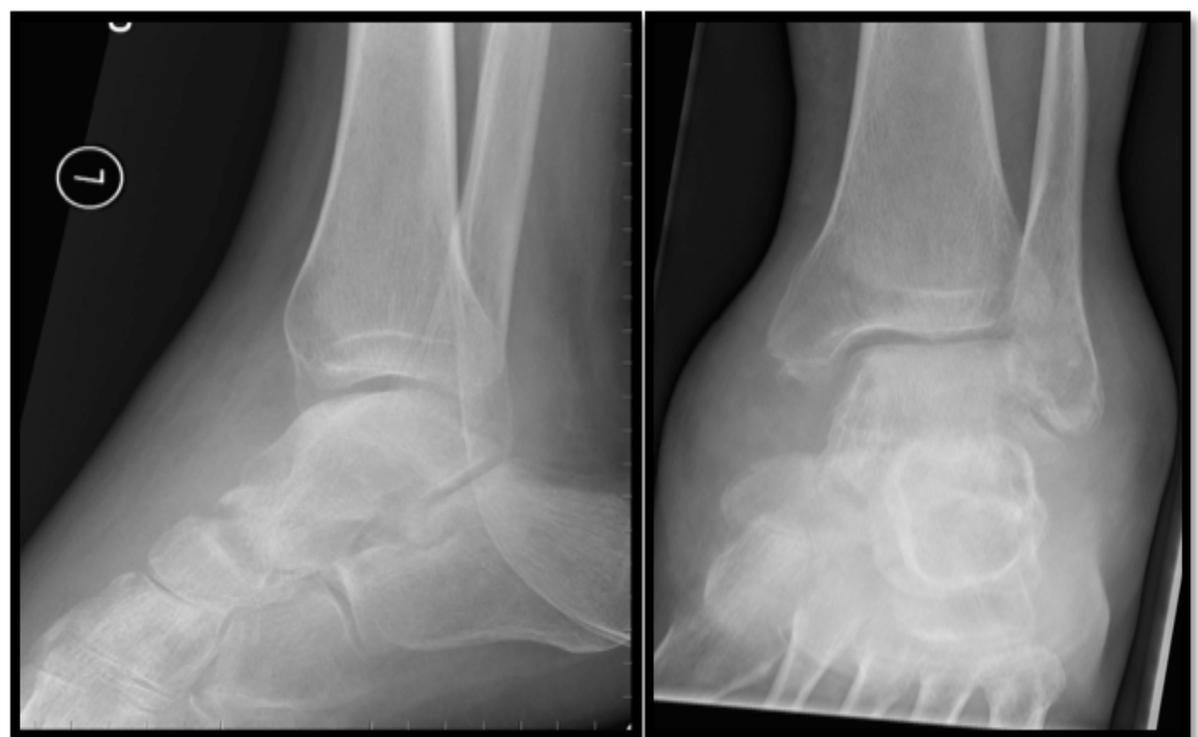
Charcot arthropathy is a destructive process affecting mainly weight bearing joints. It is commonly associated with diabetes but has also been associated with syphilis, alcoholism, leprosy, meningomyelocele, spinal cord injury, syringomyelia, renal dialysis, and congenital insensitivity<sup>1</sup>. It characteristically leads to osseous fragmentation and dislocation causing foot deformity and instability. The early presentation consists of swelling and erythema, which may mimic an infection<sup>2</sup>. Neglected and untreated cases can cause ulceration, and subsequent co-existing infection which may result in an amputation. It becomes therefore very important to correctly diagnose this clinical condition as early as possible and apply the appropriate treatment in order to avoid potentially devastating complications.

## CASE PRESENTATION

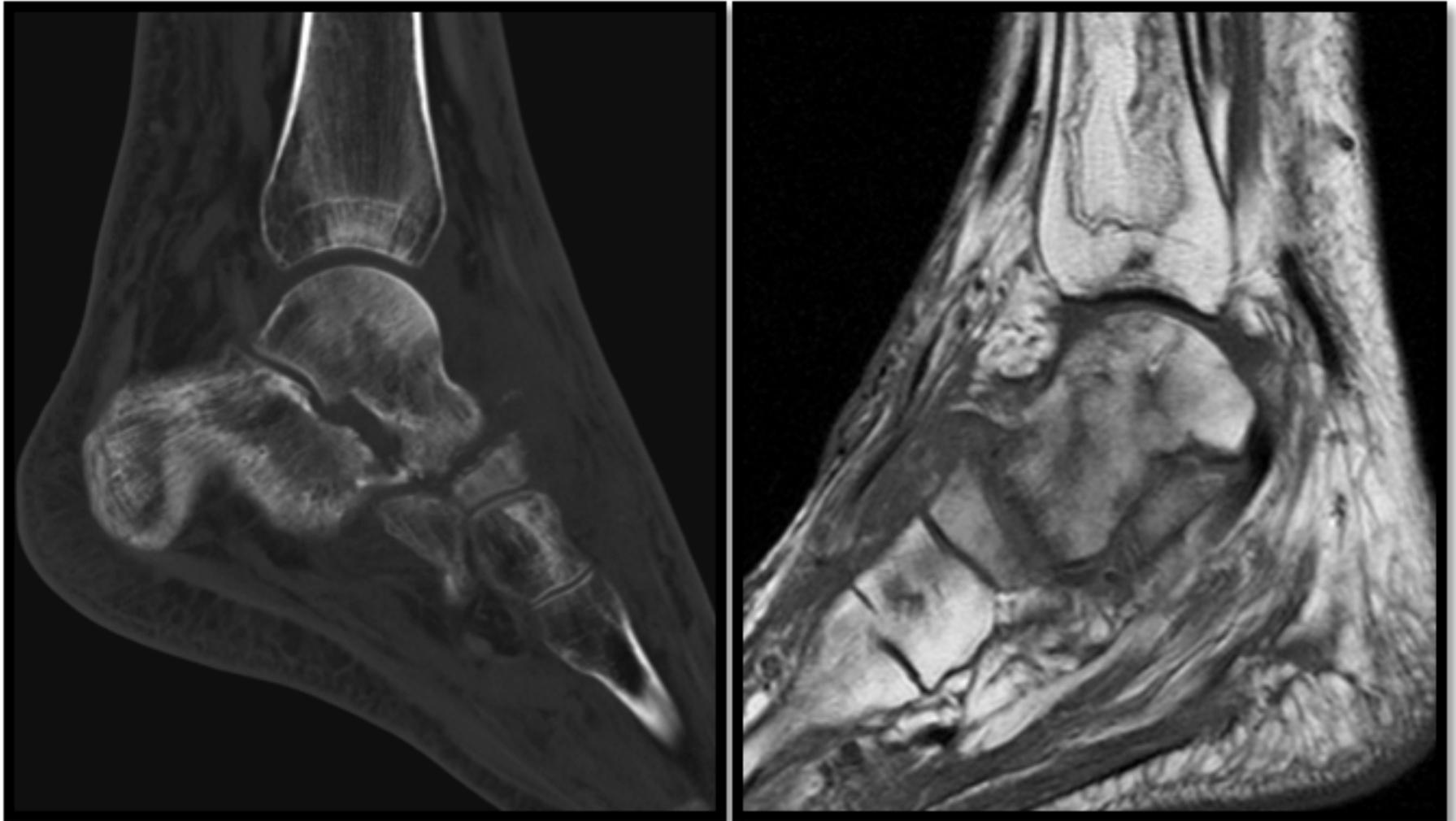
A 30 year-old Caucasian male patient presented after minor twisting injury following a fall. His X-ray showed a healing fracture of the proximal phalanx of the hallux (**Figures 1, 2**). After repeated attendances to the hospital with ankle pain and inability to bear weight on his left foot and subsequent X-rays that showed worsening soft tissue oedema and loss of the talonavicular joint space with osteopenia (**Figures 3, 4**), he



**Figures 1, 2.** AP and lateral radiographs of the left foot six months before admission, the talonavicular joint is intact.



**Figures 3, 4.** AP and lateral radiographs of the left ankle on admission, showing marked osteopenia and loss of the talonavicular joint space.



**Figures 5, 6.** CT (left) and MRI (right) lateral views of the left ankle. Marked bony destruction of the talonavicular joint is shown on the CT. MRI with gadolinium shows involvement and oedema of the surrounding bones and soft tissues without evidence of an abscess.

was admitted for further investigation and management. He was known to suffer from alcoholic liver disease and hepatitis C virus. He consumed 140 units of alcohol/week for the last 4 years. There was no family history of diabetes or any neuropathic conditions.

He was able to bear weight with discomfort and his ankle was grossly swollen, warm and tender. The skin was erythematous, without ulcers or sinuses. He had palpable foot pulses but altered sensation affecting his whole foot, tested with a Semmes-Weinstein 10-g monofilament wire<sup>3</sup>. He had diminished due to pain range of movements of the subtalar joints. He was afebrile, with Haemoglobin of 9.8g/dl, White Cell Count of 13.6 and normal B12, Folate and C Reactive Protein levels. Liver Function Tests and Glucose testing were normal. The CT and MRI scan with

gadolinium reported septic arthritis of the talonavicular, calcaneocuboid and ankle joints suggestive of osteomyelitis (**Figures 5, 6**). The provisional diagnosis of septic arthritis with osteomyelitis was questioned despite the MRI findings, mainly due to the absence of a collection. We decided to proceed with a bone biopsy and joint fluid aspiration. Interestingly the erythema diminished significantly after the 60 seconds elevation test, disputing cellulitis as the cause of redness. During biopsy the bones appeared normal, and no pus or fluid was harvested. No organisms were grown from either the bone biopsies or aspirates. He was then treated as Charcot arthropathy with Total Contact Casting for 12 weeks, partial weight bearing and referred to an alcohol detoxification service.

During his admission and the 3 month follow up the patient completed a Foot

and Ankle Outcome Score (FAOS), a 42-item questionnaire assessing patient's relevant outcomes in five separate sections: Pain, other symptoms, activities of daily living, sport and recreation and quality of life<sup>4</sup>. The functional outcome scores improved significantly with conservative management. (**Table 1**)

## DISCUSSION

Although the prevalence of neuropathy is equally common in alcoholic and diabetic patients<sup>5</sup>, alcohol induced arthropathy is rarely reported in the literature. Thornhill et al<sup>6</sup> reported 10 cases of African American males who developed neuropathic arthritis secondary to alcohol consumption, 5 cases were also described by Bjorkengren et al<sup>7</sup> and Vera and Nixon<sup>8</sup>. Most of the cases described were middle aged men between the ages of 40 -60 with ulcerative

	Pain	Symptoms	Daily activities	Sports and Recreation	Quality of life	Total
On admission	22/100	15/100	38/100	10/100	13/100	98/500
3 weeks after admission (still inpatient)	47/100	36/100	63/100	35/100	25/100	206/500
4 weeks post discharge	66/100	64/100	70/100	60/100	50/100	310/500
3 months post discharge	80/100	85/100	93/100	60/100	62/100	380/500

**Table 1** Foot and Ankle Outcome Score

Charcot on presentation. Their average alcohol intake was around 80 – 105 units/week for a prolonged period (10 -20 years). They were all treated conservatively and their deformity did not deteriorate and most ulcers healed. The acute presentation of Charcot arthropathy often resembles acute infection posing a diagnostic challenge. The accurate interpretation of the radiological investigations available is one of the keys to optimal management. Initial approach should involve plain radiography. Eichenholtz described a very useful classification of x/ray changes in Charcot arthropathy<sup>9</sup>. (**Table 2**)

MRI on the other hand is becoming increasingly popular for the investigation of osteomyelitis because it has a high sensitivity (77%-100%) and specificity (80-100%) for the disease. There is increased controversy in the literature regarding the capability of

MRI to differentiate osteomyelitis from Charcot arthropathy, because both produce similar signal changes on MRI<sup>10, 11</sup>.

**LEARNING POINTS**

- The clinical appearance of the foot, the relatively normal inflammatory markers and the absence of a soft tissue abscess on MRI raised questions regarding the provisional diagnosis of osteomyelitis and prompted us to proceed to open bone biopsy and joint fluid aspiration, which confirmed the diagnosis of Charcot’s arthropathy due to alcoholic neuropathy.
- Premature inappropriate aggressive surgical intervention and ablation of the affected limb was avoided and the conservative treatment was applied with beneficial results.
- A high index of suspicion for Charcot arthropathy, the clinical presentation,

the absence of abscess formation on MRI imaging and finally tissue biopsy are the cornerstones that help us differentiate between alcoholic Charcot arthropathy and osteomyelitis.

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**Table 2** Eichenholtz

Stage		Radiographic Findings
Stage 1	Stage of development	Bone fragmentation
Stage 2	Stage of coalescence	Absorption of bone fragments and coalescence to adjacent bone
Stage 3	Stage of reconstruction	Remodelling and rounding of bone ends

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# PATHOLOGICAL NECK OF FEMUR FRACTURE ASSOCIATED WITH RENAL OSTEODYSTROPHY

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## Introduction

Renal osteodystrophy (RO) is a generic term used to describe a spectrum of osseous abnormalities. Included within this group is the condition osteomalacia, in which there is incomplete mineralization of normal osteoid tissue. This is commonly seen in patients who suffer from chronic renal insufficiency.<sup>1</sup> Osteomalacia commonly affects the femoral neck, the axillary margin of the scapula, the pubic rami and the ribs.<sup>1</sup> RO has been associated with several non-specific clinical features that are characteristic of secondary hyperparathyroidism, Rickets, osteomalacia and osteoporosis. These include bone pain, skeletal deformity and reduced bone strength.<sup>1</sup> Insufficiency fractures resulting from poorly mineralized bone and amyloid deposition are a common complication of RO. There are three main metabolic bone disorders associated with chronic renal failure: hyperphosphataemia with resultant decrease in calcium absorption, tertiary hyperparathyroidism and aluminium toxicity.

Calcium and phosphate homeostasis is regulated by Vitamin D and its actions on bone, the gastrointestinal tract, the kidneys and parathyroid glands. Hydroxylation of Vitamin D occurs firstly in the liver and then the kidneys. Therefore, renal impairment leads to inadequate mineralisation of trabecular and



**Figure 1.** AP Pelvis showing bilateral intracapsular fractured neck of femurs

cortical bone. This effect is attributed to retention of phosphate, due to impaired glomerular filtration, resulting in hyperphosphataemia, which and causes a secondary hyperparathyroidism. Bone resorption in RO is as a result of secondary hyperparathyroidism, which increases serum calcium levels by stimulating bone resorption to release osseous calcium. Histological samples in our patient demonstrated features typical in renal osteodystrophy (RO); the coexistence of osteoporosis and an increased rate of bone turnover, which rendered the patient at risk of pathological femoral neck fracture.

## Case Presentation

We report the case of a 66 year old female of Asian descent, who was referred to the on-call Orthopaedic team at Queen Alexandra Hospital, Portsmouth, after complaining of acute, bilateral hip pain on a background of rapidly declining mobility over a six month period. Her medical co-morbidities included hypertension, osteoarthritis and insulin dependent diabetes with peripheral neuropathy, diabetic cheiroarthropathy and end-stage renal failure, requiring dialysis three times weekly. Her medications included Humulin, Felodipine, Cande-

sartan, Alfacalcidol, Folic Acid, Omeprazole, Simvastatin, Aspirin and Vitamin D3 supplements.

The patient reported that her left hip symptoms were initiated by a trivial fall six months prior to her presenting. Radiographs obtained at the time of injury did not demonstrate a fracture. Subsequent to this fall, the patient noted a progressive decline in her mobility due to worsening bilateral hip pain. Prior to the fall she had been an independent community ambulator but had since become house bound, mobilising with the aid of one stick.

Whilst attending the hospital for her routine renal dialysis, she experienced sudden and severe right hip pain in the absence of preceding trauma. Radiographs obtained by the renal physicians demonstrated resorption of the superior femoral neck bilaterally, consistent with osteomalacia. An incomplete, insufficiency fracture of the left neck of femur was also noted, with an associated old fracture that had united with varus angulation. The right neck of femur contained an acute intracapsular insufficiency fracture.

(**Figures 1, 2, 3**)



**Figure 3:** AP of Left Hip showing an incomplete, insufficiency fracture of the left neck of femur with an associated old united fracture with varus angulation

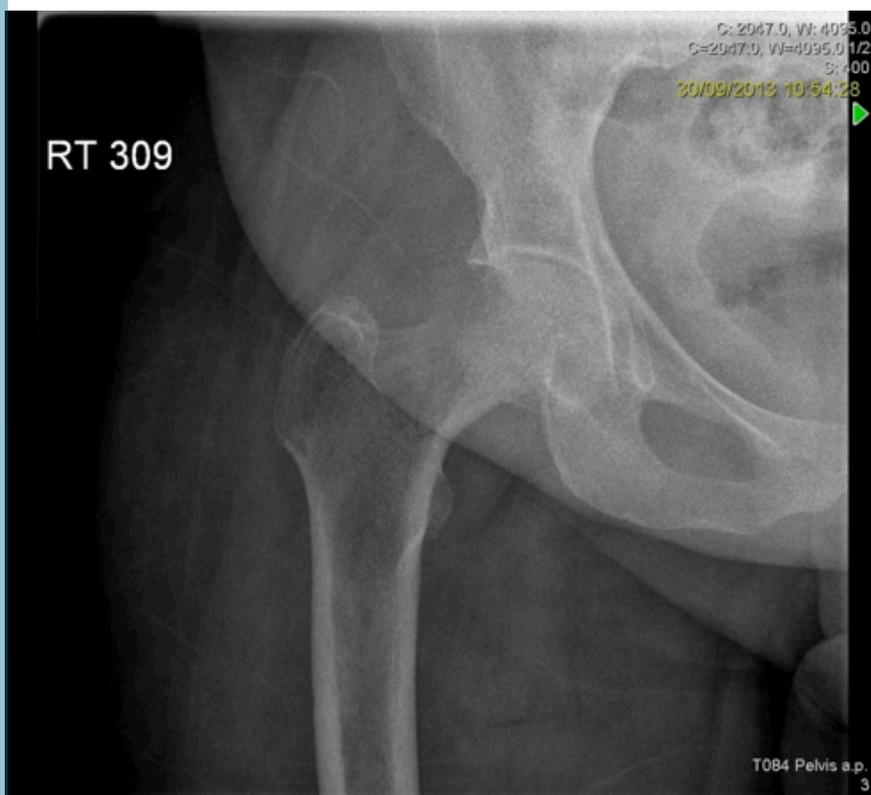
The left hip was initially treated conservatively, however, due to her underlying renal pathology, this has now displaced and she is awaiting a total hip replacement.

## Discussion

Osteosclerosis in RO is poorly understood but it is clear that a proportional increase in cancellous bone is seen, due to the deposition of amorphous calcium phosphate rather than hydroxyapatite. The resultant increase in thickness and number of trabeculae within cancellous bone may lead to osteosclerosis. Histological evidence of osteoclastosis, osteoblastosis and increased bone turnover has been found in patients with RO.<sup>1</sup>

Radiological findings include osseous resorption, osteopenia, calcification of soft tissues, amyloid deposition and fracture.<sup>2</sup> Looser zones are also seen in osteomalacia which are pseudofractures. Nuclear medicine bone scanning may be helpful in revealing pseudofractures. In addition, a bone scan may also demonstrate diffuse skeletal uptake that is distinguishable from metastatic disease by the increased uptake in the extremities. Computerised Tomography may be of use in further evaluating fractures, whilst MRI can be used to visualise amyloid deposition.

Patients receiving renal dialysis are further at risk of osteomalacia, resulting from aluminium-induced bone disease. This is caused by aluminium-based phosphate-binding agents, antacids and dialysate solutions, which all introduce



**Figure 2:** AP of Right Hip showing an acute intracapsular insufficiency fracture.

The patient was treated operatively, with primary total arthroplasty of the right hip. The right femoral head was saved for histological analysis, which revealed features compatible with the diagnosis of renal osteodystrophy. There was thick bony trabeculae, prominent osteoclasts and some woven bone formation, with focal fibrosis. There was no amyloid deposition or evidence of neoplasia.

aluminium into the circulation iatrogenically. High serum aluminium inhibits osteoblastic activity and hydroxyapatite crystal formation. Aluminium hydroxide gels are taken orally to reduce the blood phosphate levels however aluminium toxicity is a result of impaired renal function, as the kidney is unable to excrete aluminium and therefore it is retained and deposited in the bones and brain.<sup>3</sup> A study by Hardy et al.<sup>4</sup> investigated twenty six patients receiving haemodialysis, who had also sustained pathological fractures to the femoral neck. They found amyloid deposition in eighteen patients, cortical necrosis and osteoporosis in four cases, aluminic osteomalacia in three cases and hyperparathyroidism in a single patient. The study declared amyloidosis to be a frequently recognised feature in renal dialysis patients who sustain pathological fracture. Perhaps this could be utilised to identify patients who are at high risk of fracture?

## Conclusion

The use of nuclear medicine bone scanning is of limited primary diagnostic value but may be utilised in ongoing management. CT or MRI imaging may be required to investigate pathological hip fracture in the presence of osteomalacia. A delay in diagnosis can lead to significant morbidity and mortality. Dialysis patients with hip fractures have been shown to have nearly a two and a half times higher one year mortality rate compared with the general population.<sup>5</sup> Total hip replacements achieve excellent functional results. Further research is required to identify potential screening tools for the assessment of fracture risk in renal dialysis patients. If suitable criteria could be established, there may be a role for prophylactic surgical intervention.

## Learning Points

- Not all fractured neck of femur patients present acutely due to simple falls
- Treating RO and osteoporosis in patients with chronic renal failure, with consideration of falls prevention, is paramount in the management of such complex patients.

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# SPONTANEOUS QUADRICEPS TENDON RUPTURE IN A PATIENT WITH LARGE GOUTY INFILTRATE

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## INTRODUCTION

Quadriceps tendon ruptures are uncommon, usually occur in patients older than 40 years and are frequently misdiagnosed. A strong association exists with systemic disease and prior degenerative changes in the knee extensor mechanism. Rupture is extremely disabling and operative repair is required to regain function. Quadriceps tendon rupture usually occurs during a rapid, eccentric contraction of the quadriceps muscle, with the foot planted and the knee partially flexed. In the absence of a history of trauma causes of degeneration of the tendon must be considered.<sup>1</sup>

## CASE PRESENTATION

A 43-year-old male office worker presented to outpatient clinic with a seven-day history of right suprapatella pain while at rest and difficulty mobilizing without any history of trauma.

The patient had no other significant medical history, was a keen runner and golfer and had never suffered with any episodes of gout. He drank in moderation, had never smoked and was of athletic body habitus. The patient had been referred to outpatient clinic by his general practitioner who noted that he had found it difficult to find any signs on examination due to a right knee effusion when he had exam-

ined the patient in the acute setting.

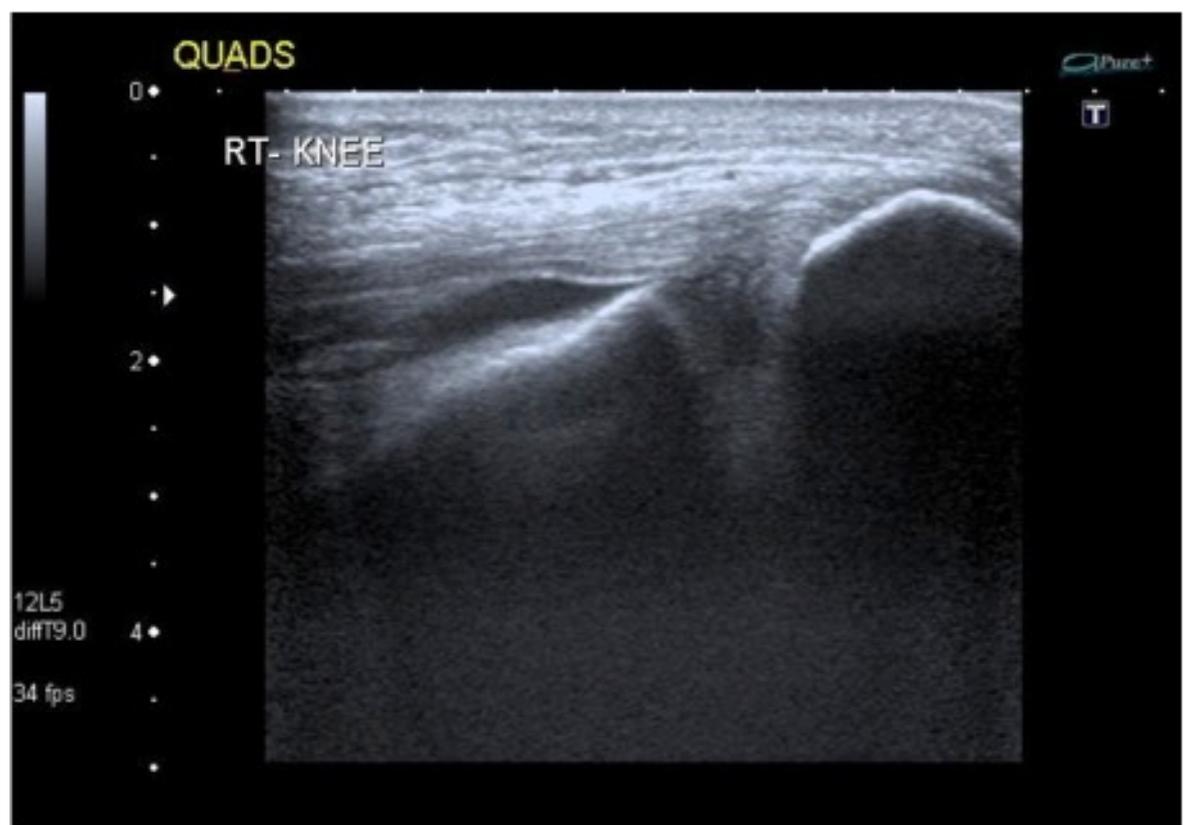
On examination in clinic, seven days after the onset of his symptoms, the gentleman was tender over the right distal anterior thigh and supra-patella region with a palpable effusion but no gap between patella and quadriceps. He had mild wasting of the quadriceps muscle bulk compared to the left and his straight leg raise was limited to 20°. His uric acid level was mildly elevated but all other bloods were normal.

Ultrasound scan and MRI knee showed a rupture of the central portion of the right quadriceps tendon

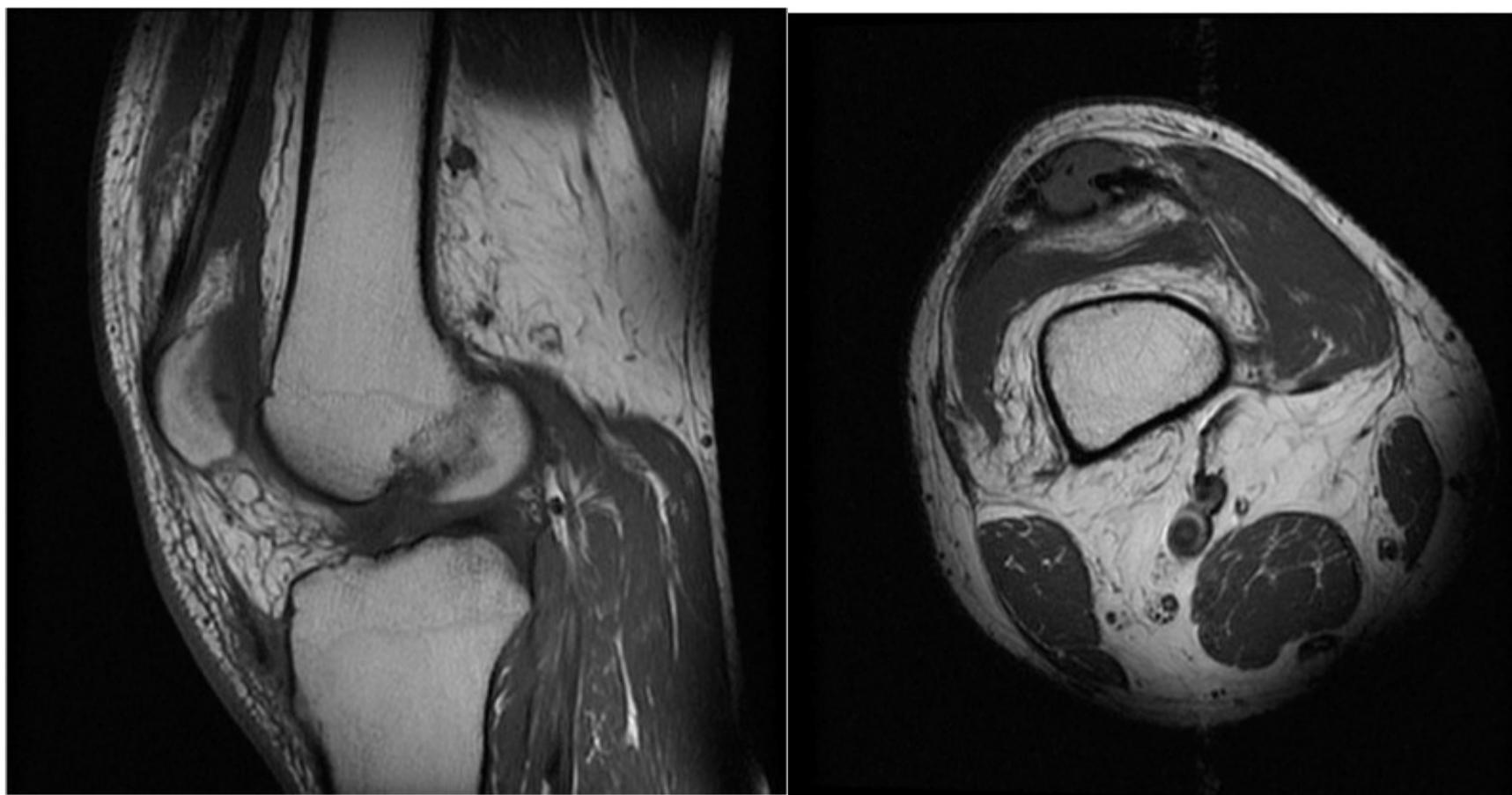
with avulsion from the superior margin of the patella.

This gentleman was listed for tendon repair with Mitek anchor-suture ten-days after injury.

During open exploration of the knee a thick white exudate was seen in the knee joint covering the surrounding tendons. A sample was sent for microbiology and pathological testing which revealed the infiltrate as positive for uric acid consistent with gout. Approximately 150ml of thick white deposit was removed and the knee was washed out prior to repair.



**Figure 1.** USS Right Knee showing defect in right quadriceps tendon



**Figures 2, 3.** MRI Right Knee coronal and sagittal views showing ruptured quadriceps tendon

Postoperatively the patient was mobilized non-weight bearing in a knee brace in extension for two weeks building up flexion to full weight bearing at six weeks. At 3-month follow up this gentleman had made a good recovery with full range of movement and had not had any further episodes of gout.

## DISCUSSION

In the absence of trauma systemic diseases are thought to weaken the quadriceps tendon by disrupting the tendon vascular supply or damaging the tendon structure and increasing the risk of minor stress on the tendon causing rupture.

A number of systemic conditions have been reported to contribute to degeneration of the quadriceps tendon including: hyperparathyroidism, chronic renal failure, gout/pseudogout, diabetes mellitus, obesity, leukaemia, rheumatoid arthritis, systemic lupus erythematosus, anabolic steroid abuse, infection and



**Figure 4.** Intra-operative findings showing white gouty infiltrate in knee joint and surrounding tissues

metabolic disease such as Wilson's disease. <sup>1,2</sup>

These predisposing conditions cause tendon degeneration by altering collagen synthesis or strength and causing sclerosis, fibrosis, fatty degeneration,

necrosis or calcification in the tendon. <sup>3,4</sup> In the case of gout deposition of uric acid crystals within the tendon weaken its structure. <sup>5</sup>

The diagnosis of quadriceps tendon rupture is based on clinical findings.

Patients typically present after a fall with their knees flexed or a sudden, sharp pain above the patella and are unable to stand without assistance. On examination, patients are unable to actively extend the affected knee with a limited straight leg raise and may have a palpable gap above the patella, sometimes referred to as the “sulcus sign” or “gap test”. The tendon may also be palpable retracted up the thigh. Patients are able to actively flex their knees and have full passive range of motion on flexion and extension. Effusion or haemarthrosis often co-exist with tendon rupture and will make examination difficult in the acute phase. <sup>6</sup>

Ultrasound scan is fast, readily available and has a high sensitivity and specificity for complete tendon rupture, it may be impaired by large haematoma or effusion or adipose tissue and is operator dependent. MRI scan gives the most accurate visualization of the tendon clearly defining the area of rupture and retraction prior to surgical intervention.

## LEARNING POINTS

- In the absence of trauma a diagnosis of a quadriceps tendon rupture is easy to miss
- Lack of straight leg raise and a palpable tendon gap are the most useful examination findings and USS and MRI the imaging modalities of choice
- Systemic disease weakens tendons and can result in spontaneous rupture

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# ACHILLES TENDON RE-RUPTURE: A CHALLENGING DIAGNOSIS

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United Kingdom

## Introduction

The Simmonds-Thompson test remains the gold standard clinical test for the diagnosis of Achilles tendon rupture<sup>1,2</sup>. Despite its popularity, there is no consensus regarding the underlying mechanism of the test. Cadaveric dissection by Thompson and Doherty<sup>3</sup> and ultrasonography studies by Scott and Chalabi<sup>4</sup> sug-

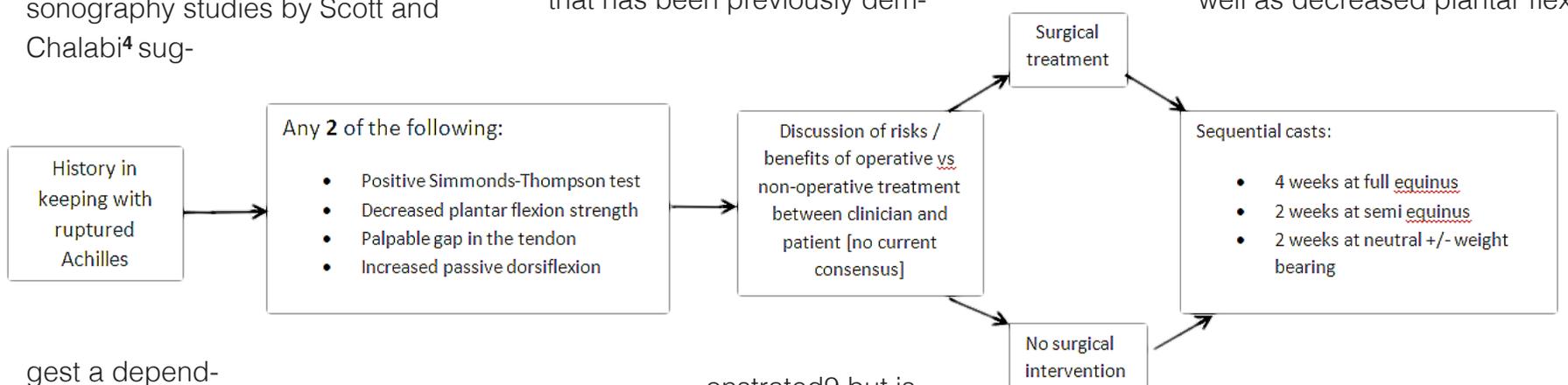
gest a dependence on the integrity of the soleus musculotendinous unit, with a positive test strongly indicative of complete tendon rupture. Conversely, O'Brien<sup>5</sup> and Douglas et al<sup>6</sup> propose the connection between the aponeuroses of gastrocnemius and soleus to be crucial, with partial ruptures therefore capable of producing a positive result.

Controversy aside, studies have shown the test to be highly capable of detecting both the intact and ruptured tendon with a positive predictive value of 0.98 and a negative predictive value of 1 when performed by a specialist<sup>7</sup>. Current guidelines dictate that a positive Simmonds-Thompson test combined with either a palpable gap, decreased plantar flexion strength

or increased passive ankle dorsiflexion is sufficient to establish the diagnosis of tendon rupture<sup>8</sup>. The case provides an example of tendon lengthening secondary to previous tendon pathology that mechanically nullifies current clinical tests utilised in diagnosing Achilles tendon rupture. This is a phenomenon that has been previously dem-

onstrated<sup>9</sup> but is yet to be factored into diagnostic recommendations. Without the use of ultrasound scanning, our patient would have been subjected to two months of unnecessary treatment that would result not only in a great restriction to his life but also a significant deterioration in function.

He presented to our hospital following a badminton injury, providing a history of a sudden onset of sharp pain after stretching for a shot. This was followed by a weakness in the affected ankle, making it difficult to walk. Clinical examination in the emergency department demonstrated a positive Simmonds-Thompson test on two separate occasions, as well as decreased plantar flex-



ion strength and a palpable depression in the tendon at the area of tenderness.

The patient was placed into a full equinus cast for two weeks prior to presentation to our clinic, where examination continued to show a positive Simmonds-Thompson test. Subsequent dynamic ultrasound testing in clinic revealed a section of healed tendon at the site of the previous rupture, which remained immobile during the Simmonds-Thomson test, preventing plantarflexion. During passive movement of the ankle, however, we were able to demonstrate an intact musculotendinous unit continuous with the calcaneum and exclude tendon re-rupture (**FIGURE 1**).

## Case Presentation

A forty-five year old male patient sustained a tendon rupture seven years prior to presentation, which was confirmed clinically and treated with nine weeks in sequential casts, followed by physiotherapy.

He presented to our hospital following a badminton injury, providing a his-



The patient was otherwise of good health; he had no other medical history of note, was taking no medication, was a non-smoker and did not drink alcohol. There was no family history of note.

The gentleman was referred for further physiotherapy with a focus on strengthening the affected muscle group.

## Discussion

This case highlights several diagnostic uncertainties in acute Achilles tendon rupture, in particular the need for diagnostic guidelines specific to cases of re-rupture. Healed Achilles tendons have been shown to have significantly increased length (2.6-3.1cm) when compared to normal tendon<sup>9</sup>. We propose that this lengthening nullifies the Simmonds-Thompson test, which relies on a small proximal movement of the tendon (1cm) to produce a result<sup>4</sup>. All clinical tests rely on some form of tension in the musculotendinous unit to produce a positive result. This causes concern in cases of re-rupture, as a positive Simmonds-Thompson test may prompt unnecessary treatment.

Further assessment of this patient showed a positive Matles test and

Copeland Pressure test. These findings support the theory that tendon lengthening nullifies clinical testing.<sup>10</sup>

There is no consensus on the use of ultrasound in diagnosis of the acute Achilles tendon rupture. This is due to the absence of research into its use in this context<sup>8</sup>. Ultrasound scanning of our patient's tendon enabled us to make a definitive diagnosis and avoid an unnecessary treatment. If our patient had been treated in accordance with the current guidelines, this would not have been the case.

## Learning Points

- Achilles tendon rupture is the most common tendon injury in adults, with re-rupture occurring in approximately 10% of patients.
- Healed tendons have been shown to lengthen; a process, which nullifies the clinical tests, recommended by current guidelines.
- We therefore propose that patients with suspected re-rupture of their Achilles tendon should undergo dynamic ultrasound imaging to assess the tendon.

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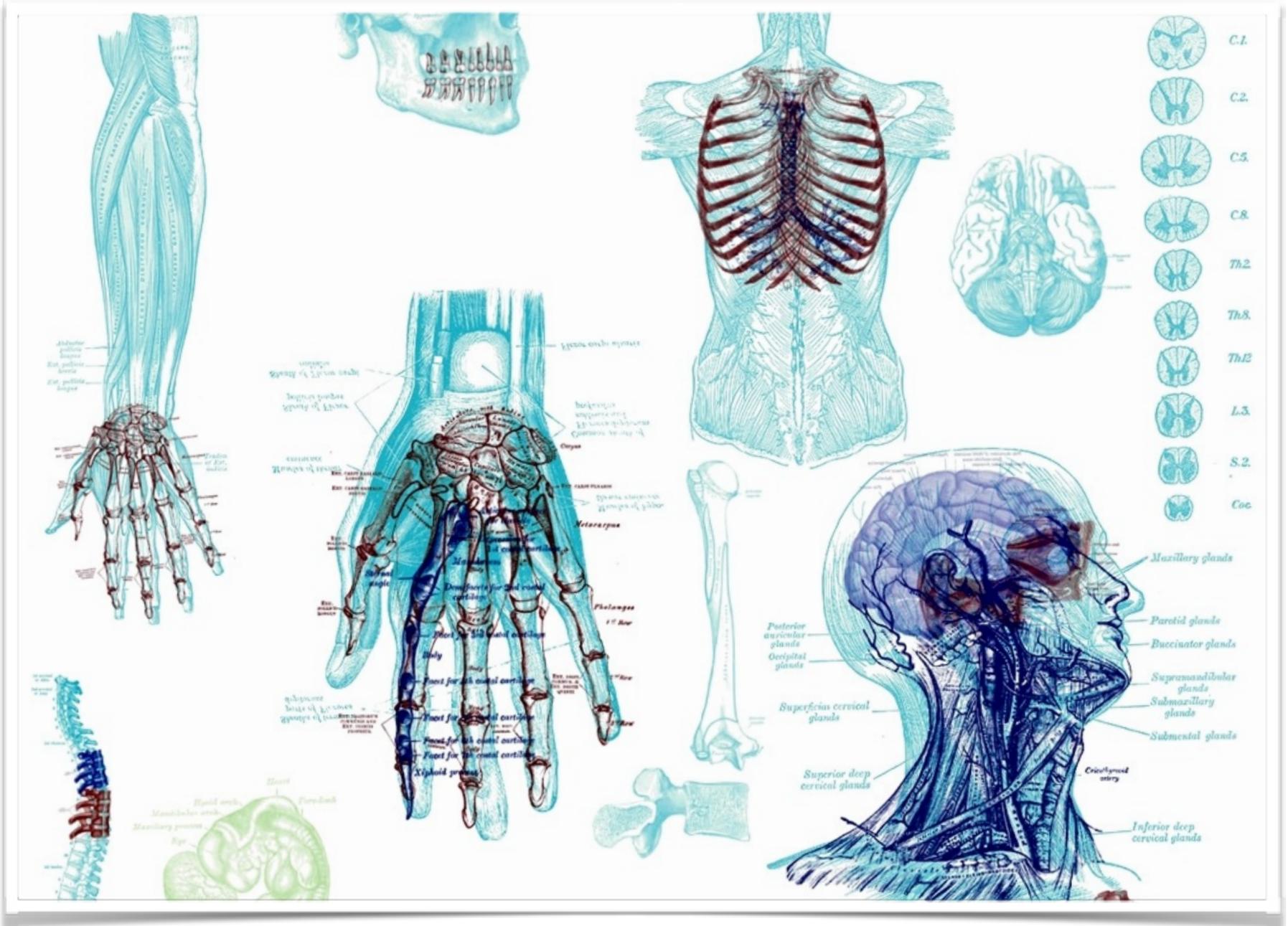


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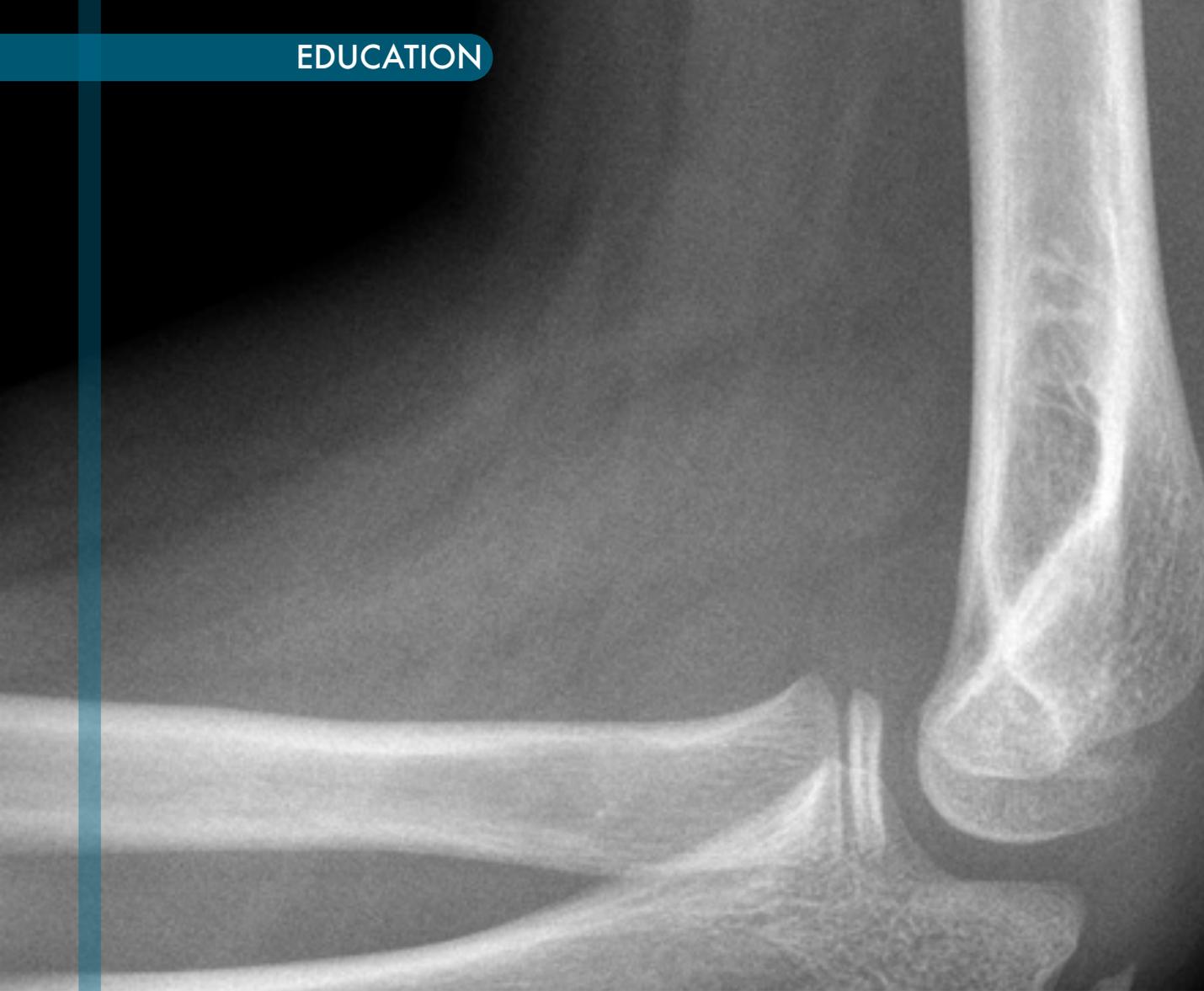
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## MANAGING SUPRA-CONDYLAR FRACTURES

Supracondylar fractures make up >60% of paediatric elbow fractures and are associated with serious neurovascular sequelae. Their management is commonly tested at interview as it is important that orthopaedic surgeons are able to effectively manage this cohort of patients.

### Introduction

Supracondylar fractures are most common in summer months when the incidence of paediatric trauma increases as children venture outdoors to play and frequently fall onto their outstretched hands.

They make up over 60% of all paediatric elbow fractures and their management is often tested at interview and trauma meetings.

### Anatomy

The time of fusion of the ossification centres of the bones around the elbow seen on AP and lateral radiographs correspond to age as below:

Mnemonic: **CRITOL**

**C**apitellum 2 years

**R**adial head 4 years

**I**nternal (medial) epicondyle 6 years

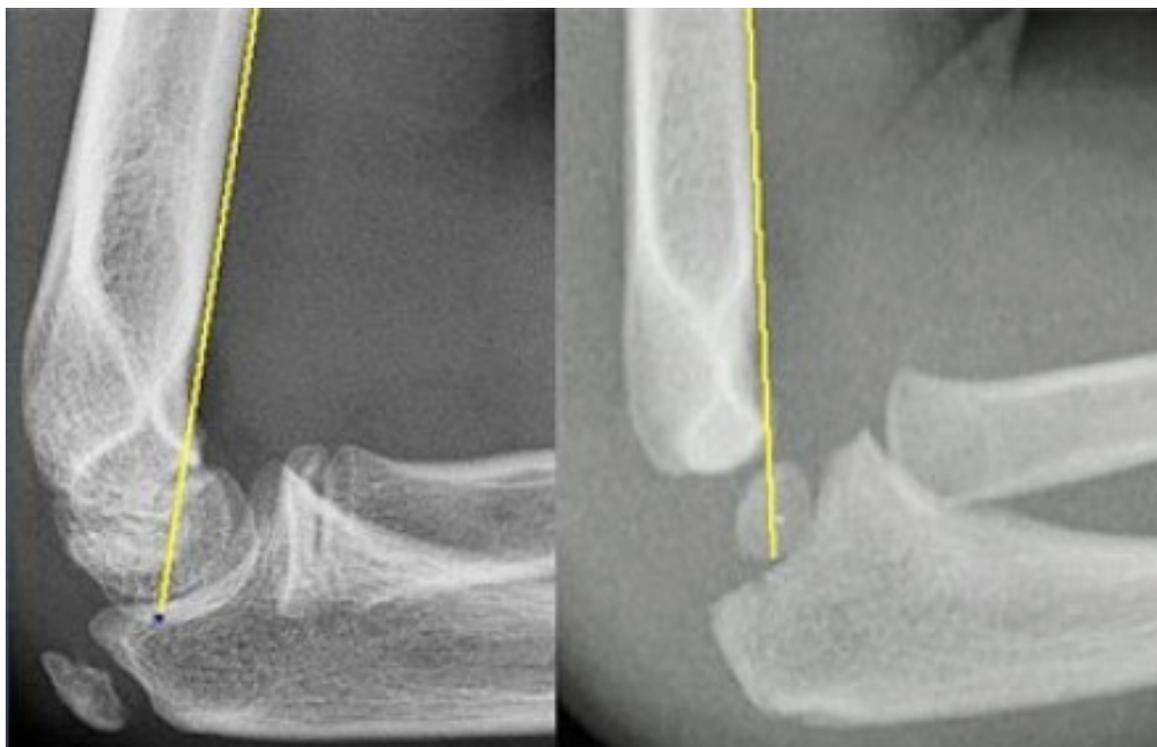
**T**rochlea 8 years

**O**lecranon 10 years

**L**ateral epicondyle 12 years



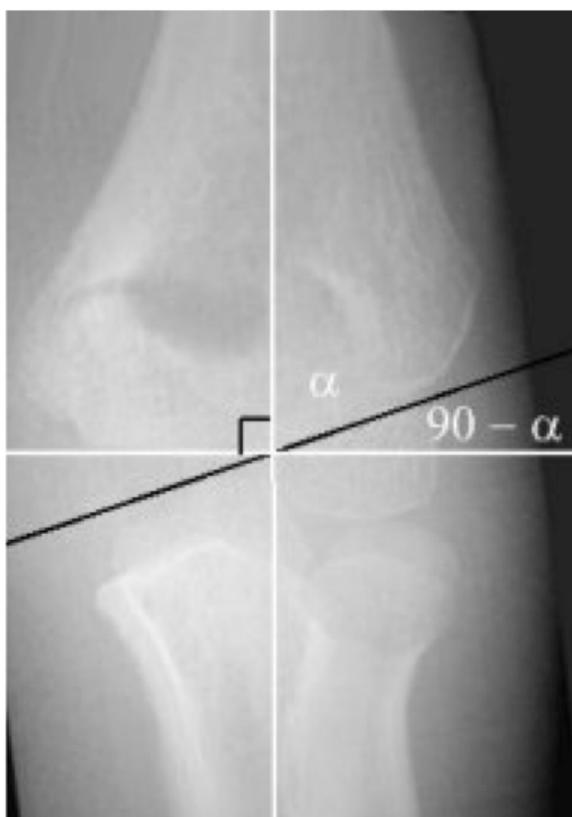
**Figure 1** Elbow ossification centres



**Figure 2** Anterior humeral line

The anterior humeral line (**Figure 2**) on lateral XR should intersect the middle third of the capitellum. The capitellum moves posteriorly to this reference line in extension type fractures.

Baumann’s angle is the angle between the lateral condylar physis and the long axis of the humeral shaft. After reduction and fixation, Baumann’s angle should be equal to that of the uninjured side (usually 70–75°). More than 75° denotes varus malposition. Correct rotational alignment is best judged on a lateral view x-ray. Alpha in **Figure 3** is



**Figure 3** Baumann’s angle ( $\alpha$ )

Baumann’s angle.

**Associated Injuries**

Extension type injuries are more common (80-95%) than flexion type and injures to nerves and blood vessels

**Nerve Injuries**

- *Anterior interosseous nerve* (branch of median n.) neuropraxia: the most common nerve palsy seen with supracondylar humerus fractures
- *Radial nerve palsy*: second most common neuropraxia (close second)
- *Ulnar nerve palsy*: seen with flexion-type injury patterns

Nearly all cases of neurapraxia following supracondylar fractures resolve spontaneously, and therefore, further diagnostic studies are not indicated in the acute setting. For those that persist in the acute setting follow up should be arranged to allow 2-3 months for them to monitor for resolution.

**Vascular Injury (1%)**

- *Brachial artery*: rich collateral circulation can maintain circulation despite vascular injury

**Classification**

Gartland (1959) classifies supracondylar fractures by displacement and cortical contact.

*Type I*

Undisplaced or minimally (<2mm) displacement with anterior humeral line intact

*Type II*

Displaced >2mm, anterior humeral line no longer passes through centre of capitellum but posterior cortex is in contact

*Type III*

Displaced with periosteum torn and no cortical contact

*Type IV (modified)*

As type III but unstable in flexion and extension

**Management**

A full history and examination of the patient is vital and should be the first step.

In young children asking them to copy your hand movements is useful in assessing nerve function:

- 'ok' sign for AIN
- cross middle over index finger for ulna
- flex wrist or MCPJ for radial nerve

The NV status should be documented in the notes and an above elbow backslap applied in 40 degrees of flexion.

**Definitive Management***Non-operative*

Treatment in above elbow cast for 4-6 weeks is reserved for Gartland type I fractures or Gartland II fractures without comminution and with an intact anterior humeral line.

*Operative*

Closed reduction with percutaneous K-wire pinning is the first choice for displaced Gartland II-IV fractures that require reduction and the stability with k-wires.

Whether operative or non-operative treatment is utilised the child will likely be in an above elbow cast for 4-6 weeks and followed up in clinic at regular intervals to ensure fracture healing. Wires are usually taken out in clinic or under general anaesthetic at week 4 with a further 2 weeks in cast after this.

**Timing of Surgery**

The urgency of definitive management depends upon the associated injuries at presentation and is still a controversial topic with ongoing clinical research. The

current accepted options are discussed below.

*Pale, pulseless hand*

Approximately 10-20% of Gartland III fractures present with an absent pulse. As the hand is also pale the circulation is not maintained by the collateral supply and emergent (immediate) reduction of the fracture is required with percutaneous pinning. An arm that is pulseless with poor perfusion is an emergency.

From the literature reduction and fixation restores the pulse in the majority of cases (75%) with the artery in spasm or trapped in the fracture site. If the pulse is not restored following reduction and percutaneous pinning open exploration of the artery is required with the vascular team.

*Pink, pulseless hand with nerve injury*

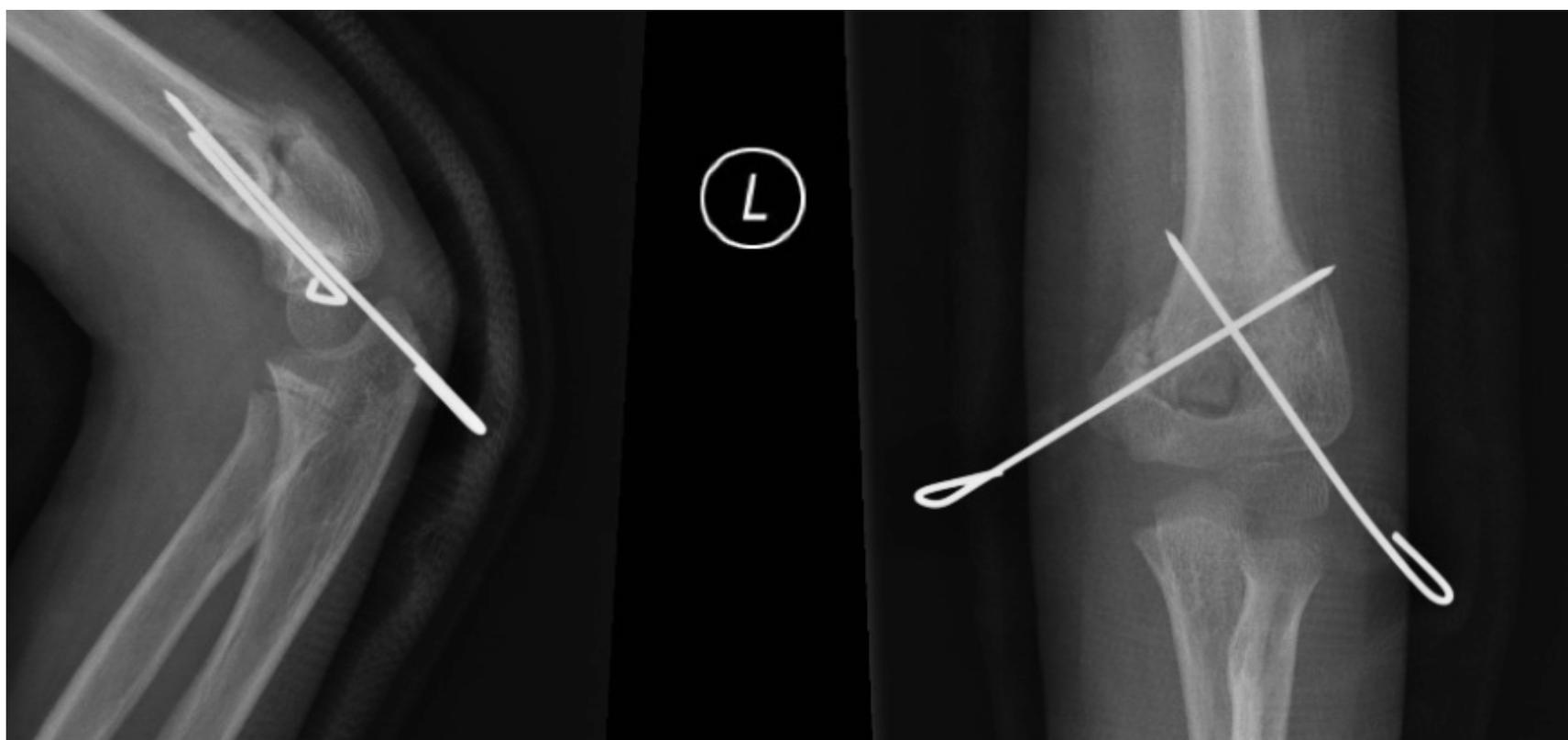
In this case the rich collateral blood supply maintains circulation to the hand despite vascular injury. An absent radial pulse is not in itself an emergency as the collateral circulation keeps the arm perfused.

There is some controversy in the literature as to the most appropriate course of action. Presently urgent but non-emergent reduction and pinning is advised though more recent studies suggest a concurrent nerve injury may indicate a co-existing vascular tethering at the fracture site due to the proximity of vessels advising immediate reduction and early exploration to untether vessels if the pulse does not return.

*Pink, pulseless hand without nerve injury*

This remains the most controversial area in the literature. Urgent but non-emergent reduction and fixation is indicated.

If the pulse does not return after surgery but the hand remains perfused most centres advocate monitoring the patient for 48 hrs. If the hand becomes pale exploration is then required with the vascular team.



**Figure 4** Two Crossed K-wires

### *No Associated Injuries*

In practical terms provided the patient is starved fixing them in daylight hours with an experienced surgeon is desirable. If the patient presents overnight or there is no available theatre space they may be operated on the following morning provided they are neurovascularly intact and comfortable. As an SHO or Registrar it is often best to discuss the timing of surgery with the on call consultant to ensure appropriate local management.

### **Reduction Technique**

The below steps summarise the intraoperative reduction manoeuvre to reduce displaced supracondylar fractures:

- 1** Traction: disengages the proximal fragment from the brachialis muscle
- 2** Coronal plane correction: medial or lateral translation
- 3** Axial plane correction: correction of internal rotation deformity
- 4** Distal fragment reduced: push with thumb

on olecranon

- 5** Elbow flexion  $>100^\circ$
- 6** Pronation: tightens medial periosteal sleeve

If the fracture is difficult to reduce prolonged traction (10-20 minutes) may be necessary to help disengage the proximal fragment from the brachialis muscle pull. An alternative in a non-emergent reduction is to keep the patient in Dunlop traction.

### **Wire Configuration**

Following reduction the fracture is stabilised with 2 or 3 1.6mm K-wires (or smaller for smaller children). There is some controversy as to whether crossed wires or lateral wires should be used. The medial wire entry site for crossed wires increases the risk of iatrogenic ulna nerve injury. These injuries are usually due to constriction of the nerve at the cubital tunnel rather than direct penetration with the majority resolving with time.

Risk of iatrogenic ulna nerve injury is increased if the medial wire is inserted when the elbow is hyper flexed rather than extended:

- Medial wire inserted in hyperflexion 15%

- Medial wire inserted in extension 4%
- Lateral wires alone 0%

The majority of surgeons are familiar with using crossed wires and incorrectly positioning lateral side-only wires can lead to loss of reduction. The best way to answer the wire debate is to discuss the pros and cons of both and to use the method that the operating surgeon is most comfortable with. If this is crossed k-wires the medial wire should be positioned using a mini-incision to locate and protect the ulna nerve rather than a true percutaneous placement. The two methods of wire placement are summarised below:

#### *Two lateral wires*

- Pin separation should be enough to allow pins to engage both medial and lateral columns
- Two rather than three wires is usually sufficient for stable fractures. Unstable fractures may require a third wire or a medial wire.
- Newer technique with best results from surgeons who perform paediatric trauma regularly.

#### *Two crossed wires*

- Biomechanically strongest to torsional stress
- Higher risk of ulnar nerve injury (4-15%)
- Highest risk if placed with elbow in hyperflexion (15%)
- Blind, percutaneous medial wire insertion has a higher risk than mini-incision and blunt dissection

### **Complications**

The below complications should be discussed with the parents prior to operation on the consent form.

- Pin migration (~2%): most common complication
- Infection (1-2.4%): typically superficial and treated with oral antibiotics

- Cubitus valgus/varus: caused by fracture malunion
- Nerve palsy
- Vascular injury
- Volkmann ischemic contracture: rare, but difficult complication
  - Compartment syndrome (rare)
- Postoperative stiffness (rare)

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## CASE CORNER

This issue's case corner looks at the management of open fractures.

- 52 year old male
- Pedestrian to car RTA at 40MPH
- No PMH
- ATLS cleared
- Right open tibial fracture



**Figure 1** AP radiograph of right tibia and fibula

### Case 1

A 52 year old male chartered accountant with no significant past medical history, allergies or medications is hit by a car travelling at 40mph while crossing the road at a zebra crossing.

He is hit on the right side and thrown into the air.

His GCS is 15/15 at the scene, he has no c-spine tenderness or thoracic pain but does appear to have an open injury to his right leg. He is stable and brought by helicopter to his local hospital. There is no plastic surgery service on site.

**Figures 1 and 2** were obtained in the emergency department.

1. How would you manage this gentleman in the emergency department?
2. What guidelines do you know for the management of open fractures?
3. What is the most commonly used classification system for open fractures?
4. What are the management options for surgical treatment?
5. What other surgical specialties might you need to contact?



**Figure 2** Open Fracture of Right Lower Leg

**How would you manage this gentleman in the emergency department?**

This gentleman should be resuscitated using ATLS principles. This is a high energy injury and there could be other injuries and vascular damage leading to haemodynamic instability.

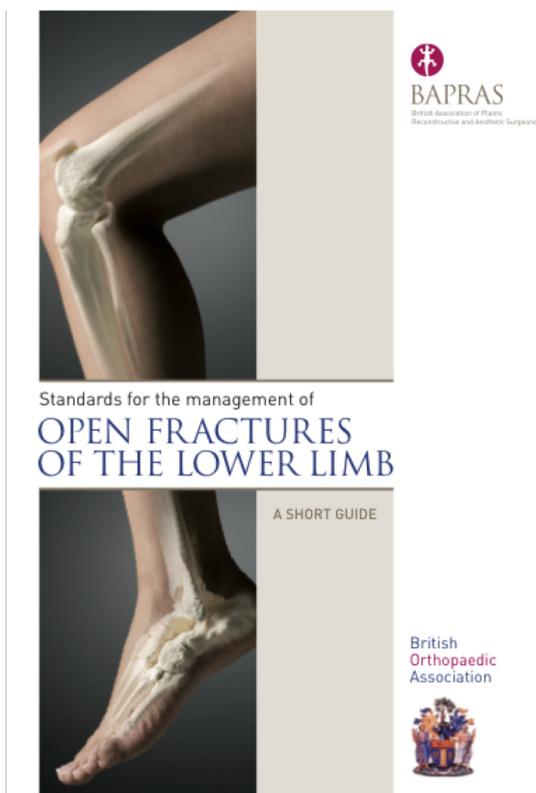
After ensuring the patient is haemodynamically stable initial management should include assessment of neurovascular status distal to the injury. Specifically accurate documentation of pulse, CRT and tibial and peroneal nerve function is required.

The patient should be given IV antibiotics and tetanus status should be up to date. In the emergency department surgeons should handle the wound only to remove gross contamination, photograph the wound and then make early contact with plastic surgeons to formulate a plan for management of the soft tissues.

Once stabilised adequate radiographs of the tibia, ankle and knee should be obtained, appropriate analgesia prescribed and the patient worked up for theatre.

**What guidelines do you know for the management of open fractures?**

Management of this open injury should be based on the BOA/BAPRAS BOAST 4 guidelines. These can be found on the BOA website.



**Figure 3** BOA/BAPRAS Guidelines

**What is the most commonly used classification system for open fractures?**

The Gustillo Anderson Classification

Other classification systems include Tscherne and the Mangled Extremity Severity Score.

- **I** Clean <1 cm
- **II** 1-10cm, No extensive soft tissue damage
- **IIIA** Contaminated wound (high-energy, gunshot, farm-yard) or extensive periosteal stripping with large skin wound (>10cm)
- **IIIB** As IIIA but requires flap coverage (plastics)
- **IIIC** As IIIA but requires vascular repair (vascular)

**What are the management options for surgical treatment?**

Management options can be classified as operative or non-operative. Given this gentleman's age, level of function and the open and unstable nature of this injury non-operative would not be advisable.

The goals of operative intervention are to stabilise the fracture and provide adequate soft-tissue coverage for wound healing.

For tibial fractures options include manipulation and plaster, tibial nail, plating or external fixation/frame.



**Figure 4** Reduced tibial fracture with Ex-Fix

As this fracture is open and unstable and the gentleman's bone stock is likely to be good an external fixator will provide

the most stable construct in the short term and will allow for transfer to a local plastic surgery unit where a skin flap to be applied before potentially converting to a tibial nail.

As outlined by the BOA/BAPRAS guidelines operative intervention in these high-energy injuries should be on a consultant operating list in daylight hours.

### What other surgical specialties might you need to contact?

In the initial work up if there is concern regarding vascular injury the vascular surgeons should be contacted.

Early liaison with the local plastic surgery team should be sought to plan soft tissue coverage on the next available combined orthoplastics operating list in daylight hours.

As there is no plastic surgery service on site the external fixator is a temporising measure while awaiting transfer to an orthoplastics unit.



**Figure 5** Skin graft healing at 1 month



**Figure 6** Definitive management with tibial nail

## EXAM CORNER

The exam corner features a selection of single best answer and extended matching questions to test your trauma and orthopaedic knowledge.

Answers can be found at the end of the section.

### Single Best Answer Questions

#### 1 Perthes Disease

- a) Is more common in girls
- b) Usually presents in teens
- c) Obesity is a risk factor
- d) The capital femoral epiphysis is small, dense and flat on AP X-Ray

#### 2 Regarding the radial nerve

- a) Is commonly injured as it crosses the wrist joint
- b) Originates from nerve roots C3-C5
- c) When injured sensation is lost over the anatomical snuffbox area
- d) Injury produces claw hand

#### 3 Regarding hip fractures

- a) The affected limb is shortened and internally rotated
- b) Extracapsular fractures may be treated with a compression hip screw
- c) Subtrochanteric fractures are intracapsular
- d) In the elderly population it is not appropriate to investigate the cause of the fall

#### 4 Shoulder Dislocation

- a) Inferior dislocation is the commonest presentation
- b) Axillary nerve function is tested by asking the patient to make the 'ok' sign
- c) Posterior dislocations are seen in epileptic fits and electric shock injuries
- d) Fracture dislocations are easily reduced in the emergency department

#### 5 Bone metastases

- a) Thyroid cancer is the commonest cause of metastatic spread
- b) Prostate cancer may cause osteosclerotic lesions
- c) 1% of patients with malignant disease develop bony metastases
- d) 50% patients develop pathological fractures

## 6 Supracondylar fractures

- a) With loss of radial pulse and poorly perfused hand do not require urgent MUA
- b) Rarely occur in children
- c) Classified by the Neer classification system
- d) Anterior and posterior fat pad signs are due to soft tissue swelling and indicate a fracture

## 7 Ewing's Sarcoma

- a) Highest incidence is in the elderly population
- b) Produces an 'Onion-Peel' sign on plain XR
- c) Is a benign tumour
- d) 5-year survival <10%

## 8 Compartment Syndrome

- a) Loss of pulses is the first sign
- b) Fasciotomy should be delayed if the patient is in extreme pain
- c) Can never occur in an open fracture
- d) Characteristically features pain out of proportion to the injury

## 9 Which of the following is not part of the immediate management of open fractures

- a) Taking a picture of the wound
- b) IV Antibiotics
- c) Ensuring Tetanus status up to date
- d) Skin Graft

## 10 Simmonds test is diagnostic in

- a) Achilles Tendon rupture
- b) Biceps Tendon rupture
- c) DVT
- d) Developmental Dysplasia of the Hip

## Extended Matching Questions

### Peripheral nerve lesions

- a) Median Nerve
- b) Sciatic Nerve
- c) Radial Nerve
- d) Common Peroneal Nerve
- e) Ulnar Nerve
- f) Lateral Cutaneous Nerve of Thigh

1. **Supplies sensation to the little finger and medial half of ring finger**

2. **Elicited using Tinel's Test and Phalen's Test**

3. **Compressed as it crosses close to the inguinal ligament**

4. **Damaged in midshaft humeral fractures**

5. **Injury causes foot drop**

### Paediatric Injuries

- a) SUFE
- b) Perthes' Disease
- c) Osgood-Schlatter Disease
- d) DDH
- e) Pyogenic Arthritis
- f) Ewing's Sarcoma

6. **An overweight 14 year old boy presents with limp, no history of trauma**

7. **Fever, crying and reduced mobility in 18-month girl Left hip is irritable on examination**

8. **Knee pain following PE sessions in a 15 year old boy**

9. **Groin pain and antalgic gait in 8 year old boy, XR shows flattened femoral head**

10. **Barlow and Ortolani Tests helpful in diagnosis**

## Answers

SBA's	EMQ's
1 D	1 E
2 C	2 A
3 B	3 F
4 C	4 C
5 B	5 D
6 D	6 A
7 B	7 E
8 D	8 C
9 D	9 B
10 A	10 D

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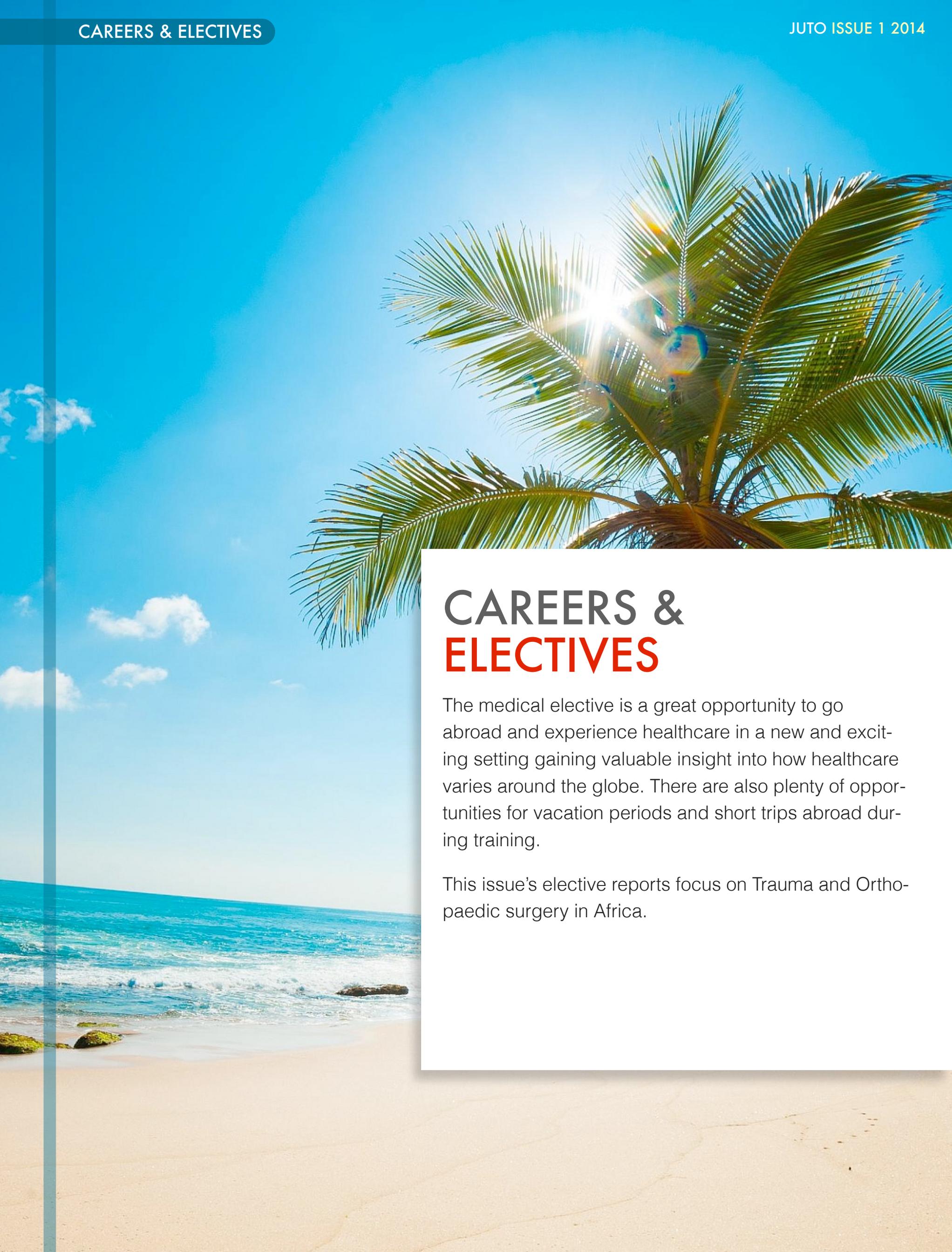
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This issue's elective reports focus on Trauma and Orthopaedic surgery in Africa.



Figure 1. Outside New Somerset Hospital, Cape Town

## NEW SOMERSET HOSPITAL, CAPE TOWN, SOUTH AFRICA

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**Jon Lawrence recounts his time spent attached to the Trauma and Orthopaedic Department at New Somerset Hospital in Cape Town South Africa**

### Introduction

I spent 7 weeks this summer attached to the Orthopaedic department at New Somerset Hospital, Cape Town. This is a secondary level state hospital with 280 beds serving the west of the peninsula – roughly 6400 square kilometres. The 30 bed department was staffed by one consultant, two registrars and two interns.

I chose Cape Town as my destination for several reasons. South Africa is famed as a training ground for would-be orthopaedic surgeons, and I felt it would provide an ideal opportunity for me to sample the career in depth in order to aid important future career decisions. I hoped that Cape Town would provide pathology that is unusual in the UK whilst having the facilities to mean any skills learned during the trip would be transferable to work at home.

Furthermore, I have always been fascinated with South Africa's recent history – It is a young democracy at 19 years old and has a past which is littered with political and social unrest. Despite this, South Africa today is projected to the world as "The Rainbow Nation" – a name which stirs up tranquil images of people of all kinds living together in harmony. I was eager to explore this new image, and to delve into the infamous past in any way that I could.

Choosing a hospital was fairly difficult – Cape Town is a popular destination and the tertiary centre quickly filled its places and of the secondary centres, Somerset was the most accommodating.

### The Experience

My experience in Cape Town surpassed expectations. My main professional aim was to gain as much clinical exposure to orthopaedics as possi-

ble in the elective period and the department was very accommodating to this end. Each day began with a 7am ward round in the ED where overnight admissions were reviewed. This in itself was a great insight into the workings of a typical South African hospital – A&E was always busy, with beds full to capacity without fail and patients spilling into the corridors or onto the floor. This often meant the ED staff could not devote time to orthopaedic patients beyond what was needed to stabilise them. Many were left in a bed overnight with little assessment other than x-rays and almost no treatment of the injuries.

After ward rounds, time was split evenly between clinic and theatre. In clinic, I was given my own list of patients to see with little time pressure to ensure I was able to assess at a pace that suited me. After assessments, cases could be presented to any of the three senior team members and management discussed. This was an extremely effective way to learn as it enabled me to quickly pick up skills in history taking, such as excluding important negative symptoms for a multitude of presenting complaints, and examination, without losing support from the team. This arrangement also meant the team were greatly appreciative of my work – the department was greatly under-staffed and clinics would often run over by several hours. I felt like a valuable member of the team and grew to make many friends during my time there.

Surgical work was equally rewarding. Unlike the UK, the vast majority of cases were traumatic injuries and this meant great exposure to the side of the speciality that I had not experienced during my placement in the UK. I was an invaluable aid to the surgeons – assisting in every list I attended. Again, the staff were most grateful for my help, as this allowed a registrar to complete work away from theatres and reduce the workload on the team. Much of the surgical work involved patients who were HIV positive, which was a new and useful learning experience for me.

## Summary

I would highly recommend Cape Town, and in particular New Somerset Hospital, as a destination for students who want to further their experience in orthopaedic trauma. If you are prepared to put the hours in you will take a huge amount from your trip.

I would recommend organising your elective as soon as possible to avoid all the elective places being taken. However, if you are told department is full they will more than

likely accommodate you if you are persistent.

The best way to communicate by far is using Skype or a similar technology for cheap overseas calls. After struggling for weeks with email it took me two phone calls to organise the entire trip.

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Figure 1. Outside Ngwelezane Hospital, Empangeni

## NGWELEZANE HOSPITAL, EMPANGENI, KWAZULU-NATAL, SOUTH AFRICA

ALEXANDER AQUILINA  
FY2 SEVERN DEANERY

**Alexander Aquilina was a recipient of the BOTA Elective Prize and put the funding to good use with a trip to KwaZulu-Natal, South Africa**

### Introduction

Looking back at my time in medical school, I have no doubts in stating that my elective was the highlight. I learnt practical skills, teamwork and clinical experience, but beyond all else it was the most enjoyable period of learning I have had.

Ngwelezane Hospital, Empangeni, is a tertiary referral trauma centre in KwaZulu-Natal, South Africa where I spent my 2-month elective placement in the department of trauma and orthopaedic surgery. Ngwelezane is a government district hospital of 550 beds just outside the small town of Empangeni, near Durban. The hospital takes referrals from 13 peripheral hospitals over an area of 36396 sq. km, and a population equivalent to half that of Scotland. The ZwaZulu-Natal province borders with Mozambique and Swaziland to the North and Lesotho to the West creating a considerable amount of health migration stretching the re-

sources of government funded hospitals in the province. Consequently there was never a lack of patients or opportunities to get stuck into the thick of it.

### The Experience

There is a heavy trauma workload in this area mainly coming from high rates of road traffic accidents, gunshots and bush knife injuries along with a significant number of work related injuries. The hospital is equipped with two orthopaedic theatres staffed by 2 permanent consultants, 5 medical officers/registrars, and 5 interns/house officers. The department utilises a morning trauma-meeting model for daily handover and incorporates weekly teaching and research time into the timetable providing plenty of opportunity for me to get stuck in. The head of department Dr. Rollinson is a UK trained consultant and many of the practices are based on UK guidelines



**Figures 2,3.** Entrance to the orthopaedic wards at Ngwelezane Hospital, Empangeni

making knowledge gained very applicable back home.

I chose this placement, as I wanted to become immersed into surgical practice in a developing world setting. I aimed to develop my basic surgical skills, gain experience in the management of trauma, observe and participate in orthopaedic procedures and contribute to one of the several research projects running in the hospital. But I gained the most from just to going and spending time on the ground, in theatre, clinics and watching the magic happen. The Elective Experience When myself and two other elective students arrived in the department the learning curve was steep. After a 7 am trauma meeting we were speedily shown around the hospital by Dr. Rollinson and then deposited in wards F and G, the male and female orthopaedic wards respectively. We weren't told, but quickly realised,

that because Dr. Rollinson knew that our elective placement was after our final exams he expected us to become interns in his department. As the departmental workload far exceeded the level of staffing our arrival was used as an opportunity to give the current interns forced annual leave whilst leaving us to staff the wards.

The wards consisted of 50-60 orthopaedic beds in each filled with patients suffering trauma or bone and joint sepsis. The three of us rotated around the two orthopaedic wards and one of us went to the emergency department. Our day in orthopaedics consisted of a morning trauma meeting after which we hit the wards. As the interns were off on holiday we had the daunting task of completing an often 50-60 patient ward round mainly on our own each morning. This taught us the ability to rapidly spot problems, act on them and treat



**Figures 4,5.** Writing an operation note and walking between the wards at Ngwelezane Hospital, Empangeni



**Figure 6.** A rhino spotted on safari

things quickly with the resources available. A time that particularly stands out for me, was seeing a tetraplegic patient following a road traffic accident, but also having underlying spinal TB on top of HIV. He was acutely septic and unstable. This was the first time I had had to deal with an 'ill' patient by myself and it was both scary and also exhilarating as I tried to find the source of his sepsis while also trying to resuscitate him. One thing I would recommend be-

fore going to a place like South Africa is, given the opportunity, to book onto an Advanced Life Support (ALS) course. This would be very useful and give you the confidence to act quickly when confronted with very 'sick' people. After our ward rounds each day we would split our time between theatre and the clinic. Both provided excellent learning opportunities. I particularly loved getting involved in theatre and the more enthusiastic we were the more we were able to do. By the end of my placement I felt confident incising and draining abscesses, closing wounds, placing drains and I had even plated a couple of distal radius fractures. After the team got to know us better they would regularly give us our own room in clinic an interpreter and let us get on with seeing our own patients, whilst trusting us to come and present anything we were unsure about how to manage. Time spent in the Emergency medicine unit (EMU) was also extremely useful in terms of developing practical skills. The department was staffed by a large number of British trainees taking a year out to gain experience and, consequently, practice mainly followed UK guidelines. There were opportunities to observe and then perform procedures that would not be expected until core trainee level in the UK. These included, placing central lines, chest drains, performing lumbar punctures, minor operative procedures, running resus calls amongst many others. I looked on my time in the EMU as a fantastic opportunity to learn how to suture. I sutured things from surgical wounds to facial lacerations. However it was after dark and during the numerous public holidays that the most was to be gained from the EMU. This is when the de-



**Figure 7.** Ward round at Ngwelezane Hospital,

partment comes to life getting swamped with traumatic injuries, often with patients lining up to get stitched up in the suture room.

However, approximately 30% of the population in this area is HIV positive and although the risk to healthcare professionals is minimal, the daunting prospect of a needle stick injury and a month long course of anti-retrovirals ensures that you remain disciplined with universal precautions and 'no-touch' surgical technique at all times.

The responsibility we were given created an incredible learning experience helping us develop skills that we will take long into our future careers, however it also presented a double edged sword. It meant that for the first time we actually had patients on the wards relying on us and if we didn't see or arrange cover in an understaffed department they would not be seen and suffer consequently. This meant that we had to take on a mature attitude toward asking for leave to go and explore the fantastic countryside and make the most out of being in one of the most beautiful spots in the world.

## Summary

The appeal of an elective in South Africa goes beyond the fantastic clinical experience available. I shared a three-bedroom house in a small idyllic town about 30mins drive south of Empangeni called Mtunzini on the coast. Here there is a large community of medics from the hospital who were extremely welcoming and we were never lacking in evening activities to get involved in, including touch rugby twice a week on the beach. We were driving distance from the oldest game reserve in South Africa Hluhluwe and Imfolozi where you would be hard pushed not to see a Rhino or two! Or the stunningly beautiful Drakensburg mountains to the southwest. Mozambique is a three hour drive up the coast and on the way you can stop off at amazing nature and beach reserves. All in all we had an incredible time! N'Kosi Sikeleli Africa (God bless Africa)

Thank you to BOTA for helping me fund such a fantastic elective.

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Figure 1. View of Mount Meru across Arusha

## MOUNT MERU HOSPITAL, ARUSHA, TANZANIA

ALEXANDER YOUNG  
ST3 SEVERN DEANERY

**Alexander Young looks back on his time spent during a vacation period at Mount Meru Hospital in Arusha Tanzania**

### Introduction

Mount Meru is a 450-bed hospital located in Arusha in Northern Tanzania. I was fortunate enough to spend a vacation period working in the surgical department at the hospital.

The surgical department consisted of four surgical wards and a major and a minor operating theatre. The theatres were a stark contrast to what I had experienced in Western surgical units with only one anaesthetic machine and one autoclave with which to sterilise the surgical equipment. Despite the lack of equipment the surgeons were more than capable and were keen to teach in English during operations and on ward rounds. The surgical team consisted of the Chief of Surgery and five trainees at various stages of their training. All members of the surgical department were very welcoming and friendly and were keen to hear about how things differed in Europe.

### The Experience

A typical day began with the walk in to the hospital from where I was staying through the town of Arusha. Local vendors and street sellers were always keen to try and sell things to the 'Mizungos' (white people) and would often follow you with their wares in the hope that you might make a purchase. Having made it to the hospital the day usually began with a ward round or theatre list.

Ward rounds were conducted in a mixture of Swahili and English. Patients had little privacy on the wards with no dividing curtain between beds and twenty to thirty beds crammed into each ward. Infection control was an issue with no hand-washing facilities or alcohol gel and it was not uncommon to see birds flying around the ward. Wards were divided into male, female, paediatric and septic. The septic ward mainly consisted of burns patients. Burns is a major problem in Af-



**Figure 2.** Outside Mount Meru Hospital

rica with many women and children living with open fires used for cooking. There is also still an element of mob-law with fires and scolding oil used to punish crimes. Without the facilities and technology to prevent infection and replace fluids burn injuries are invariably life threatening and management usually comprises of covering the wound and basic fluid support.

Together with burns, trauma made up the vast majority of surgical inpatient cases. Causes of trauma ranged from motorcycle and road traffic accidents to gunshot wounds and developmental conditions such as osteogenesis imperfecta.

During my time on the surgical ward a riot had broken out in a neighbouring town and several patients had been admitted with shotgun wounds and injuries caused by explosive devices.

The mainstay of fracture fixation on the wards was traction. Traction consisted of bags of rocks attached by string to the legs of the patients and hung over the end of the bed. This method was effective but patients were bed-bound for several weeks and traction often had to be adjusted each morning due to patient movement.

Due to the living conditions of some of the patients discharge from the wards was a problem. There were no occupational therapists in the hospital and one patient, who was paralysed following a mining accident, had been in the hospital for over two years as he could not have received adequate care had he returned to his village.

The majority of my time at Mount Meru was spent in the operating theatres. Surgeons were very much general trauma surgeons performing emergency hernia repairs, open re-

duction internal fixation for fractures, ectopic pregnancy and plastic surgery procedures.

Theatres were not sterile by Western standards but doctors and nurses did their best to maintain a sterile environment. Lack of resources also meant that equipment such as suture material was often of poor quality and it was not uncommon for sutures to break during wound closing. Muscle relaxant used was also of poor quality and it was common for the surgeons to have to search for structures such as the appendix while operating as the bowels had been allowed to move without adequate relaxant. Fluid management was also a major concern as there was no

blood available for transfusion and only saline for resuscitation.

Patients had to pay for operations and there were several occasions when a patient had not provided adequate funds and their operation had to be postponed. This was difficult to



**Figure 3.** On the Orthopaedic Ward Mount Meru



**Figure 4.** Walking to the paediatric ward at Mount Meru

watch and certainly made me appreciate healthcare provided by the NHS.

In the face of the obvious lack of resources fracture reduction, fixation, casting and intramedullary nailing was performed with excellent results. It was not just trauma that was performed, however, the Ponseti method for treating club foot was put to good use with long queues of patients every Tuesday and Thursday mornings waiting for their serial castings in a small clinic room next to the main theatres.

Despite the obvious contrast in equipment and funding to surgery in Europe the competency and training of the surgeons themselves was of a very high standard. The team were knowledgeable of procedures and complications and were able to swiftly deal with problems caused by poor equipment or lack of resources.

## Summary

Working at Mount Meru was one of the most challenging and rewarding experiences of my surgical career. I was able to learn much from the surgical department and have certainly captured many of the principles and difficulties of surgery in a developing country.

I would highly recommend this placement for both elective students and for junior trainees looking for short vacation periods.

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# F O S S C 2 0 1 4

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ROYAL SOCIETY OF MEDICINE LONDON

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# FUTURE ORTHOPAEDIC SURGEONS' CONFERENCE 2013 **ABSTRACTS**

7-8th December 2013 at The Royal Society of Medicine

## How Do Engineered Tissue Scaffolds Effect Differentiation On Mesenchymal STem Cells?

D.Rowland, T. Aquilina, A. Klein, O. Hakimi, S. Snelling, P. Mouthuy and A.J. Carr.

NIHR Biomedical Research Unit, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, UK.

**BACKGROUND** Bioengineered tissue scaffolds used in combination with cells and/or growth factors hold a great promise for tissue repair. The aim of this project was to determine how the chemical and physical properties of engineered scaffolds affect the differentiation of mesenchymal stem cells (MSCs) into osteogenic, chondrogenic and adipogenic cell lines. Cell growth on aligned and randomly orientated electrospun scaffolds of polydioxanone (PDO) and poly-lactic-glycolic acid (PLGA) were compared.

**METHOD** Electrospinning was used to create the nanofibrous scaffolds. MSCs were seeded on to scaffolds and cultured for 14 days. The cells were induced down one of the three differentiation lines by media supported with appropriate growth factors. This was compared to a non-induced culture, as well as a non-material comparator. To assess cell viability, Alamar blue assays were carried out at days 1,7 and 14. Gene expression was determined using RT-PCR. Cells on the scaffolds were visualized using actin phalloidin and DAPI staining.

**RESULTS** The growth of adipogenic cell lines was facilitated to the greatest extent by aligned PLGA, chondrogenic cell lines by aligned PLGA and osteogenic cell lines by aligned PDO. Microscopy showed that cells grow in line with scaffold morphology.

**CONCLUSION** Our data suggests that MSCs grown on electrospun scaffolds can be differentiated into three lineages. Growth and differentiation were affected to some extent by both scaffold chemistry and morphology. An engineered tissue scaffold, selected on the basis of such

parameters, could provide great therapeutic potential for tissue specific grafts in orthopaedic surgery.

## Measuring Tenocyte Cell Profile Change In Polyethylene Glycol Rod-Based Hydrogel Composites in a Range of Applied Strains

Lucy Glasgow, 4th year medical student

St Bartholomews and the Royal London School of Medicine and Dentistry

**Background** Tendons are fibrous connective tissues bands which transfer force from muscular contraction to bones enabling joint motion. Tendons only receive negligible vascular supply and hence their regenerative capacity is minimal. With tendons operating under such great tensile and compressive forces surgical repair often compromises the functionality and capacity of tendon for transferring force. While research has focussed on the global response of tendon to mechanical loading, little has investigated the individual responses of tenocytes.

**Method** The study aimed to characterise tenocyte response to tensile and shear forces by measuring tenocyte cell deformation under axial loading. This was carried out by seeding 20%, 40% and 60% polyethylene glycol rods with tenocytes and then enclosing these within 20% polyethylene glycol (PEG) composites. By varying the concentration of PEG rods, the time rods are soaked in PEG hydrogel, and the applied strain, a relationship between mechanical loading and tenocyte deformation was determined.

**Results** Composites soaked for 10 minutes showed greatest cell extension on 20% PEG rods (then 40% and 60%). Tenocytes in 60 minute soak composites generally extended more than tenocytes on rods soaked for only 10. All deformation was parallel to the direction of loading and was found to be significantly more in composites fixed at 10% strain compared with those in samples fixed at 0% strain.

**Conclusions** This study demonstrated a robust relationship between axial loading and tenocyte deformation thus advo-

cating PEG rod hydrogel composites as a valuable material for the future research of tenocyte response. This model can now be applied to other scenarios introducing growth factors and other bioactive substances.

### **Pregnancy-Related Pubic Symphysis Diastasis And The Efficacy Of Surgical Intervention**

Abdullatif Aydin & Mohammed Husnain Iqbal (Medical Students)

Barts and The London School of Medicine and Dentistry, Queen Mary University of London, London, United Kingdom

**Background:** Pubic Symphysis Diastasis (PSD) is a rare condition, which can occur during pregnancy or in the post-natal period, where the inter-pubic gap abnormally increases to above 10 mm. A variety of different orthopaedic interventions have been attempted in the literature. This study aims to review the efficacy of current interventional methods in orthopaedic surgery for pubic symphysis diastasis.

**Methods:** A broad search of the current literature was performed using MEDLINE and EMBASE up to 2013. The search terms included a combination of pubic symphysis diastasis, orthopaedic surgery and fixation.

**Results:** A total of 10 studies were identified with a total of 693 patients who were intervened. 207 patients were mentioned to also have sacroiliac joint involvement. Various different fixation techniques were employed with the use of locking and non-locking plates, dynamic compression plates and dynamic endobuttons, out of which the latter was seen to be the most promising. However there were complications associated with surgery. 34% of surgery resulted in failure of anterior fixation and 3% of total interventions lead to loss of reduction and recurrence of PSD. Furthermore, 3% of patients were noted to have post-surgical deep infections. 4-hole plates had the lowest failure rate of 13%, compared to 2-hole plates (33%), 6-hole plates (48.5%) and >6-hole plates (57.6%).

**Conclusions:** PSD is a serious condition which severely affects patients and management remains very challenging. Despite different interventions, there is no definitive solution for many patients as all studies have limited results.

### **The Implementation of the Enhanced Recovery**

### **Programme for the Fractured Neck of Femur Pathway: A single-centre experience**

Farooq, Assad; Farooq, Dilawar; Simmonds, Alan; Moiz, Malik

Department of Trauma and Orthopaedics, Heatherwood and Wexham Park NHS Foundation Trust

**Background** Fractured Neck of Femur (NOF) admissions account for the majority of the emergency Orthopaedic admissions. Trusts continue to strive to streamline the assessment and treatment of patients with NOF fractures. The Enhanced Recovery Programme (ERP) is about improving patient outcomes (decreased length of stay, increased throughput of surgical cases) and speeding up patient's recovery after surgery. There are four elements; effective pre-operative assessment, reducing physical stress of the operation, structured peri- and post-operative management and early mobilisation.

#### **Methods**

- We implemented the ERP at our Trust in December 2012 and integrated its methodology into a new Integrated-Care Pathway for the NOF patient .
- We calculated our data during the 6 months before and after the ERP.
- We calculated the average length of stay (LOS), complication rates and operative outcomes for each patient. Also, we calculated the overall surgical throughput and the cost of implementation of the ERP, and held focus groups to get clinician feedback about the new system.

#### **Results**

- The average LOS decreased from 16.3 days to 12.1 days ( $p < 0.05$ )
- We increased our theatre capacity by 18%
- There was no significant change in the number and type of complication
- Clinicians and allied healthcare professionals provided positive feedback about the ERP

**Conclusion** The ERP is an effective quality and service improvement tool. It provides a holistic approach to improve the perioperative health of patients whereby increasing postoperative outcomes; both operative and non-operative. We will

assess its suitability in patients with other fracture pathways.

### **Audit of Orthopaedic operations performed in a regional referral hospital in south-western Uganda**

A T Schade, 4th year medical student

University of Bristol,

**Background:** Mbarara regional referral hospital provides care for 300,000 people of south-western Uganda. Many of the orthopaedic cases are dealt with by bone setters (traditional doctors) in the villages and only a small proportion of cases are dealt within hospital.

**Methods:** Orthopaedic operations performed in theatre between 05/06/13-17/07/13 were audited using the log-book in theatres. All orthopaedic operations were identified and the following information were recorded: age, sex, type of anaesthesia, diagnosis and type of operation. Possible reasons were suggested for this pattern of orthopaedic cases.

**Results:** 30 patients were recorded with a mean age of 32.1 years old (11-80). 47% were females and 53% were male. 43% were done under general anaesthetic, 40% were done under spinal anaesthetic and 17% were done under local anaesthetic. Cases included: 47% (14) fractures (6 femoral, 4 humeral and 4 tibial and/or Fibular), 30% (9) cases of osteomyelitis, 2 dislocations, 5 other. Operations included: 11 ORIFs, 9 sequestrectomies, 2 excisions, 2 closed reductions, 6 other.

**Conclusions:** Fractures, all upper or lower limb, were the most common presentation probably due to the high rates of trauma in Africa. Osteomyelitis is a large burden of the healthcare system in low-income countries, especially in the young population (mean age = 14.5 years old). This could be due to factors including high rates of infection and late presentation in hospital.

### **Fragility Fractures and DEXA Scanning**

Aaron Kler, 4th Year Medical Student

Leeds Medical School

**Background:** Osteoporotic fragility fractures are associated with significant morbidity for patients and prevention of future fractures is critical to improve the patient's quality

of life as well as saving on the surgical repair costs of subsequent hip fractures.

The NICE guidance (CG146) and the orthopaedic blue book provide guidance on the risk assessment tools and indications in identifying vulnerable patients at risk of fractures. A key aspect is the utility of DEXA scanning to diagnose and treat osteoporosis earlier.

The aim of this audit was to assess if patients with simple fractures were referred for DEXA scanning and assessed for future fractures based on the NICE guidance.

**Method:** The audit data was collected from fracture clinics in at Leeds General Infirmary (LGI). Patients were included if they met the following 3 criteria: patients with new fractures, patients with low energy fractures and patients over 55 years. All patients were then investigated to ascertain whether the action plan as detailed in NICE CG146 guideline was being followed.

**Results:** Twenty-one patients met the criteria, 15 were female, age range 57-96 years. The type of fracture varied across the subjects. Of the 21 patients, only 3 patients (14%) were receiving osteoporotic medication and 1 patient (5%) had a DEXA scan (done privately).

**Conclusion:** The NICE guideline was introduced in 2012 with a view that hospitals implement the guidance. This preliminary audit has identified that NICE CG146 is not fully implemented in the LGI.

### **BMI, Anthropometric Body Fat Measures and Upper Limb Length Asymmetries in Female Adolescent Idiopathic Scoliosis Patients.**

Christopher William Metcalfe- 5th Year Medical Student

University of Liverpool.

**Background:** The pathogenesis of Adolescent Idiopathic Scoliosis (AIS) is complex and not fully understood; however leptin has a hypothesised role following observations of decreased BMI in AIS sufferers. This study looks at upper limb length asymmetries, BMI and anthropometric body fat measures in an unstudied population to assess whether or not adiposity correlates with the magnitude of upper limb asymmetry.

**Methods:** Anthropometric data from 150 female AIS patients with right thoracic curves was compiled from outpatient clinics in Merseyside. Female control data was available from a

school collection. Both populations were stratified into age groups for comparison and all statistical analysis was carried out using SPSS Statistics©.

**Results:** Right upper arm length was found to be greater than left in the scoliosis group ( $p < 0.001$ ) whilst no significant difference was observed between forearms. The control group showed no statistically significant asymmetry. BMI and anthropometric measures of body fat were found to be lower in the scoliosis group compared to controls, with significance varying between age groups. Low measures of adiposity did not correlate with the magnitude of limb length asymmetries.

**Conclusion:** This study demonstrated isolated proximal upper limb asymmetry and reduced BMI in scoliosis patients compared to controls in a previously unstudied population. It has added to the current evidence by demonstrating that anthropometric body fat measures are also low however measures of adiposity do not correlate with the magnitude of asymmetry. Findings of decreased total body adiposity tie in with the proposed role of leptin in the pathogenesis of AIS.

### **Preoperative Pain Catastrophization Predicts Poorer Function, Higher Pain And Analgesia Use During Primary Hip Arthroplasty**

Farooq, Dilawar; Farooq, Assad; Chaudhury, Salm

Faculty of Medicine, University College London

**Background** Hip arthroplasty is one of the commonest surgical procedures in UK. Postoperative pain in orthopaedic operations is associated with reduced patient satisfaction, delayed discharge and increased costs.

The aim of this study was to investigate the short-term association between preoperative psychological variables (pain catastrophising, depression and anxiety) and postoperative pain in patients undergoing primary elective hip arthroplasties.

#### **Methods**

- 80 patients completed four validated questionnaires Oxford-Hip Score, Pain-Catastrophising Scale (PCS), Hospital-Anxiety-and-Depression Scale (HADS) and Verbal-Rating Scale (VRS) for pain intensity preoperatively and at 48 hours postoperatively.

- Data on demographic, operative, and clinical characteristics were obtained from medical records.
- Key outcome measures were pain intensity and analgesia consumption at 48 hours postoperatively.

#### **Results**

- 26 patients exhibited PC ( $PCS > 20$ )
- Scores on the anxiety, depression, and PCSs were not significantly different between the pre- and postoperative period.
- Patients reported a higher level of pain intensity postoperatively ( $P < 0.001$ ).
- In the adjusted multiple regression analysis, postoperative pain intensity was predicted by a higher level of preoperative pain intensity (dichotomized above median;  $b = 2.15$ , 95% confidence interval [CI]: 0.37–3.92) and a higher score on the preoperative PCS (dichotomized above median;  $b = 1.79$ , 95% CI: 0.67–3.13).

**Conclusions** Pain catastrophising is an important predictor of postoperative pain intensity in patients undergoing hip arthroplasties, independent of other psychological variables or the preoperative level of pain. This knowledge can help us to accurately profile patients and better understand their exact analgesia requirement whereby improving perioperative pain management.

### **Audit of undergraduate education on orthopaedics in general practice**

Emma Derby Year 5 (intercalating) medical student

Peninsula College of Medicine and Dentistry

**Background:** Orthopaedic cases represent a large proportion of the general practitioner (GP) workload, and with an aging population this is likely to increase. There is however little standardization of undergraduate medical education in orthopaedics and students and GPs alike report it as an area they feel unconfident in. This audit aimed to look at the current knowledge of fourth year students at Peninsula College of Medicine and Dentistry (PCMD) to determine if this was of a sufficient standard and to investigate ways to improve this.

**Methods:** A questionnaire was sent to all fourth year students at PCMD assessing current and perceived knowledge of common presentations in general practice. Students were then

invited to attend teaching sessions and to receive an information booklet. Their knowledge was then re-audited using a second questionnaire 2 weeks later.

**Results:** The initial questionnaire was completed by 46 students. Results showed an average score of 40% in direct questioning, and an average score of 4.6/10 for perceived confidence with different common conditions. After attending teaching sessions, direct questioning scores rose to 83%, and a rise was also seen in students who received the booklet alone to 69%.

**Conclusion:** These results suggest current knowledge is not at a sufficient standard and there is a role for additional teaching sessions and teaching materials in this area of orthopaedics to improve knowledge and allow students more confidence.

### **The Relationship Between Perioperative Blood Loss and BMI to Recovery Following Total Knee and Hip Arthroplasty**

Gareth Turnbull,

Edinburgh Royal Infirmary

**Background:** Total hip arthroplasty (THA) and total knee arthroplasty (TKA) are major orthopaedic operations with associated blood losses. The aim of this study was to examine the average drop in haemoglobin (Hb) in patients undergoing primary THA or TKA, and to examine how this impacted upon length of stay (LOS) in hospital.

**Methods:** Patients who had recently undergone primary THA or TKA were identified from the local arthroplasty database. Electronic and operative records were used to ascertain parameters including pre-operative Hb and lowest post-operative Hb. Results were analysed using PASW.

**Results:** 105 patients of average age 70 years were identified, with 104 undergoing spinal anaesthesia. 57.1 % of patients were female and 42.9% male, and 53 THAs and 52 TKAs were included. Average decrease in Hb post-operatively was 2.61 g/dl (S.D 1.28) for THAs and 2.20 g/dl (S.D 1.23) for TKAs with no significant difference found ( $P=0.099$ ). Male patients had a significantly higher drop in Hb compared to females ( $P<0.0001$ ), although female patients had a significantly lower pre-operative Hb ( $P<0.0001$ ) and only 1.9 % of patients were transfused. LOS positively correlated with decrease in Hb ( $r=0.33$ ,  $p=0.001$ ) and BMI ( $p=0.001$ ,  $r=0.34$ ). Average length of

stay was 4.8 days (S.D 2.52) for THAs and 5.7 days (S.D 3.88) for TKAs.

**Conclusions:** Low overall transfusion rates and LOS were found. Although male patients experienced significantly larger drops in Hb than females, this did not translate into increased transfusion rates or LOS. Patients with higher BMIs and those experiencing larger drops in Hb had increased LOS.

### **Orthopaedic referral rates: Are patients being referred to secondary orthopaedic care appropriately?**

Joshua Balogun-Lynch, Thomas Kenney

Northwick Park Hospital

**Background** Inappropriate referrals to secondary care pose a huge cost to the National Health Service. The aim of this study was to investigate whether National Institute of Clinical Excellence (NICE) guidelines for managing hip and knee osteoarthritis before referral to secondary care are being followed. The surgical conversion rates of referrals were also investigated.

**Methods** In this retrospective cohort study, the medical records of 100 randomly selected patients aged >18, referred to secondary orthopaedic care between September 2011 – March 2012 were reviewed. Details of presenting complaint, treatment received by their general practitioner and subsequent treatment from secondary orthopaedic care were recorded.

**Results** After referral to secondary care 57% ( $n=57$ ) of patients had a surgical procedure performed. Only 43% ( $n=6$ ) of patients with hip or knee osteoarthritis were offered one NICE core treatment before referral to orthopaedic secondary care. 86% ( $n=12$ ) of patients with hip or knee osteoarthritis had surgery or were recommended surgery after referral to orthopaedics. General orthopaedic patients referred for upper limb conditions had the highest surgery conversion rate 71% ( $n=17$ ). The lowest surgical conversion rate was for patients referred due to spine related conditions with only 28% ( $n=5$ ) undergoing surgery.

**Conclusion** Patients with hip or knee osteoarthritis are being referred appropriately despite the majority not receiving at least one of the NICE core treatments before referral to secondary care. Patients with spinal related conditions may benefit from a prolonged regime of conservative treatment such as

physiotherapy and medical treatment before referral to secondary orthopaedic care.

### The importance of completeness of post-operative care instructions in operative notes following Orthopaedic Trauma surgery

Kandi Ejiofor, FY1,

Guy's and St Thomas' Hospital

**Background:** The operative note is the only record of an operation and documents the continued plan for a patient after surgery. It is the principal means of communication between differing health professionals and when comprehensively written, the post-operative care instructions can maximize the success of a patients recovery.

The Good Surgical Practice guide details points that should be included on all operative notes. However, it merely states that post-operative care instructions should be included(1) without further divulsion into specific points.

**Methods:** This audit was carried out at St Thomas' Hospital in the Orthopaedic department on adult trauma cases between August - September 2013.

Specific post-operative care instructions were decided based on agreement between differing health professionals involved in the care of an Orthopaedic patient (i.e. surgeons, doctors, pharmacists, nurses and physiotherapists).

The quality of post-operative documentation was recorded based on these predetermined data points, a post-operative proforma was then implemented and re-audited to see if there was any improvement.

**Results:** 62 post-operative notes were reviewed in the entire cycle. Of the 28 notes reviewed initially the mean data point entry was 40%, this increased to 80% with the inclusion of the proforma.

**Conclusion:** The post-operative care instructions are the most important part of the operative note as it has significant implications in the ongoing management of patients after surgery. This audit shows that inclusion of the proforma had a clear improvement in the quality of documentation of post-operative care instructions and it is our suggestion that this be utilized for all Orthopaedic cases.

### Greater patient age and longer duration of surgery are associated with higher tip-apex distance in dynamic hip screw fixation

R. Kabariti, P. Tarassoli, T. Yousri, S. Mitchell.

Bristol Royal Infirmary

**Background** Hip fractures are frequent in the elderly population and with rising life expectancy they will represent an ever-increasing proportion of the workload of orthopaedic clinicians [1]. The dynamic (or sliding) hip screw (DHS) is a popular choice for internal fixation. Outcomes following DHS fixation are strongly correlated with the position of the screw in the femoral head, known as the tip-apex distance (TAD) [2]. A technically demanding procedure, some studies have suggested a correlation between the experience of surgeon and TAD [3,4].

Objectives were to investigate the relationship between TAD and the duration of the surgery. Additional patient factors considered included age, gender, location and type of the fracture.

**Methods:** We retrospectively reviewed the radiographs and operative notes of patients who had undergone DHS fixation at our institution. Measurements for TAD were taken from the AP and lateral radiographs by two independent observers. A total of 101 patients were included.

**Results:** 100 patients were included in the study. Average TAD was 24.7mm. A higher TAD distance was associated with longer duration of surgery ( $r=0.23$ ) and higher patient age ( $r=0.28$ ). Average TAD was similar for surgeons of different grades. TAD did not increase with increasingly unstable fracture configurations (Evans I to V).

**Conclusion:** A longer duration of surgery and higher patient age were associated with a higher TAD. This is first study to report such correlations. Possible reasons for this may be that a longer duration of surgery represents a more technically demanding procedure in which higher TADs are accepted. Higher patient age may represent the willingness of the operating surgeon to accept a higher TAD because of the perceived lower functional requirements.

## RETROSPECTIVE STUDY OF SEASONAL VARIATIONS IN HIP FRACTURES

M. Ding, R. Prawiradiradja, E. Chew, J. J. Chan, P H Ding

Heart of England NHS Trust

**Background:** There is varying evidence in literature investigating seasonal differences in admission, mortality rates and length of stay due to hip fractures. Some studies showed significant increase in the incidence and mortality rates during winter.

Our aim was to investigate whether there was an increase in admission and mortality rates for hip fractures in the West Midlands, England during winter.

**Methods:** A retrospective observational study was conducted on all admissions aged >65 for hip fractures in summer (21st June-21st September) and winter (21st December-21st March) 2011 and 2012 at a DGH. Data was obtained from electronic patient records. Fisher's exact test was performed for data analysis and Student's t-test for length of stay. Patients were followed-up for 90 days post-discharge to determine mortality rates.

**Results:** 357 patients were included in the study, 73% (n=260) were female and 27% (n=97) male. Admissions were (n=190) in winter versus (n=167) in summer (p=0.14, 95% CI=0.11-1.05). Mean length of stay was 17 days versus 18 days (p=0.43). Mortality rates were 10.5% versus 12.6% (p=0.62, 95% CI=0.47-1.49). 30 day post-discharge mortality was 2.2% (n=8), 60 day 6.2% (n=22), 90 day 8.4% (n=30).

**Conclusion:** There was no significant difference in admissions, mortality rates or length of stay between winter and summer months. Incidence and mortality rates from hip fractures remain high regardless of the time of year, as does post-discharge mortality.

## Anatomic considerations of lateral mass screw placement in the posterior cervical spine

Matthew Gittus (5th year medical student), David Roberts (Professor of Anatomy)

University of Leeds, Anatomy Department

**Background:** Lateral mass screw fixation is indicated for the realignment and stabilisation of an unstable cervical spine. Insertion is considered a difficult procedure due to

the proximal relationship to vulnerable anatomical structures. There are a wide variety of techniques which aim to maximise stabilisation and minimise risks.

Investigation of the anatomy at the posterior cervical region in relation to lateral mass screw insertion C1-6.

**Study design:** Three dissections were performed to demonstrate the anatomy of the posterior cervical region relating to insertion or anatomical structures at risk.

**Results:** Most at risk anatomical structures were not immediately visible at all levels through the textbook posterior approach to the cervical spine including the vertebral artery, spinal cord and nerve roots. Two structures were largely seen to obstruct the atlanto-axial facet joint at the screw insertion site: second dorsal cervical and greater occipital nerves. In addition, there was an extensive suboccipital cavernous sinus at the posterior cervical region. This study also illustrated the poorly defined nature of the musculature in the posterior cervical region.

**Conclusion:** There are multiple anatomical considerations required when inserting lateral mass screws with both the entry and exit sites plus screw axis critical to preventing injury. Damage to these vulnerable structures may result in severe complications. Insertion technique analysis demonstrated the most advantageous trajectory given the anatomical findings. It is important to note the suboccipital cavernous sinus ramifying across the insertion point of multiple screws. In the literature there has been largely no discussion of this structure which could represent a potentially significant complication.

## Compliance with NICE guidance for neck of femur fractures- simple interventions are not sufficient

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**Introduction:** The National Institute of Health and Clinical Excellence (NICE) issued guidelines in 2011 for the management of hip fractures in adults.[1] Two main standards were derived from this guidance, all patients should undergo surgery within 48 hours of admission and that a proven femoral stem design should be used in all patients

**Methods:** A retrospective analysis of patients admitted for a hip hemiarthroplasty following a neck of femur (NOF) fracture was conducted. Initial audit over a 4-month period identified 34 patients of which 31 case-notes were retrievable. A repeat

audit over 4 months identified 18 patients with 17 case-notes available. Intervention took the form of increasing departmental awareness at local meetings and an admission proforma to enable early identification of co-morbidities. Chi-squared analysis was used for non-parametric data values.

**Results:** Initially, 68% of patients had surgery within 48 hours of admission to hospital the need for medical review (80%) being the main reason for delay. In only 11% of patients was an Exeter stem utilised, an Austin Moore or Thompson being used in the remainder.

Intervention failed to affect change with no significant difference in the percentage of patients undergoing surgery within 48 hours ( $p=0.44$ , 95% CI), or the degree with which proven femoral stem designs were utilised ( $p=0.14$ , 95% CI).

**Conclusions:** Previous reports have promoted simple measures such as increasing departmental awareness and structure proformas.[2] We demonstrate failure of such measures and would instead suggest alternative measures such as increasing number of trauma lists [3] as well availability of consultant trauma surgeons

### **Analysis of orthopaedic post-operative instructions: a need to extend the current operative note guidelines?**

Nathan Edwards, Alicia Dimech, Gabriel Galea

Mater Dei Hospital, Malta

**Background:** 'Post-operative instructions' facilitate continuity of care within different clinical settings and is one of the 15 criteria identified by the Royal College of Surgeons of England in 'Good Surgical Practice' to be included in operative notes. The aim of this audit was to assess the quality of post-operative instructions and identify differences between elective and trauma cases at Mater Dei Hospital, Malta.

**Method:** A pilot study identified the most important sub-criteria to be mentioned in post-operative instructions, and included IV fluids, parameter charting, analgesia, antibiotics, DVT prophylaxis, mobilisation and post-operative bloods. 25 elective and 25 trauma orthopaedic operative notes were analysed, and the number of post-operative instruction sub-criteria per case was recorded. Data was analysed using the Chi-Squared Test and Fisher's Exact

Test where appropriate. Values were presented as mean + 1.96\*SEM.

**Results:** All sub-criteria were statistically different from the standard of 100% documentation ( $p < 0.05$ ). Post-operative antibiotics and IV fluids were documented with the highest frequency (68 + 13%) and lowest frequency (14 + 10%), respectively. Post-operative bloods and IV fluids were documented at a higher frequency in elective when compared to trauma cases ( $p < 0.05$ ).

**Conclusion:** Results identify overall poor documentation of post-operative instructions. This potentially jeopardises patient recovery and may have serious medico-legal implications for the surgeon if mistakes occur. We suggest incorporating post-operative instruction sub-criteria into the operative note template to better facilitate care between health professionals.

### **The epidemiology of fractures in London: A trauma centre experience**

Nithish Jayakumar, Sinthuja Neminathan, Peter Bates, Nima Heidari

Barts and The London School of Medicine and Dentistry

**Introduction** The Royal London Hospital (RLH) is one of 4 designated Major Trauma Centres (MTC) in London, offering dedicated trauma care [1].

We aimed to retrospectively analyse the fracture caseload at the RLH over 14 months to establish the total number of Orthopaedic trauma patients treated, and to characterise these fractures by pattern of injury. No such epidemiological data exists on fracture patterns at a MTC.

**Methods:** All trauma admissions are logged on a database.

Data from January 2012-February 2013 (14 months) was analysed. Each trauma admission was categorised by the type of fracture and the number of fractures per patient. Patients were further sub-categorised within the individual fracture group.

#### **Results:**

1. 1309 patients were admitted with fractures in January 2012-February 2013.
2. 1916 fractures were suffered by all patients, with the majority (71.4%) admitted with a single fracture.

3. Tibial, forearm, and neck of femur fractures comprised almost half the caseload (47.5%).

4. 133 patients (10.2%) had pelvic and acetabular fractures.

5. 123 patients (9.4%) had open fractures, and the majority of these were tibia-fibula fractures. Road traffic accidents were the biggest cause of injury.

6. 188 patients (14.4%) were paediatric. Forearm fractures were the commonest type in this group.

**Conclusion:** Understanding trauma epidemiology is the first step in working towards a reduction in trauma burden. This epidemiological data will allow for analysis of the patterns and mechanisms of injury seen at a MTC, with a view to driving public-health and preventive measures.

### **Plastering techniques for junior orthopaedic doctors – is this an undervalued skill?**

Tshuma N, Najefi A

Whipps Cross Hospital, London

**Background:** Orthopaedic trainees and junior doctors are often expected to apply plaster in the emergency department. The level of knowledge required to ensure adequate placement of cast and advice to patients upon discharge is variable.

**Methods:** 11 orthopaedic doctors at senior house officer level were given a questionnaire inquiring about their knowledge on fracture splinting, 3-point moulding, advantages of casting and post-casting complications and advice. A one-hour tutorial and one-hour teaching session was subsequently arranged. The same doctors were given the same questionnaire after the intervention and the answers were compared.

**Results:** Of the 11 doctors, 5 were surgical trainees with an interest in orthopaedics, and 6 were doctors in trust posts. Before the training intervention, 40% of trainees and 33% of trust doctors were confident to independently apply plaster to wrist fractures. Of all the doctors, 45% understood the concept of 3-point moulding and 64% were able to name more than 2 complications of casting. Only 27% could suggest more than one piece of advice to casted patients upon discharge. After a short tutorial, 100% of trainee doctors and 80% of trust doctors felt confident to apply plaster to a independently. In addition, all of the doc-

tors understood 3-point moulding, and were more aware of complications of casting and post-discharge advice.

**Conclusions:** A short but effective tutorial on plaster casting and complications can have a positive impact on the knowledge and skill of all grades of orthopaedic doctors. This would have a positive impact on patient safety and satisfaction.

### **Soft tissue knee injuries: How can we improve management in the acute care setting?**

Nima Razii, Stuart Roy

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University Hospital of Wales, Cardiff

**Background:** Acute trauma to the knee often results in damage to soft tissue structures, and is a relatively frequent cause of attendance at accident and emergency (A&E) departments. Anatomical and biomechanical aspects are discussed, alongside recognizable mechanisms and presentations of injury. The relevant investigation(s) and effective management of such injuries is fundamental to minimizing complications and impact upon quality of life.

**Methods:** This study involved a retrospective case note review of 126 patients who presented to the A&E department at a large district general hospital over a one-year period (2010), with clinical examination or further investigation revealing a soft tissue knee injury, regardless of any other trauma.

**Results:** 92% of patients presenting to A&E were referred to trauma clinic, with a mean interval of 4.9 days. 57% required diagnostic imaging, with an average waiting time of 35.7 days for magnetic resonance imaging (MRI) and 9.8 days for an ultrasound scan. 13 patients waited longer than the Welsh Government's target time of 8 weeks for MRI scans; 4 of these were still waiting after 12 weeks. 33 patients required an operation and 61 were referred for physiotherapy.

**Conclusions:** We recognize the importance of selecting patients for imaging upon the basis of good clinical judgement; subsequent investigation results have a clinically and statistically significant effect on any decision to intervene surgically. Improvement is required regarding waiting times, particularly for MRI scans. A literature review considers the potential benefits of integrating physiotherapists with an extended scope of practice (ESP) into the A&E department.

## Rise (and Fall) of the MAMILs and its impact on the NHS

Oliver Adebayo, Behrooz Mostofi

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**Background:** Cycling has become one of the most popular sporting activities in the UK, with MAMILs (Middle Aged Men in Lycra) having been one of its most prominent groups - transforming the perception of cycling as a casual leisure activity into it being seen as a full time hobby. However while the incidence of serious injuries for all other modes of transport continues to depreciate, the number of serious injuries among cyclists continue to rise. The majority of injuries resulting from bike accidents are from the resulting trauma, and have implications for the local trauma and orthopaedic service.

**Methods:** Using data collected from the latest National Travel Survey, STAT19 police database, HES database and the local NHS trust, the morbidity and cost of treatment regarding cycling-related injuries was analysed.

**Results:** While the mortality due to cyclist-related activities has decreased since 2007 in line with all other modes of transport, the numbers of seriously injured riders admitted to hospital have increased by 24.5% nationally.

**Conclusions:** The Department of Transport estimates that ambulance and medical costs relating to treatment of seriously injured casualties average around £13,500. Using local data, it is estimated that seriously injured cyclists cost the East Kent Hospitals Trust approximately £2.5million. Based on the most recent national figures, these injuries have cost the NHS approximately £120million last year. While only £140 million has been spent by the Government in the last 7 years on cyclist safety, and with further rises in the amount of seriously injured cyclists expected, more needs to be done to improve cyclist safety in the UK.

## Management of hot and swollen knee at Queen Elizabeth Hospital Birmingham UK

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Department of Trauma and Orthopaedics, Queen Elizabeth Hospital NHS Foundation Trust, Birmingham

**Background:** To examine if our clinical practice was compatible to the guidelines published by BSR and BOA.

**Method:** Records of 56 men and 40 women, aged between 17 and 91 (mean 69.1) who were suspected of septic arthritis January 2012 and February 2013. Knee aspiration and microscopy of the sample prior to antibiotic treatment was recorded. Examined the number of the patients who had FBC, U&Es, CRP, ESR and blood cultures.

**Results:** Aspiration of the knee and synovial fluid culture were performed in 81% of the patients. FBC, U&Es and CRP were tested for the 96.8% of the cases, but ESR was sent in 22.8% of the cases only. Blood culture was sent in 29.8% of the cases. Diagnosis of septic arthritis was confirmed on the culture for 18 patients and the were mostly diagnosed as gout or reactive arthritis.

**Conclusion:** ESR and blood cultures were not tested for most of the patients, resulting to poor compliance to the guidelines. Local pathway to be introduced in the A&E department.

## 'Simulated Shoulder Arthroscopy: Construct Validity and Performance Assessment'

R. Middleton

NDORMS, Nuffield Orthopaedic Centre, Oxford University.

**Background:** Arthroscopy is technically demanding and difficult to learn. With restrictions on junior doctors' working hours, alternative training and assessment methods for surgical skill are required. Our aim was to determine whether a simulated diagnostic shoulder arthroscopy task (SDSAT) had construct validity for different surgical skill levels and whether a Global Rating Score (GRS) was a valid assessment method.

**Method:** 46 individuals across training stages performed a SDSAT. Performance was assessed using objective motion analysis (MA) (total time, path length, hand movements) and a GRS previously validated for knee arthroscopy. Correlations between simulator performance and number of previous arthroscopies performed were calculated.

**Results:** MA values and GRS scores demonstrated significant differences between training levels ( $p < 0.005$ , Kruskal-Wallis). Sub-group analysis demonstrated differences between all groups for GRS scores ( $p < 0.05$ , Mann-Whitney U). All MA values were significantly different between novice and SHO ( $p < 0.05$ ); total time was significantly different between SHO and registrar ( $p < 0.05$ ); and all MA values were significantly different between fellow and consultant ( $p < 0.05$ ). There were statistically significant correlations between num-

ber of previous arthroscopies and measured variables ( $p < 0.005$ , Spearman's rho).

**Conclusion:** The SDSAT demonstrates construct validity for distinguishing surgical grades when using MA or GRS as the assessment method. This further validates the use of an arthroscopic GRS to assess shoulder arthroscopy and demonstrates its ability to differentiate between skill levels at each training stage. Its ease of use makes it an attractive and feasible prospect for assessing surgical skill in the operating theatre.

### Patterns of internet use in patients undergoing elective orthopaedic surgery at Guy's Hospital

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Department of Orthopaedics, Guy's Hospital

**Background:** There is an increase in the number of patients who perform online research regarding their procedure prior to surgery, and there is evidence that this impacts patient satisfaction. Issues remain regarding quality control of non NHS websites. We aim to assess the patterns of internet use in patients undergoing elective orthopaedic surgery at Guy's Hospital.

**Methods:** A 17 item paper questionnaire was distributed amongst patients undergoing elective orthopaedic surgery at Guy's Hospital commencing 1st January 2013. The questionnaire required participants to circle the most appropriate response.

**Results:** 91 patients responded (67% female). 44% were undergoing hip arthroplasty, 37% knee arthroplasty. The mean age was 59 years and 44% of participants were retired. 77% had access to the internet at home. 56% used the internet to gain information about their procedure prior to admission, and of these, 49% used more than one source. 82% patients used google or similar search engines, 51% used NHS websites, 25% used youtube, 20% used patient websites (such as patient.co.uk), 22% used blogs or forums. 82% perceived online information to be reliable. 94% found online information "somewhat useful" or "very useful." 77% patients stated they would access online information provided by the NHS if available and 50% patients preferred electronic information instead of printed.

**Conclusion:** A large number of patients use the internet to research their procedure prior to admission and although most consider available information to be reliable and use-

ful, there is a role for creating tailored online information for patients at Guy's Hospital.

### Medium Term Morbidity And Mortality Following Total Knee Replacement Surgery In Patients With Complex Arthritis Patterns And Comorbidities. A Matched-Pair Cohort Analysis.

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**Background:** Total knee arthroplasty surgery (TKA) is well documented as a highly successful major operation. There is limited information regarding the longer term outcomes of patients with heightened clinical complexity in terms of complication risk or subjective outcomes. We wished to determine the effects of clinical complexity on the overall incidence of medium term outcomes following TKA

**Methods:** From a consecutive series of 347 total knee arthroplasty patients undertaken over a 1 year period using a single implant system and stratified prospectively by 4 grade scale of case complexity, we obtained a cohort of 17 patients who were in our most complex group (group C3; severe arthritis deformity and multiple comorbidities with ASA 3 or more).

We age and surgery-date matched them with a group of straightforward (group C0) patients. Fourteen patients in the complex group remained for 5 year follow-up (2 deaths, 1 lost).

We analysed outcomes in terms of all complications, death and patient related outcome measures within a minimum 5 year follow up period. We analysed case records, radiographs and undertook appropriate follow-up.

**Results:** In the C0 group there were no systemic complications or deaths, 13 patients (76%) with no complication and 5 local complications related to pain and stiffness in 4 patients (26%) with 2 requiring surgery in the form of closed manipulations and no revisions.

In the C3 group there was 1 major systemic complication, 2 deaths over a year from surgery from unrelated causes but only 5 patients had no complication (31%). There were 11 local complications in 10 patients, including one in 1 of those who later died, giving a complication rate of 63%,  $p < 0.05$ . Of these 3 patients underwent a total of 6 operations, including 2 revisions.

There is therefore a statistically significant medium term risk of complication ( $p=0.037$ ) and complication or mortality ( $p=0.015$ ) in C3 patients.

Interestingly of the survivors the 5 year patient related scores are not significantly worse in the C3 group.

**Conclusions:** Our series highlights the additional risk profile of the most complex patients and is a more accurate guide for patients, surgical teams and orthopaedic groups when given more tailored advice to this group.

Our study also highlights the use of patient stratification by clinical complexity.

### Outcomes of hip replacement surgery in the elderly compared to a younger cohort

Samuel Everett.

Newcastle Medical School, Newcastle University.

**Background** Hip fractures are a leading cause of hospital admission and an increasing problem within the ageing population. The two main treatments for displaced intracapsular fractures are total hip arthroplasty and hemiarthroplasty. This service evaluation aims to compare the outcomes of patients over 80 years old with a younger cohort undergoing the two main treatment modalities.

**Methods** The study included 378 patients admitted to a major UK trauma centre between April 2011 and March 2013. The main outcome measures were: mortality rate at 30 days and one year; reoperation rate at 30 days; proportion living in their own home/sheltered accommodation at 30 days, one year and upon NHS discharge; change in walking ability indoors and outdoors at 30 days and one year.

**Results** All patients receiving THA were discharged home compared to 5.2% under 80 and 17.4% over 80 receiving hemiarthroplasty not discharged home. No THA patients required reoperation at 30 days. 4.4% under 80 receiving hemiarthroplasty required reoperation, as did 2.0% over 80 receiving hemiarthroplasty. Mortality rates were highest for hemiarthroplasty patients and THA patients over 80 at one year. Patients receiving THA in both age groups were more likely to retain their pre-injury walking ability by one year; however loss of walking ability was similar at 30 days regardless of age or treatment.

**Conclusion** Patients receiving THA had lower risk reoperation with an increased chance of retaining pre-injury walking ability and place of residence; however THA may not confer as great a benefit in patients aged over 80.

### Acute Knee Injuries: an epidemiological and outcome based retrospective case note analysis

Sean Booth

Aberdeen Royal Infirmary

**Background** The knee is the most commonly injured joint often requiring specialist assessment in acute knee clinics, which have been shown to decrease costs and time to diagnosis. This study analysed the epidemiology and patient outcomes from the acute knee service in Aberdeen Royal Infirmary, data that has not been previously published for UK institutions.

**Method** Retrospective case note analysis of 140 patients (sample size 48.6%) with an acute knee injury presenting to two consultants' clinics over a 6 month period. Data collection involved epidemiology, investigations, diagnosis and final outcome.

**Results** 70% of attendees were male whose injuries were mostly sustained during football. Initially 57% were offered MRI; 25% physiotherapy; 9% did not attend; 5% were admitted acutely and 4% were immediately discharged. After initial management 54% were discharged; 24% continued with physiotherapy; 18% underwent elective and 4% acute surgery. The commonest diagnosis was non-specific soft tissue injury (47%) followed by ACL ± meniscal injuries (24%) of which 37% underwent reconstruction.

**Conclusion** Acute knee injuries occur mostly in men after sporting accidents and are largely non specific soft tissue injuries, findings similar to international publications. MRI is utilized extensively in this particular institution, however evidence supports that clinical suspicion should continue to play a major role in decision making. Interestingly, but perhaps not surprisingly, a larger proportion of patients undergo ACL reconstruction than was once reported by Noyes. Publication of data from other centers will enable comparison and identification of areas for improvement.

## Improving the quality of Orthopaedic operation notes in a District General Hospital: a prospective completed audit loop study

Sebastien Crosswell

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**Background:** Good note keeping and records is an essential part of good clinical practice. The importance of this is clearly explained by many governing bodies including the GMC and the Royal College of Surgeons of England (RCSEng). An accurate record of surgical procedures can assist with future operations, provide members of the multi-disciplinary team with vital information and also importantly has medico-legal implications.

**Method:** A proforma was developed based on 15 key points outlined by the RCSEng "Good surgical Practice" (2008) which must be all completed by the surgeon to be deemed adequate documentation. Fifty trauma and elective patients' case notes were randomly reviewed retrospectively and proforma used to assess adequacy of the operation notes. A revised operation note was introduced and re-audited.

**Results:** 50 patients case notes were reviewed, 48% trauma and 52% elective. Date of operation, operating surgeon and assistant were well recorded with over 80% in all data sets. Operation titles were noted in 96% of notes for both elective and trauma patients. Major failing of documentation were in diagnosis and findings with only 32% (trauma) and 11% (elective) documented. Postoperative instruction showed failings in discharge, post operative investigations and follow up. GMC numbers were recorded in only 25% (trauma) and 15% (elective) of notes. Legibility of notes was 71% (trauma) and 65% (elective). Improvement in all data sets was seen with re-design and re-audit of a modified operation note.

**Conclusion:** Operative note keeping is of key importance for patient safety. A structured operative note can aid with this and should be considered by more departments.

## Validated Training Models in Orthopaedic Surgery: A Systematic Review

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**Background:** Over the last two decades, simulation has become a favourable training method to supplement the apprenticeship model in surgical training. However, before surgical simulators can be integrated into training programmes, scientific evaluation of the available models is required. By performing a qualitative systemic review, this study aims to characterise training models in orthopaedic surgery.

**Method:** Studies up to October 2013 were identified through a broad search of EMBASE, Scopus and PubMed, using two search strategies: "Orthopaedic surgery and (training or simulation or model)" and combinations of these terms with "validity or validated". Studies were included if they (1) described one or more training models, and/or (2) examined the validity of training models.

**Results:** Twenty-one articles, describing nine virtual reality and six bench models, met the study criteria. Of the included studies, twelve described knee arthroscopy simulators, five were in relation to shoulder arthroscopy, four were for fracture fixation, one was developed to teach sacroiliac screw placement and one article was in relation to lumbar spine cannulation. Five of the included studies reported face validity, three reported content validity, fifteen reported construct validity, one reported concurrent validity, and one reported predictive validity. However, only three of these studies were randomised control trials (RCTs).

**Conclusion:** The validation studies reported in orthopaedic surgery training, thus far, are few in number and consist of few RCTs, highlighting a paucity in the field compared to other surgical specialities.



# AUTHOR INFORMATION

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The *Journal of Undergraduate Trauma and Orthopaedic Surgery (JUTO)* is a peer-reviewed, open access, online journal aimed at medical students and junior doctors.

The journal aims to offer publication opportunities and experience to those pursuing a career in trauma and orthopaedic surgery.

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JUTO welcomes the submission of original, previously unpublished manuscripts in one of the following sections of the journal:

- **Original Articles** This section includes original research articles, reviews, quality improvement projects and a summary of recently published articles from the major orthopaedic journals.
- **Education** The education section features summaries of core orthopaedic knowledge topics, anatomy, guidelines and operative techniques.

- **Case Reports** This section contains cases of patients with a discussion at the end, incorporating literature. This section provides an insight into orthopaedic clinical perspective.
- **Electives and Careers** Elective reports and reflections on research placements together with advice on applying for specialist training.
- **Views and Reviews** Letters to the editor, personal accounts of training, patient perspectives of diseases, book reviews and event reviews are accepted.
- **Abstracts** accepted abstracts from the society's Future Orthopaedic Surgeons' Conference together with Essay Prize winners will be published.
- **Conference Listings** Listings for student orthopaedic events for the following quarter will be included.

**Deadline for JUTO Vol1 Issue 2: November 2014**

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ROYAL SOCIETY OF MEDICINE LONDON

SATURDAY 8<sup>TH</sup> NOVEMBER 2014

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**JUTO** VOLUME 1 ISSUE 2 ONLINE DECEMBER 2014

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