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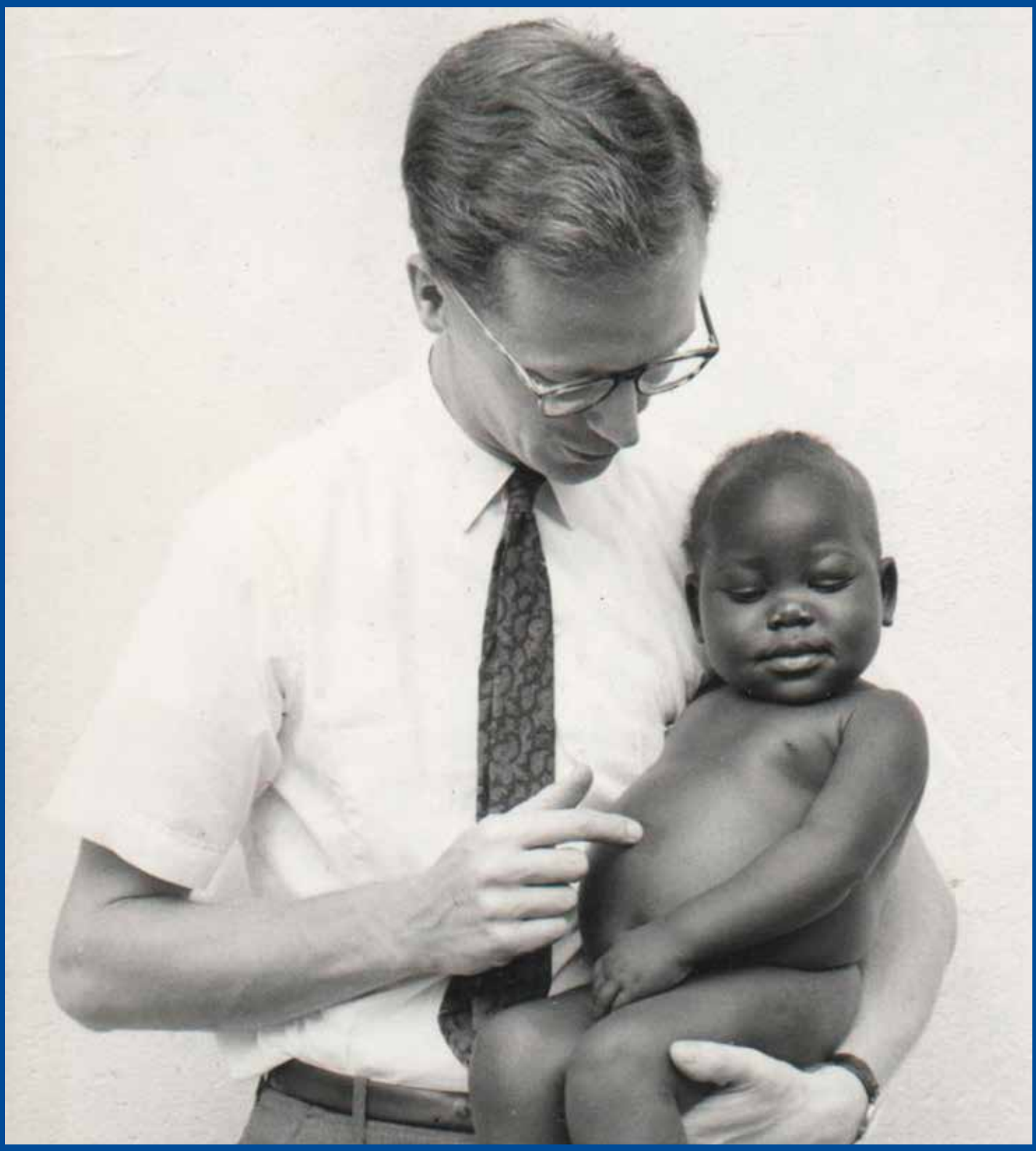

The Ulster Medical Journal

The journal of the Ulster Medical Society. First published in 1932.

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Transactions of the Belfast Clinical and Pathological Society (1854-1860)

Statement: The Ulster Medical Journal is an international general medical journal with contributions on all areas of medical and surgical specialties relevant to a general medical readership. It retains a focus on material relevant to the health of the Northern Ireland population.

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Editorial

Dum Spiro, Spero

It is my sad editorial duty to acknowledge that Professor David Hadden, previous editor of this Journal died earlier this year. As a previous editor he has his obituary published here and I thank Professor Patrick Bell for rising to this sad task so diligently. David bore his final illness with great dignity, clearly determined that while he was alive, he would *live (*dum vivimus, *vivamus).*

The journey to the undiscovered country, was for him, I think, a long -planned walk, stopping only briefly to part the veil, and walk on through. I can see him now, peering through those distinctive glasses and continuing a line of searching Socratic and indeed Jesuitical questioning with some minor celestial official. Looking intently at his subject, finger tips apposed and saying, "Yes, young man, *perhaps*. Think it through though, think it through." I was involved peripherally in his care and in due course, I received a letter from him. I took it as a letter of absolution. I am sure like all us of when we look after friends and colleagues as patients, there is always a moment of dread when unfortunate news has to be delivered. His letter of thanks concluded: '*Take therefore no thought for the morrow; for the morrow will take thought for the things of itself.*' (Matthew 6: 34)

As one of the Journal board members reminded me recently, "He was a truly benevolent person. I will always remember his absolute concern on my first day that there was no one cooking either breakfast or dinner for the house officers in Musgrave and Clarke House. I didn't have the heart to tell him that the shoe-shining service had long stopped. (Dr Gerry Hanna: personal communication). David, for me, imbued the, possibly now unfashionable philosphy of William Osler, who said, "You are in this profession as a calling, not a business; as a calling which exacts from you at every turn self-sacrifice, devotion, love and tenderness to your fellow men. Once you get down to a purely business level, your influence is gone and the true light of your life is dimmed. You must work in the missionary spirit, with a breadth of charity that raises you far above the petty jealousies of life." [1]

I went to visit David last May, as I needed some pressing editorial advice. I had written my forthcoming editorial, which was entitled *Benediction* [2]. I told him that I was troubled by it, more than somewhat, as Damon Runyon might have put it. "Why?" he asked. I outlined what I had written, effectively a 15th century canter through the Benedictine monastaries of Europe and an 8th century poem about a cat. Certainly this wasn't mainstream for a medical journal editorial, but even that didn't completely trouble me as I assumed that the readership had become accustomed to my eccentric and quixotic view of the world. No my concern was that it was all a little too, well, *Catholic* for the kirk. David, paused, sipped his coffee and regarded me keenly. "Barry," he said, "Have the courage of your convictions!" He raised his fist and continued, "Hadden says, publish!" Publish I did. Thank you, David.

Grace under fire, all too often is unrecognised: a pity since it often reveals the finest version of ourselves. Joaquin Rodrigo contracted diphtheria when he was three years old. As a consequence he lost his sight. However, despite this devastating complication, he would became a renowned composer: his triumph over adversity. Of interest, he never actually mastered the guitar, writing music in braille and having it transposed subsequently. His *Concierto d'Aranjuez* is probably the most recognised classical guitar piece ever written. Aside from its inherent musical beauty, Rodrigo concealed within it a personal agony, possibly of interest to you cardiac types. The second movement focuses on a weak and increasingly faltering heartbeat. The heartbeat belonged to his wife, Elizabeth, and reflects a devastated Rodrigo's musical interpretation of her precarious physical state immediately after losing their first child. You can hear and see the piece here: (https://www.youtube.com/watch?v=ekznnxaGzNU) . At the end, it's almost an agonal ryhthm. Thankfully though, she did survive.

Antonio Lucio Vivaldi's Four Seasons is another instantly recognisable pice of classical music. However, the Summer movement isn't a hazy bucolic scene. It's frenetic and jarring in places. Vivaldi suffered from debilitating and chronic respiratory problems, probably asthma. Now imagine that you have bronchospasm: fighting for each breath. Can you hear that in the frenzy? So its hectic panicky pace is about breathing, and hoping. Listen.(https://www.youtube.com/watch?v=Es9RgQGw3Gk).Genius.

Briefly now, to houskeeping matters. I am delighted to announce the inclusion of another new section: the Pictorial Review. My thanks to Dr Gormley and his coauthors for producing the first of these on malignant melanoma. I hope that the readership will find this section illuminating.

So Vivaldi and Rodrigo produced works of acclaimed beauty, each also containing a coded message about illness, often lost in translation, that speaks of courage, the pernicious nature of fear, adversity, and defeating that last enemy, which is of course, death. So as they, and David Hadden might have said, " Dum spiro, spero; sed dum vivimus, *vivamus."(*While I breathe I hope, but while we are alive, let us *live!)*

Have a wonderful summer, and please, as Professor Hadden always signed off, do keep sending me your good papers.

Barry Kelly
Honorary Editor

REFERENCES

1. Osler W. The Reserves of Life. *St. Mary's Hosp Gaz.* 1907;13:95-8
2. Kelly BE. Benediction.*Ulster Med J.* 2013;82**(2)**:1-1

Ulster Med J 2014;**83(2):**78-79

Obituary

David Robert Hadden

Patrick Bell

Accepted 17 April 2014

Professor David Hadden, who died on 26th February 2014, edited the Ulster Medical Journal from 1984 to 1995, the sixth in a line of Editors recorded in the Journal[1]. On taking up the role he instigated modernisation of typeface, cover and illustrations. He had a gift for clear and concise writing which, combined with a genuine desire to support and encourage colleagues, he used to good effect as new authors submitted their first papers to the Journal. After stepping down from the Ulster Medical Journal he became Technical Editor of Diabetic Medicine passing on this role shortly before his death.

Important as his contribution to the Ulster Medical Journal was, it is as an internationally recognised expert on growth, nutrition and diabetes that he will be best remembered. Anticipating the impact of the westernised lifestyle on the epidemic of type 2 diabetes, he set up, in 1972, the Belfast Diet Study, which confirmed that strict adherence to diet alters the natural history of the disease. Subsequently his collaboration with colleagues in Oxford and elsewhere in the UK Prospective Diabetes Study demonstrated for the first time the importance of good control of blood glucose in preventing complications of type 2 diabetes.

His other great contribution was in the management of diabetic pregnancy. The joint diabetes obstetric service he built up was an example copied nationally. He led the involvement of Belfast as major centre and main laboratory in the Hyperglycaemia and Adverse Pregnancy Outcome Study, which highlighted the potentially adverse effects of small increases in blood sugar on the non-diabetic mother – findings that continue to challenge and change practice.

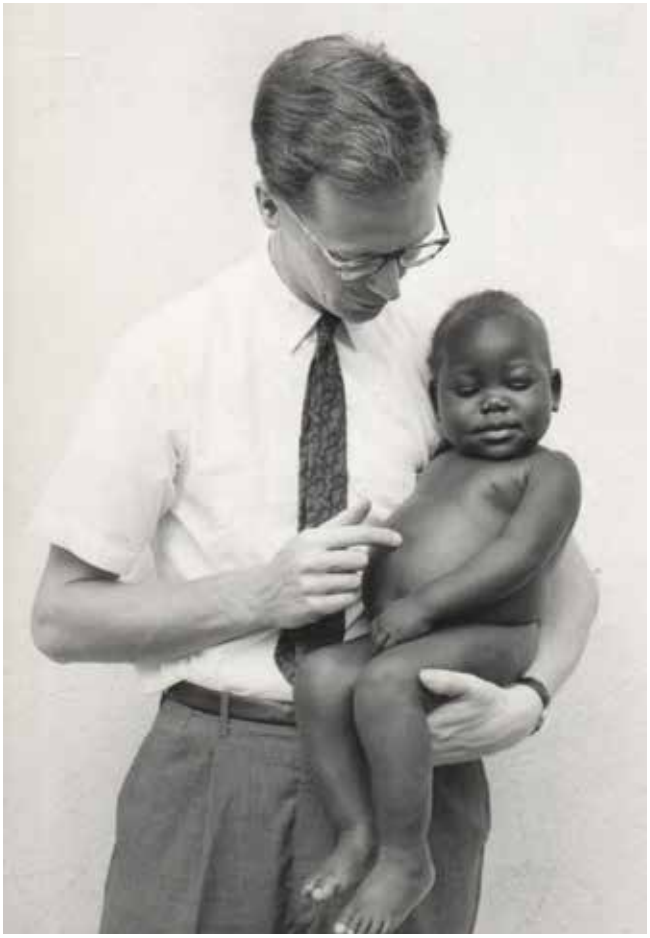
David Hadden came from a well known Irish medical family. His great grandfather was a doctor in Skibbereen, Co Cork, where he treated victims of the Irish potato famine. His grandfather became ship's doctor on an ocean liner, the SS Narnia, bound for Liverpool from New York. The chance event of the ship running aground on Rathlin Island near Ballycastle led to him settling in Northern Ireland and setting up practice in Portadown, where his grandson was born. David Hadden grew up across the road from the practice run by his grandfather, father and aunt. After primary school in the war years, he attended Campbell College, and then medical school at Queen's University, Belfast. Fellow students remember a tendency to be late for lectures often finishing breakfast at the back of the hall, wearing a deerstalker hat in cold weather. Despite this he graduated

David Hadden

with honours in 1959, winning the Thomson Medal for top marks in the final examination in medicine.

His training through the early 1960s, in his chosen specialty of endocrinology and diabetes, began in the Royal Victoria Hospital, Belfast. After a Clinical Research Fellowship using the new technique of radioimmunoassay to measure growth hormone, he travelled as Fulbright Fellow to the Johns Hopkins Hospital, Baltimore, USA . His identification and report in the journal Nature of a growth hormone binding protein, although dismissed by conventional thinking at the time, is now recognised as one of the first descriptions of that important regulatory protein. He brought this interest back to Belfast, as the first children with short stature and growth hormone deficiency were treated using growth hormone extracted from human pituitary glands. His own children also remember being lined up in his study each year to have height and weight measured and plotted on a centile growth chart, a tradition later extended to his seven grandchildren.

Continuing his interest in growth and nutrition as MRC Fellow at the Malnutrition Research Unit in Kampala, Uganda, and then the Department of Experimental Medicine in Cambridge under the supervision of Professor RA McCance, he was asked to explore the cause of hypoglycaemia in babies with kwashiorkor. He was able to show that these children were in fact insulin resistant, with abnormally high blood glucose and insulin levels, differing from the more striking cases of total starvation (marasmus). This experience in malnutrition was also carried back to Belfast as he developed his ideas on



David Hadden with an infant suffering from Kwashiorkor (malnutrition)

the treatment of Type 2 diabetes, at least in part a disease of excessive nutrition.

Returning to the Metabolic Unit at the Royal Victoria Hospital as Consultant Physician in 1967, he worked there until his retirement in 2001. He was an extraordinarily caring physician, who regarded himself as permanently on-call. The pressure experienced by colleagues from his attention to detail and determination to get things right was balanced by his friendly manner as well as clear personal commitment and example. His clinical work and research covered the full range of endocrinology and diabetes and extended well past formal retirement.

His work and qualities were marked by an Honorary Chair at Queen's University Belfast and lectureships including the 1998 Jorgen Pedersen Lecture of the Diabetes Pregnancy Study Group of the European Association for the Study of Diabetes, the 2006 Norbert Freinkel Lecture of the American Diabetes Association and, in 2012, the first Lifetime Achievement Award of the Irish Endocrine Society. These recognised scientific excellence in the true sense of knowing and sharing work with colleagues.

Of many interests outside medicine, the most memorable was the project to produce Irish linen, possibly inspired by his mother's family, the Johnstons, who had been involved in the linen industry in its heyday. With his wife, Diana, they started by growing flax in a field at their country cottage in Co Down and succeeded, with some difficulty, in arranging for the whole process of retting, spinning and weaving to be done in Northern Ireland. As foreign competition had undermined this once thriving industry, authentic Irish linen had not been manufactured locally for many years.

He is survived by his wife Diana, a doctor and artist, son Robert, neurologist, and daughters Katharine and Emily, engineer and landscape architect respectively.

Professor David Robert Hadden, born May 24th 1936, died February 26th 2014

Hadden DR. The Editors of the Ulster Medical journal. *Ulst Med J* 2006; **75(1)**: 5-10

Ulster Med J 2014;**83(2):**80-85

Review

Emergency Medicine in the RVH and the challenges it faces from a clinician's perspective

Brendan Sinnott

Accepted 17 April 2014

BACKGROUND TO EMERGENCY MEDICINE IN BELFAST

The National Health Service (NHS) is an organisation providing services and treatments in Primary, Secondary, Tertiary care across a spectrum of specialties. Disruptive technologies, treatments and new ways of delivery require the doctor and manager to work in an ever changing environment. Belfast like many cities across the UK needed big changes in delivering Emergency Medical Services. Prior to November 2012 there were three Emergency Departments (ED's) within a one mile radius; The Royal Victoria Hospital (RVH), Belfast City Hospital (BCH) and Mater Infirmorum Hospital (MIH), each providing a 24/7 Emergency Service. This was not sustainable. A decision for rationalisation of the Emergency Departments was long overdue. Staffing, training and resourcing of the three units were problematic. The BCH ED closure was deemed the most politically and legally viable decision – (Trust status of the Mater Hospital would require new legislation and therefore it was decided in the short term to close the BCH ED). The MIH ED continued as an emergency department and faced the same challenges with staffing and service provision. Acute surgical and laboratory services have been since withdrawn.

When closure of the BCH ED department came in November 2012 the transition into the RVH ED resulted in a decline in the standard of care, patient safety and staff morale.

Some of the biggest challenges faced in the transformation were

1. Insufficient space to meet increased patient flow at RVH ED
2. Lack of timely diagnostics
3. Inadequate staffing in ED and Acute medicine.
4. Lack of robust Escalation plans to ensure patient flow
5. Poor understanding of strategies and risks between clinicians and managers

The RVH is a teaching Queen's University Belfast (QUB) Hospital, and Regional Trauma centre currently treating 88,000 new patients a year. (BCH: 42,000 and pre November 2011, the RVH: 48,000). Sixty nine per cent of the attendees are ambulatory and 31% are brought in by ambulance of whom 55% are admitted. (Figure1). Predictable capacity on high demand days, Mondays being the busiest, followed by Sundays, Saturdays and Fridays, would mean having 40 available beds to facilitate acute admissions. This means all inpatient ward rounds, diagnostics and discharge letters are undertaken in a timely fashion and staff are deployed optimally in preparation to process the new admissions.

Emergency Department, RVH,
BHSCT

Year 2013

	Numbers	%
Total attendances	82,007	100
Ambulance arrivals	25,083	31%
Admissions/Ambulance arrivals	13,868	55%

Fig 1: RVH ED statistics

It was not uncommon to have ED nurses and doctors constantly deal with a saturated infrastructure from trolley waits grinding the ED almost to a halt. (Figure 2 shows the RVH ED 12 hour breaches). However the resuscitation room always had to function, creating huge stress and strain on an already over overburdened system and staff. Patient care was compromised and delays lead to bad outcomes for some.

In a recent assessment of all medical inpatients lead by the Manager For Improvement with a team of consultants, found that up to 50 inpatients were waiting for either diagnostics or a health care package for discharge. None of these patients required an acute medical bed.

The challenges faced from the transformation are not solely related to structural changes but also share a commonality in the changing pattern of Emergency Medicine driven from demographic and technological changes and patient expectation.

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This transformation was followed in 2014 with the partial closure of peripheral ED departments in Lagan Valley Hospital and the Down Hospital. These closures were announced with little warning or planning, putting extra pressure on the RVH. No additional staff or diagnostics were made available and further burden was added to the challenges outlined above. This led to greater demand on staff and some consultant colleagues expressed concern regarding burn-out of trainees and consultant colleagues. One consultant had taken early retirement, two were on sabbatical leave and one went on long term sick leave. In addition maternity and paternity leave had to be facilitated.

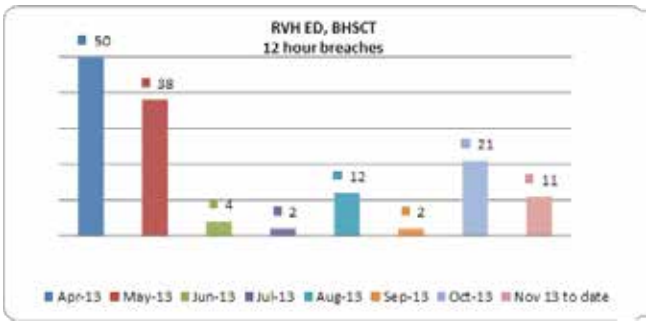

Fig 2. RVH ED 12 hour Breaches

In a recent British Medical Association survey, 80% of 1,000 respondents rated the pressure that they are under at work as 'high' or 'very high'. The 3 top stresses were – meeting patient's demands; lack of time and excessive bureaucracy.[1]

Surveys in the UK and the USA reveal the extent of the burn out issue. In 2012, a poll of 7,288 US doctors, 45.8% reported at least one symptom including extreme emotional exhaustion "and indeed depersonalisation". Those in the front line of care access such as Emergency Medicine were found to be at greatest risk.[2]

In 2009 in a report into Health and Wellbeing in the NHS, Dr Steve Boorman notes that the culture in which 'highly motivated staff do not always recognise the impact of their own health needs and where early access to care is erroneously considered to risk disadvantaging patients'.[3] The latest NHS sickness statistics for England showed that NHS hospital doctors took on average of just 2.8 sick days in 2012/2013 against the national average of 4.5 days according to the Office of National Statistics figures. Just 1.25% of hospital doctors were ill on an average day in 2012/2013; the lowest rate of any staff group.[4]

Dr Emma Sedgwick, Director of Professional Development at Coaching Specialist Health Care Performance estimates that burn out is a factor in 15-20% of doctors who seek her help with problems at work. "The intense emotional engagement doctors have with their work is an important factor in susceptibility to burn out. They are acutely conscious of the need to meet expectations of patient, colleagues, employers and the GMC and worry about letting others down". [5]

Studies have shown that burn out is particularly associated with the caring professions. The author of a 1998 US report reflected "medicine attracts idealists who want to help others but as professional demands increasingly impose on their available time and energy more is crowded into the limited working day". [6]

The head of the BMA Support Service - Doctors for Doctors, Dr Mike Peters believes that it's a growing problem in the UK too. "One big factor is the fragmentation in the way care is delivered. Doctors are working different shifts so there is not the same camaraderie. At the same time, less invasive techniques and shorter hospital stays mean the turnover of beds in hospital departments is higher and there is a limited opportunity to establish a rewarding relationship with patients".[7]

WHAT THE COLLEGE OF EMERGENCY MEDICINE WANT

An emergency department treats patients with complex conditions across a wide spectrum of pathologies, injuries and illness. Unlike the non-urgent sector it does not have the option to opt out. It must function 24/7 all year round and to be efficient and effective must have a mix of staff to deliver quality care. Poor care is costly, inefficient, erodes morale and makes recruitment difficult if not impossible. Why should the ED be the portal for all emergency and urgent care or can the differentiation take place in the community or DGH?

The College of Emergency Medicine (CEM) in July 2013 look at - Funding Emergency Departments: why the current system is failing our patients and what needs to be done about it. 'Care delivered in the urgent and emergency setting is increasingly important and complex. Existing systems fail to adequately fund current care and are not driving improvements in care. Fundamental change is needed so that resources are allocated to produce the most cost-effective outcomes. Recognise and drive the important role of senior medical decision making early in the patient's journey.'

CEM recommendations on staffing for the region are a minimum of 10 consultants per ED in Northern Ireland (NI). Of the 10 EDs in NI, the RVH is the only ED with more than 10 consultants. The CEM recommendation for the RVH as a Regional Trauma centre is 16 consultants. The acuity and intensity requires optimum deployment of consultants on a daily basis 7 days a week. Current allocation is shown in figure 3.

In addition the College launched 'CEM10' in the Autumn of 2013, (Figure 4) and argues the case for co-location of urgent care centres and hopes to achieve the support of the RCGP in campaigning to achieve this.[9] The NHS Confederation and the Secretary of State has recognised terms and conditions as inequitable for those who work in Emergency Medicine[10] They recognise the need as does the BMA for a contract for both trainees and consultants that better recognise the consequences of high frequency and high intensity out of hours work. The College has highlighted the absurd sums

Date	Consultants	Middle Grades	Junior Doctors
Monday 14/4/14	3 – (8am-1pm) 3 – (1pm-6pm) 1 – (6pm-12mn) 1 on call 12mn-8am	2 – (8am-5pm) 2 – (10am-6pm) 2- (12pm-9pm) 2 – (3pm-12pm) 1 – (10pm-8am)	2 – (8am-4.30pm) 1 – (11am- 9pm) 1 – (1pm-10pm) 2 – (4pm-12mn) 2 – (10pm-8.15am)

Date	Consultants	Middle Grades	Junior Doctors
Wed 23/4/14	2 - (8am-1pm) 3 - (1pm-6pm) 1 - (6pm-12mn) 1 on call 12mn-8am	2 - (8am-5pm) 2 - (10am-6pm) 1- (12pm-9pm) 2 - (3pm-12pm) 1 - (10pm-8am)	2 - (8am-4.30pm) 1 - (11am-7pm) 1 - (1pm-10pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)
Thurs 24/4/14	3 - (8am-1pm) 2 - (1pm-6pm) 1 - (6pm-12mn) 1 on call 12mn-8am	2 - (8am-5pm) 2 - (10am-6pm) 2- (12pm-9pm) 2 - (3pm-12pm) 1 - (10pm-8am)	2 - (8am-4.30pm) 1 - (11am-7pm) 1 - (1pm-10pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)
Fri 25/4/14	3 - (8am-1pm) 2 - (1pm-6pm) 1 - (6pm-12mn) 1 on call 12mn-8am	2 - (8am-5pm) 2 - (10am-6pm) 2- (12pm-9pm) 2 - (3pm-12pm) 1 - (10pm-8am)	2 - (8am-4.30pm) 1 - (11am-7pm) 1 - (1pm-10pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)
Sat 26/4/14	2 - (8am-1pm) 1 - (1pm-6pm) 0 - (6pm-12mn) 1 on call 12mn-8am	1 - (8am-5pm) 2 - (10am-6pm) 2- (12pm-9pm) 1 - (3pm-12pm) 1 - (10pm-8am)	1 - (8am-4.30pm) 1 - (10am-6pm) 1 - (12md-9pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)
Sun 27/4/14	2 - (8am-1pm) 1 - (1pm-6pm) 0 - (6pm-12mn) 1 on call 12mn-8am	1 - (8am-5pm) 2 - (10am-6pm) 1- (12pm-9pm) 1 - (3pm-12pm) 1 – (10pm-8am)	1 - (8am-4.30pm) 1 - (10am-6pm) 1 - (12md-9pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)
Mon 28/4/14	3 - (8am-1pm) 3 - (1pm-6pm) 1 - (6pm-12mn) 1 on call 12mn-8am	2 - (8am-5pm) 3 - (10am-6pm) 2- (12pm-9pm) 2 - (3pm-12pm) 1 - (10pm-8am)	2 - (8am-4.30pm) 1 - (11am-7pm) 1 - (1pm-10pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)
Tues 29/4/14	3 - (8am-1pm) 2 - (1pm-6pm) 1 - (6pm-12mn) 1 on call 12mn-8am	1 - (8am-5pm) 2 - (10am-6pm) 2- (12pm-9pm) 2 - (3pm-12pm) 1 - (10pm-8am)	2 - (8am-4.30pm) 1 - (11am-7pm) 1 - (1pm-10pm) 2 - (4pm-12mn) 2 - (10pm-8.15am)

Fig 3: RVH ED Clinician's allocation

spent on locums to prop up fragile rotas, which demonstrates that it is not arguing for a greater overall spend: indeed the reverse is true. If terms and conditions were equitable, recruitment and retention problems would be overcome; sustainability would return; patient experience and outcomes would improve and overall financial savings would be significant. Properly resourced Emergency Medicine saves lives and saves money. The Keogh review and Monitor acknowledge that consultant-delivered emergency medicine care is the best method of doing this.[11 12] The College in its negotiations with the relevant bodies, is building on CEM 10 and providing a manifesto and a road map to building a resilient Emergency Medicine system that is safe, effective, efficient and sustainable.

Transforming Your Care, the government paper emphasising the need for more treatments within the community and moving £83m of the health care budget to the community, played little part in reducing the attendances at ED.[13] The drive for integration must be greater than that of competition. If we are to deliver meaningful results and keep people safely out of hospital our conversion rate has to remain under 20%. This requires salient, timely diagnostics coupled with integrated pathways that deliver 7 days a week.

Fig 4

WHERE WE ARE AT

Failure to manage in any organisation leads to dire outcomes and strong leadership is a key factor in achieving results. Denial and failure to listen to staff and patient coupled with paralysis by analysis produces dysfunctional systems. Ownership is a key factor in business performance but yet the Emergency Medicine in Belfast Trust does not have its own Clinical Director (CD). Interim CDs from other specialties have held the post from November 2012 and whilst ticking certain boxes it did not provide the leadership required to deliver breakthrough performance.

Strategies to deliver safe care to circumvent obstacles and navigate a course to make the micro processes work at each encounter in the patient's journey through the system were never developed. Escalation plans were discussed but never worked. Trigger charts were developed and used to alert management of impending gridlock in the department. The in-house system had no strategy to respond to these triggers and ED was left to carry the risk. There is no point in proclaiming initiatives and schemes if they don't deliver meaningful changes. Studies show that overcrowding in ED increases mortality and morbidity.[14 15] Our 4 hour Performance is shown in Figure 5.

These events led to the RVH ED making headline news following Major Incident Call on January 8th this year. The issues surrounding the declaration of a major incident are affecting all ED's in Northern Ireland and nationally and they are not separate from the challenges affecting the Health Service throughout primary and secondary care. When a service is working at full capacity, when there is no give, no slack or redundancy in the system, then that system is forever balanced on the edge of an inability to copy, an inability to deliver and falter it will. To process patients in the ED and through the granularity of processes in the patients' journey, one needs to be able to have a place to which they can be discharged, whether that is an available bed within the hospital setting or the availability of a community-based package of care. Add to that, the issue of staff mix which should be consultant-led with well communicated strategies to build greater capacity and resilience across unscheduled care. There is a lack of ED consultants across Northern Ireland and indeed throughout the UK. This is an issue that has to be recognised. We need to be able to recruit and retain our ED consultants. Working terms and conditions must include a work life balance to firstly attract and secondly retain consultants. This means that in the long term, we need more effective workforce planning. There is increasing demand on the Health Service due to demographic changes, ageing population, new technologies and increased patient expectation. All this is occurring against a backdrop of increased financial constraint. Seven day working week must now be an integral part of health care delivery. Proper workforce planning with annualised working rota will bring about a resilient, sustainable and safe service and recruitment and retention will be become a thing of the past. Work life balance in a high stress working environment must remain the imperative of all health care institutions.

TEACHING AND TRAINING

Whilst Service delivery has its own importance, teaching medical students and training of junior doctors has to remain part of the primary function of all University hospitals including the RVH. We are here to empower and facilitate our students and doctors, to optimise their futures as Health Care Professionals. Emergency medicine provides a challenging environment in which the medical student and doctor in training can develop clinical acumen and skills that form the basis for further learning and growth in knowledge and skills.

We are deeply cognisant of a responsibility to care for, encourage, challenge and motivate our medical students and junior doctors to realise their full potential. Our caring imperative underlines our determination to do more for our

students and doctors than just impart knowledge. We must ensure that not only are our student and doctors strategically positioned at the frontiers of leading edge knowledge and skills but also they must have the competencies to contextualise that knowledge in terms of patient care. As consultants, the most rewarding part of our job is observing and supporting growth in knowledge, skills and attitude of the young doctor who go on to develop into mature practising doctors. We encourage feedback from our doctors and students such that we can inform and shape our approach to innovate and change. This requires adequate infrastructure, staffing and technology. Our future success is contingent on our ability to grow RVH's national presence and reputation as a centre of excellence in healthcare professional education and training.

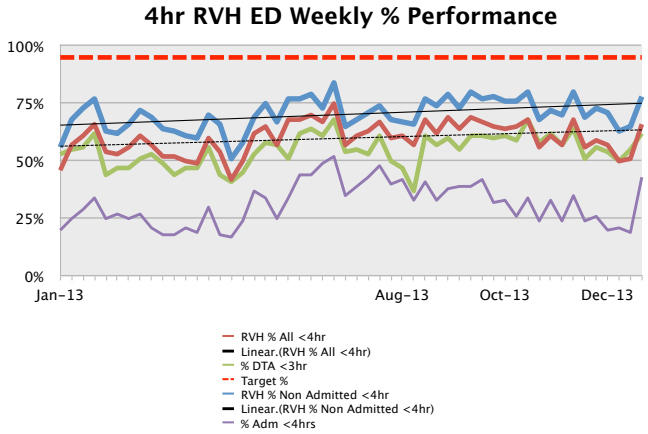

Fig 5. RVH ED Weekly Performance for Year 2013

SOLUTIONS

The solutions are as complex as the problems. In a recent interview, Tom Coffey, co-chair of the London Urgent and Emergency Clinical Network says 'that the clear responsibility for patients should rest with GPs and yes GP's could perhaps take back the responsibility for patient care OOH (out of hours) but not return to the old contract'.[16] However, he adds that the delivery of OOH care should be a shared responsibility with a combination of 111, co-location urgent care centres, Nursing homes/care homes having more proactive links and support from GP's, geriatricians and advocates to avoid 999 calls and ED attendances.

In the event of patients ending up in ED there should be better social care packages accessible 7 days a week and OOH. Better financial incentives for EM with readjustment of the tariffs to reflect the level of activity in EM. Consultant led ED service with senior medical decision making early in the patients' journey to avoid admissions and optimise patient flow.

THE FUTURE - NEXT STEPS FOR BELFAST TRUST;

Our speciality is evolving and the CEM is leading on the requirements and evidence that supports effective, efficient and safe patient care, which will promote the recruitment and retention of staff with the flexibility to meet future developments in healthcare, technology and patient volumes. We need to build on CEM work and what it means for the RVH. There is and has been a willingness to change but it has to be properly planned, managed and resourced. Opportunities must be created to bring together all stakeholders clinicians and managers to design, own and deliver pathways that make meaningful change. Such processes need to be continually challenged and reviewed.

Some of the challenges facing the RVH discussed above are being resolved a new RVH ED facility will open early next year this will resolve in most part the spacing challenge. Timely diagnostics is increasing within the RVH and this challenge will be largely resolved pending financial commitment to equipment and staffing. More consultant recruitment is in progress and the one year sabbaticals are coming to an end. This will alleviate some of the staffing challenges. However more debate is required on the annualised working rotas and the spectrum of conditions that ED will deliver. This debate is of the utmost importance to ensure that the specialty is attractive for recruitment and retention and there is a stream of capable and expert clinicians.

Robust escalation plans must be developed which reflect the risks and pressures of all stakeholders the Trust needs to hold workshops with all stakeholders to ensure that there is a shared understanding of the risks so that patient safety is ensured and a consistent quality of emergency care is delivered.

If we are to have a seamless system of health care delivery there cannot be finger pointing, group blame or counterproductive time wasting arguments.

Finally Belfast Trust must communicate a clear vision for a single Emergency Department that is ED consultant led, adequately staffed and optimally supported with timely diagnostics and patient flow 24/7.

The author has no conflict of interest

REFERENCES

1. Jaques H. BMA must "act now" on stress and burnout, say doctors. *BMJ Careers*. 2013 Jun 25. Available online from: http://bit.ly/MDUJ01. Last accessed May 2014.
2. Shanafelt TD, Boone S, Tan L, Dyrbye LN, Sotile W, Satele D, *et al.* Burnout and satisfaction with work-life balance among US physicians relative to the general US population. *Arch Int Med.* 2012;**172(18)**;1377–85.
3. Boorman S. NHS health and wellbeing. Final report. Leeds: Department of Health, Great Britain. 2009. Available online from: http://bit.ly/MDUJ02. Last accessed May 2014.
4. Workforce and Facilities Team statistics team, Health and Social Care Information Centre. [HSCIC]. Sickness, absence rates in the NHS: January–March 2003 and annual summary 2009–10 to 2012-13. Leeds: HSCIC. 2013. Available online from: http://bit.ly/MDUJ03. Last accessed May 2014.
5. Field S. Doctors at breaking point. *MDU J.* 2013; **29(2)**: 5-7. Available online from: http://bit.ly/1lzxay4. Last accessed May 2014.

6. Felton JS. Burnout as a clinical entity – its important in health care workers. *Occup. Med.* 1998; **48(4)**: 237–50. Available online from: http://bit.ly/MDUJ04. Last accessed May 2014.

7. Field S. Doctors at breaking point. *MDU J.* 2013; **29(2)**: 5-7. Available online from: http://bit.ly/1lzxay4. Last accessed May 2014.

8. Higginson I, Hughes T, Hassan T. Funding emergency departments: why the current system is failing our patients and what needs to be done about it. London: The College of Emergency Medicine. 2013. Available online from: http://bit.ly/RMMQX8. Last accessed May 2014.

9. The College of Emergency Medicine. 10 priorities for resolving the crisis in Emergency Departments. London: The College of Emergency Medicine. 2013. Available online from: http://bit.ly/1hpyTYH. Last accessed May 2014.

10. Mann C. CEM news. *BMJ Suppl Emerg Med J.* 2014 Apr. 1-2. Available online from: http://bit.ly/1js6DH6. Last accessed May 2014.

11. Keogh B. NHS England. High quality care for all, now and for future generations: transforming urgent and emergency care services in England - urgent and emergency care review. End of phase 1 report. The Keogh Urgent and Emergency Care Review. Leeds: NHS England. 2013. Available online from: http://bit.ly/1mIQSeW. Last accessed May 2014.

12. NHS England. News. Monitor and NHS England call for views on how the NHS payment system can do more for patients. Leeds: NHS England. 2013 May 13. Available online from: http://bit.ly/1iZjVFq. Last accessed May 2014.

13. Compton J. Transforming your care. A review of health and social care in Northern Ireland. Belfast: Department of Health, Social Services and Public Safety, Northern Ireland. 2011. Available online from: http://bit.ly/1dxKD4I. Last accessed May 2014.

14. Richardson DB. Increase in patient mortality at 10 days associated with emergency department overcrowding. Med J Aust 2006;**184(5)**:213-6.

15. Sprivulis PC, Da Silva JA, Jacobs IG, Frazer AR, Jelinek GA. The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments. Med J Aust 2006; 184:208-12. Medline Web of Science

16. CEM news. Primary and emergency care: an interview with Tom Coffey *BMJ Suppl Emerg Med J.* 2013; **30(11)**: 3–4. Available online from: http://bit.ly/1keP24y. Last accessed May 2014.

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Paper

Hereditary Gigantism – the biblical giant Goliath and his brothers

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ABSTRACT:

The biblical giant Goliath has an identifiable family tree suggestive of autosomal dominant inheritance. We suggest that he had a hereditary pituitary disorder possibly due to the AIP gene, causing early onset and familial acromegaly or gigantism. We comment on the evidence within the scriptures for his other relatives including a relative with six digits and speculate on possible causes of the six digits. Recognition of a hereditary pituitary disorder in the biblical Goliath and his family sheds additional information on his and other family members' battles with David and his relatives.

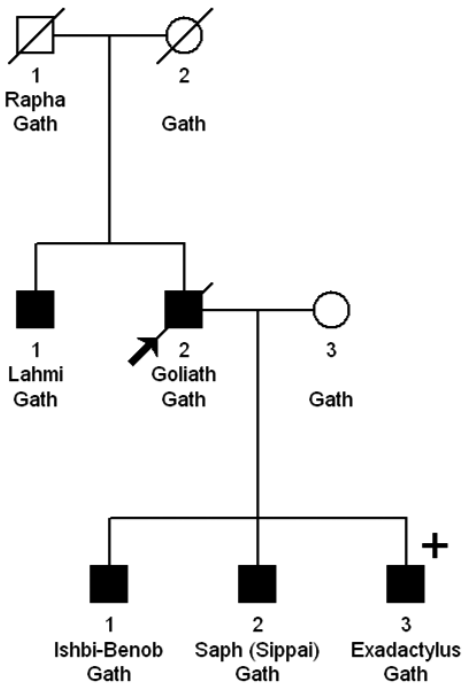

Fig 1. Goliath's Pedigree. Affected members are shaded in black. + symbol indicates exadactyly.

INTRODUCTION

Giants have been around since time began; they are first described in the Bible in the book of Genesis (6:1-4)[1]. Originally, giants appear to have been regarded positively, often considered as heroes, particularly by the non-Hebrew population. After the great Flood, giants remained present in the scriptural texts, but their good reputation had waned in the eyes of the Hebrews, and they often tended to be seen as the enemy, often fighting in armies. Giants lived together as a number of separate races, before and after the Flood. The exact relations between different families of giants are a little unclear. For example, the Nephilim (Numbers 13:32-33), appear to be present before and after the flood. The Emites, the Ammonites (or Anakites) and the Rephaim (Deuteronomy 2:10-11), existed after the Flood and appear to be separate entities although the chronicler often uses the phrase 'like' suggesting they had a similar phenotype. The Anakim seem to be derived from the Nephilim. The Rephaim although similar to the Nephilim, appear to be distinct from them with respect to family lineage. Deuteronomy 2.21 states the Rephaim were largely subdued by the Ammonites which 'dwelt in their stead' One of the most prominent Rephaim was Og, King of Bashan, who slept in 'a bedstead of iron; nine cubits was the length, and four cubits the breadth of it' (Deuteronomy 3:11). A cubit was the distance from the elbow to the fingertips. He appears to be one of the last survivors of the Rephaim. A race of giants implies a hereditary element and the origins of some names may indicate the genetic pathway involved. The Hebrew word anaq may mean necklace (Proverbs 1:9), or possibly goitre. This could suggest hyperthyroidism, possibly due to underlying pituitary gland, or other endocrine, dysfunction.

A FAMILIAL ASPECT TO GOLIATH'S GIGANTISM.

Goliath, the Gittite, is the most well known giant in the Bible. He is described as 'a champion out of the camp of the Philistines, whose height was six cubits and a span' (Samuel 17:4). From Samuel and Chronicles (table 1), we have drawn Goliath's pedigree (figure 1). A literal interpretation of the verses suggests that his brother and three sons were also of giant stature. The name of Goliath's third son does not appear in the Bible, so we have named him Exadactylus as it was said that 'he had on every hand six fingers, and on every foot six toes' (Samuel 21:20-21). Goliath's family tree is suggestive

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of a hereditary autosomal dominant pituitary gene, such as AIP[2].

Goliath was killed by David who threw a stone at his forehead (Samuel 17:49). This gives further evidence that he suffered from pituitary gland dysfunction; a pituitary tumour pressing on his optic chiasm, and consequent visual disturbance due to pressure on his optic nerve, would have made it difficult for him to see the stone in his lateral vision. Pituitary giants look impressive in terms of stature, but may not have speed and agility to match their perceived strength. David, having agility, particularly having declined the heavy set of armour that was offered to him, and being skilled at sling shots, may have found a way around the fearsome looking giant by firing a sling shot from the side of the battlefield. The fact that Goliath may have had a pituitary tumour was recognised by Vladimir Berginer in a paper in 2000[3]. In his description of the condition, he notes a painting of David and Goliath by Puget in the 18th century noting the appearance of acromegaly in the severed head of Goliath, and remarks that the painting was done more than one hundred years before Marie originally described the condition in 1886. He also helpfully comments that Goliath was killed by David severing his head, not from the impact of the stone which felled him, possibly due to brain contusion, but did not actually kill him directly.

TABLE I

Bible references for the relatives in figure 1

Name	Position in Pedigree	Bible Reference
Lahmi	II:1	Samuel 21:19 Chronicles 20:5
Ishbi-Benob	III:1	Samuel 21:16
Sippai (Sath)	III:2	Samuel 21:18 Chronicles 20:4
'Exadactylous'	III:3	Samuel 21:20-21 Chronicles 20:6-7

Gigantism results when a growth hormone-secreting pituitary adenoma is present before epiphyseal fusion. Pituitary adenomas can be present in a number of genetic conditions, such as multiple endocrine neoplasia type 1, Carney complex, and Familial Isolated Pituitary Adenoma (FIPA). FIPA is an autosomal dominant condition with incomplete penetrance, caused by germline mutations of the aryl hydrocarbon receptor interacting protein (AIP) gene4. Patients with AIP mutations have an earlier mean age at diagnosis than AIP mutation-negative patients[4]. The age of Goliath is not clear, but early onset of pituitary tumours is typical of hereditary gigantism and limitation of lateral vision is common. Goliath himself had a shield bearer precede him, possibly to indicate to Goliath the direction of the approaching foe.

Polydactyly has not been described in association with FIPA. The AIP gene lies on chromosome 11q13.3. The Bardet-Biedl gene, BBS1, is located close by on chromosome 11q13.2. Bardet-Biedl syndrome type I is characterized by rod-cone dystrophy, truncal obesity, cognitive impairment and postaxial polydactyly[5]. The protein encoded by BBS1 is thought to play a role in limb development. It is unlikely that Goliath's family had FIPA caused by a microdeletion which also involved BBS1, as the genetic distance between the BBS1 and AIP genes is separated by a 1 Mb gene-packed region. Such a gap makes an inherited contiguous gene syndrome unlikely as there would have been too many other features. Very rarely BBS1 patients have symmetric exadactyly; most commonly it is present in one or two extremities, upper and lower - not in all four. We are not given much other detail about Exadactylus so a new BBS1 mutation due to some complex rearrangement is unlikely – a new mutation in an autosomal dominant polydactyly gene might explain his symmetrical phenotype. If he had pituitary disease and six digits – he may have looked an intimidating foe - but he may not have been a great warrior in action.

Interestingly, the book of Samuel refers to five stones that David carefully selected for his sling from the nearby stream, and further reading of the surrounding passages shows that David's relatives were all involved in the deaths of the other giants in Goliath's family. There can be other interpretations for this and various types of symbolism, but it appears likely that several giants may have been from Goliath's family, further suggesting autosomal dominant inheritance. The reverse also almost happened - Ishbibenob, Goliath's son, is credited with almost killing David until the swift intervention of David's nephew Abishai (2 Samuel 21.16), so clearly intellect or agility was not deficient in some of the giants, and myopathy seen in some cases of pituitary disease in later life, not a direct issue in the younger giants.

The giants from Gath were present after the Flood. One possible answer to the often raised question of why the Nephilim giants, present before the Flood were not eradicated by it, could be that new mutations in the AIP gene (or other genes) caused new families of giants to appear. There is no evidence in the Bible to suggest that the Nephilim, Rephaim or Anakim were directly related but they may have had some relations and intertwined lineage. If Goliath was the son of Rapha – he is likely to be descended from the Rephaim, but being brought up in Gath, an ancient stronghold of the Anakim, could suggest he may also have had some Anakim relatives, making his champion status even more significant in the ancient world.

Families of giants have been described in the medical literature[6], but this may be one of the oldest and most famous examples to be documented. Perusal of the archaeological literature of that period gives evidence of giants being excavated but numerous fakes exist. Technology now exists to extract DNA from giant skeletons[2], and if any new excavations in the Middle East unearth a skeleton suggestive of Goliath, or of Og or similar biblical giants, more proof may be obtained by careful DNA analysis and it may be possible

in the future to delineate the exact relations between different giant lineages in the bible, and dissect them further.

In conclusion, Goliath may have had an AIP mutation causing early onset autosomal dominant pituitary gigantism and one of his sons may have had a syndrome involving both AIP and BBS1, which could some way account for the physical characteristics of his family and their good success rate on the battle field until they met David.

Acknowledgements.

We thank the reviewers for their helpful comments, particularly the theological reviewer who carefully checked our statements on the Biblical giants for accuracy and who provided very helpful comments including original Hebrew text, which has helped us clarify the scriptural texts for UMJ readers.

The authors have no conflict of interest.

REFERENCES

1. The Holy Bible. King James Version, 1611 Edition. Edinburgh, UK: Hendrickson Publishers; 2010. Genesis 6:1-4.
2. Chahal HS, Stals K, Unterhälter M, Balding DJ, Thomas MG, Kumar AV, Morrison PJ, et al. AIP mutation in pituitary adenomas in the 18th century and today. *N Engl J Med*. 2011;**364(1)**:43-50.
3. Berginer VM. Neurological aspects of the David-Goliath battle: restriction in the giant's visual field. *Isr Med Assoc J*. 2000;**2(9)**:725-7.
4. Williams F, Hunter S, Bradley L, Chahal HS, Storr H, Akker SA, Morrison PJ, et al. Clinical experience in the screening and management of a large kindred with familial isolated pituitary adenoma due to an aryl hydrocarbon receptor interacting protein (AIP) mutation. *J Clin Endo Metab*. 2014;**99(4)**:1122-31.
5. Mykytyn K, Nishimura DY, Searby CC, Shastri M, Yen HJ, Beck JS, et al.Identification of the gene (BBS1) most commonly involved in Bardet-Biedl syndrome, a complex human obesity syndrome. *Nat Genet*. 2002;**31(4)**:435-8
6. Bradley L, Morrison PJ. Giants of the British Isles. *Ulster Med J* 2011;**80(1)**: 31-32.

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Case Report

Adrenal Sarcomatoid Carcinoma: A case report and review of the literature

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ABSTRACT

Adrenocortical sarcomatoid carcinoma (ASC) is an extremely rare variant of adrenocortical carcinoma (ACC). Its relative rarity and its characteristic histological pattern of both epithelioid and sarcomatoid components may pose diagnostic challenges which influence treatment. Here, we report a case of ASC in a 58 year-old man presenting with increasing abdominal pain and associated abdominal bloating with a large right adrenal mass detected by computed tomographic scan (CT). To our knowledge, only eleven prior cases of ASC have been reported in the literature. Here, we discuss the clinical, radiological and histopathological findings in our case, review the literature on ASCs and offer opinion on best management.

INTRODUCTION

Sarcomatoid carcinomas are tumours which contain both carcinomatous and sarcomatous differentiation. They have been identified in a variety of organ and tissue sites, including kidney, bladder, lung, breast and oesophagus.[1-3] Adrenocortical carcinoma (ACC) is an uncommon, aggressive malignancy with an estimated incidence of 1-2 per million population per year and, when untreated, a mean survival of 2.9 months.[4-7] Adrenocortical sarcomatoid carcinoma or carcinosarcoma (ASC) is a rare subgroup of ACC. To our knowledge, only eleven cases have been previously reported in the literature. [8-17] We present the twelfth case and review the previous published literature to identify management strategies for the treatment of this rare tumour subtype.

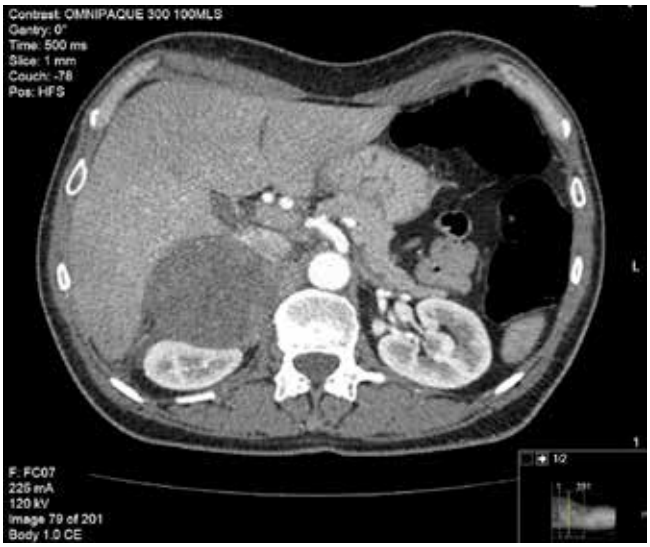

Fig 1a. Axial Abdominal CT scan showing large right sided adrenal mass.

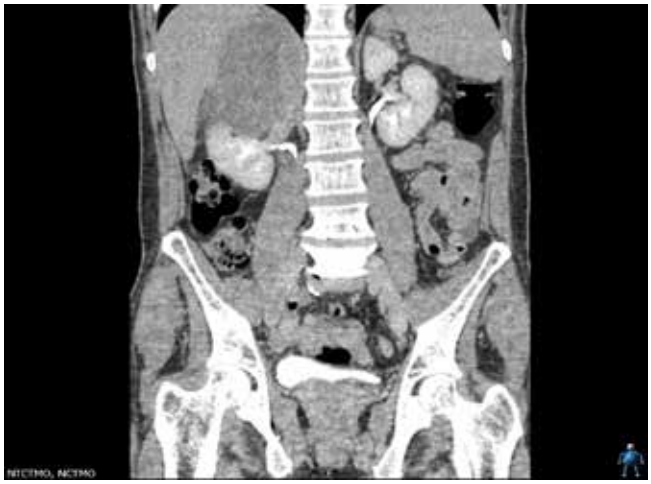

Fig 1b. Coronal Abdominal CT scan showing large right sided adrenal mass.

CASE REPORT

A 58-year-old caucasian male presented with a gradual onset of right sided loin pain over a number of months. A sudden increase in his pain prompted admission to a District General Hospital. The patient described a constant right loin pain with radiation to his groin. Initial urinalysis showed haematuria and a CT of his urinary system was arranged to investigate possible renal calculi. This identified an underlying adrenal mass. A further CT scan of the chest abdomen and pelvis confirmed a 9 x 7cm right sided adrenal mass.

The patient was transferred to a Regional Specialty Endocrine Surgery centre where hormone studies were performed

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to determine the potential functionality of the tumour. 24 hour urinary catecholamines, a dexamethasone suppression test, the Cortisol/Creatinine ratio and testosterone, dihydroxyepiandrosterone sulphate (DHEAS) and aldosterone levels were all within normal limits confirming the presence of a non-functioning adrenal mass. The patient went on to have an adrenalectomy and nephrectomy for the underlying lesion. The initial laparoscopic procedure was converted to open due to adherence of the mass to surrounding structures making for a difficult dissection from the inferior vena cava, inferior surface of the liver and the posterior abdominal wall musculature to which it was attached. Despite these difficulties a complete macroscopic excision was achieved. Post operatively the patient made an uneventful recovery. Given the extent of the primary tumour, and despite evidence of macroscopic excision, it was felt that the patient's greatest risk of relapse was at the site of surgery from a local recurrence. The patient went on to have 25 fractions of external beam radiotherapy at a dosage of 45 Gray (Gy). The benefits of chemotherapeutic agents were discussed with the patient and he and the oncology team felt that, given the absence of metastatic disease, any potential benefit was outweighed by potential morbidities of the treatment. At 16 months from initial diagnosis and treatment the patient was found to have evidence of metastatic disease to lung and brain. However a tissue diagnosis confirmed this to represent disease load from a second primary malignancy of lung origin. To date there is no evidence of local recurrence on CT PET or MRI of the previous adrenal malignancy.

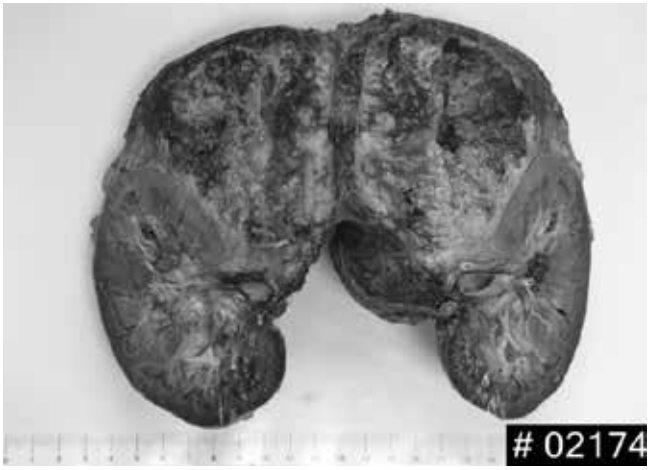

Fig 2. Specimen showing necrosis within the adrenal mass with no macroscopic evidence of extracapsular extension.

MACROSCOPIC EXAMINATION

The specimen weighed 573 g. The right kidney measured 12 x 7 x 5 cm and was compressed superiorly by a 12 x 5 x 6 cm adrenal mass. On sectioning of the specimen, the mass was found to be well-circumscribed with no macroscopic evidence of extracapsular extension. There was extensive haemorrhage and necrosis within the mass (Figure 2). The interface between the kidney and the mass was examined carefully by close serial sectioning. No communication between the two was identified

MICROSCOPIC EXAMINATION

Histology of multiple representative sections showed a malignant tumour composed of diffuse sheets of epithelioid and spindle cells. There was marked nuclear atypia. No clear cell component was identified. Mitotic activity was brisk, at approximately 70 mitoses per ten high-power fields. The epithelioid and spindled areas were equally mitotically active. Numerous atypical mitoses were present. There was extensive necrosis. Tumour giant cells were present as well as a prominent lymphohistiocytic infiltrate (Figures 3a and 3b). No venous invasion was identified, and no evidence of extension into the surrounding soft tissues was seen. No normal adrenal gland tissue was identified. The kidney, which was removed en bloc, was histologically unremarkable. The area of kidney adjacent to the tumour was sampled in its entirety for histology. This showed no involvement by tumour.

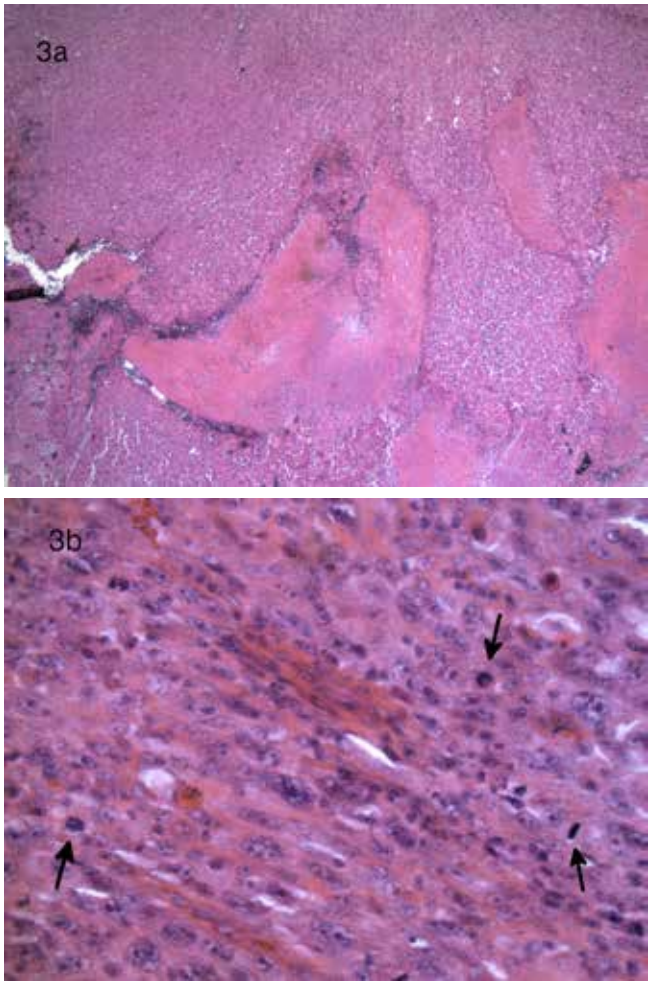

Fig 3a. Histopathology section (magnification x25) showing extensive necrosis and a prominent lymphohistiocytic infiltrate. Figure 3b: Section (magnification x200 showing a brisk mitotic activity and spindle cell components.

IMMUNOHISTOCHEMISTRY

The tumour cells showed strong, diffuse positivity with cytokeratins AE1/3 and Cam5.2. Cytokeratin 7 and epithelial membrane antigen showed patchy positivity. Weak positivity with synaptophysin was also present. The only other positive

TABLE 1:

Summary of ASC reported in the literature to date

Case No.	Reference	Age	Sex	Clinical Presentation	Metastatic Disease at Presentation	Size +/- Weight	Sarcomatous Component	Postoperative Survival
1	Okazumi et al. (1987)	46	M	Abdominal distention	No	14cm, 880g	Spindle cell	6 months
2	Collina et al. (1989)	69	F	Abdominal pain	No	11cm	Spindle cell	6 months
3	Decorato et al. (1990)	42	F	Abdominal pain	No	19cm, 1400g	Rhabdomyosarcoma	7 months
4	Fischler et al. (1992)	29	F	Weight loss, virilization	No	12.5cm, 610g	Rhabdomyosarcoma	8 months
5	Barksdale et al. (1993)	79	F	Hypertension	Invasion of Inferior Vena Cava	5cm, 199g	Osteosarcoma, chondrosarcoma	Not recorded
6	Lee et al. (1997)	61	M	Flank pain	Liver	12cm	Spindle cell	2 days
7	Strum et al. (2008)	31	M	Abdominal pain	No	12cm, 620g	Spindle cell	3 months
8	Coli et al. (2010)	75	F	Abdominal pain	No	15cm	Spindle cell	12 months
9	Sasaki et al. (2010)	45	M	Abdominal pain	Retroperitoneum, pancreas and duodenum	17cm, 2974g	Rhabdomyosarcoma	3 months
10	Feng et al. (2010)	72	M	Flank pain	No	No record	Spindle Cell	Not recorded
11	Thway et al. (2012)	45	M	Abdominal pain	Retroperitoneal nodes and pulmonary deposits	24cm, 6500g	Pleomorphic rhabdomyosarcoma	11 months
12	Current Study (2013)	58	M	Flank pain	No	12cm, 573g	Spindle cell	No evidence of metastatic adrenal disease at 17 months

immunohistochemical markers were CD10, vimentin (strong), desmin and S100 (weak). RCC marker antigen was negative. All other epithelial (including neuroendocrine) and mesenchymal markers were negative, as were melanocytic markers. MIB1 proliferative index was approximately 40%.

Due to these morphological and immunohistochemical findings, it was important to consider the possibility of sarcomatoid renal cell carcinoma. There was, however, no communication between the ipsilateral kidney and the adrenal mass. The contralateral kidney was radiologically normal. The most likely diagnosis on the basis of the clinical, radiological and pathological findings was therefore felt to be adrenocortical sarcomatoid carcinoma.

DISCUSSION

We present the twelfth documented case of Adrenocortical sarcomatoid carcinoma and a comprehensive summary of the previous literature. The age of presentation of ASC ranges from 29 - 79 years (mean 54.3 years). Although the number of cases reported is small, there is a female to male ratio of 1.4. Despite aggressive treatment, this variant of ACC has a poor prognosis, with the majority of patients succumbing to the disease within 3 - 12 months (mean 7 months) following surgical intervention. The greatest determinants of early demise appear to be limited surgical resection and presence of distant metastatic spread at time of presentation.

All twelve cases can be defined as being carcinosarcoma or sarcomatoid carcinoma as suggested by Strum et al.[14] Carcinosarcoma combines features of conventional ACC and areas of sarcoma which include heterologous elements such as rhabdomyosarcoma (skeletal muscle differentiation), chondrosarcoma and osteosarcoma. Sarcomatoid carcinoma, also referred to as carcinoma with sarcoma-like component, is mostly composed of malignant spindle cells without any identifiable heterologous differentiation and is often associated with areas of more conventional epithelial differentiation.[14] Our case represents a sarcomatoid carcinoma since there was a prominent population of malignant spindle cells which did not show any recognizable differentiation. These findings were similar to six of the previous eleven reported cases.[8,9,13,14,15,16] The other five previously reported cases were more appropriately classified as carcinosarcoma, with rhabdomyosarcoma identified as the sarcomatous component in three[10,11,17], pleomorphic rhabdomyosarcoma in one[18] and the final case showing elements of both osteosarcoma and chondrosarcoma.[12]

The rarity of these subgroups of ACC presents a histopathological challenge, particularly when applying the Weiss scoring system which has remained the most widely used means of assessing the potential for malignancy in adrenocortical neoplasms.[20,21] The presence within a tumour of a sarcomatous or sarcomatoid component seems to be a predictor of shorter survival in ACC. Sarcomatoid histology is not accounted for in the Weiss system, which may lead to confusion when dealing with these tumours, particularly with regards to the proportion of diffuse architecture required.[22] In this setting, Sturm and colleagues have proposed that a sarcomatoid component should be well circumscribed and represent at least 10% of the tumour bulk in order to establish this unusual diagnosis.[14,22] Whilst this rare tumour subtype represents a significant clinical, radiological and histopathological diagnostic challenge, its prompt identification will ensure the best long term prognosis in a cancer that requires a maximally aggressive management approach.

Given the rarity of this tumour subtype an evidence-based consensus regarding best oncological treatment is difficult. The use, or documented use, of adjuvant treatments in the previous cases was variable. In eight cases no additional treatments were reported [8,10,12,13,15,16,17,18] the remaining three cases opted mainly for chemotherapy with a combination of Cisplatinum and Etoposide reported by Collina[9] and Fischler et al[11] and Cisplatinum used in isolation by Strum et al.[14] Fischler also reported additional adjuvants with Mitotane in combination with chemotherapeutics. Only one of the previous cases used radiotherapy but it is assumed, given the radiation doses described and the context of bony metastatic disease, that this was for symptomatic palliation only.[9] Our patient was clinically well 14 months following surgical intervention with follow up CT imaging showing no evidence of local recurrence. Our patient has been the longest survivor when compared to previous cases however he has unfortunately gone on to develop evidence of malignant spread from a second primary lung malignancy. We maintain that the greatest chance of long term survival from adrenal sarcomatoid carcinoma to be early detection prior to metastatic spread, radical complete excision and adjuvant external beam radiotherapy in an attempt to prevent local disease recurrence. Despite these findings our patient has been the longest survivor when compared to previous cases and we therefore surmise that the greatest chance of long term survival to be early detection prior to metastatic spread, radical complete excision and adjuvant external beam radiotherapy in an attempt to prevent local disease recurrence.

All authors have no conflict of interest

REFERENCES

1. Guarino M, Tricomi P, Giordano F & Cristofori E. Sarcomatoid carcinomas: pathological and histopathogenic considerations. *Pathology*. 1996; **28**: 298-305.
2. Meis JM, Ordonez NG & Gallagher HS. Sarcomatoid carcinoma of the breast: an immunohistochemical study of six cases. *Virchows Archiv*. 1987; **410**: 415-421.
3. Weidner N. Sarcomatoid carcinoma of the upper aerodigestive tract. *Seminars in Diagnostic Pathology*. 1987; **4**: 157-168.
4. Tauchmanovà L, Colao A, Marzano LA, Sparano L, Camera L, Rossi A, Palmieri G, Marzano E, Salvatore M, Pettinato G, Lombardi G & Rossi R. Adrenocortical Carcinomas: Twelve-year Prospective Experience. *World J Surg*. 2004; **28**: 896-903.
5. Hanna NH & Kennedy E. Advances in the management of adrenal tumours. *Curr Opin Oncol*. 2000; **11**: 49–53.
6. Thompson NW & Cheung PSY. Diagnosis and treatment of functioning and nonfunctioning adrenocortical neoplasms including incidentalomas. *Surg Clin North Am*. 1987; **67**: 423–436.
7. Søreide JA, Brabrand K & Thoresen SØ. Adrenal cortical carcinoma in Norway, 1970-1984. *World J Surg*. 1992; **16**: 663–668.
8. Okazumi S, Asano T, Ryu M, Nagashima T, Odaka M, Isono K & Nishizawa T. Surgical resection of adrenal carcinoma extending into the vena cava, right atrium and ventricle: case report and review of the literature. *Nippon Geka Gakkai Zasshi*. 1987; **88**: 231–238.
9. Collina G, Maldarizzi F, Betts CM & Eusebi V. Primary sarcomatoid carcinoma of the adrenal gland. First case report. *Virchows Arch A Pathol Anat Histopathol*. 1989; **415**: 161–167.
10. Decorato JW, Gruber H, Petti M & Levowitz BS. Adrenal carcinosarcoma. *J Surg Oncol*. 1990; **45**: 134–136.
11. Fischler DF, Nunez C, Levin HS, McMahon JT, Sheeler LR & Adelstein DJ. Adrenal carcinosarcoma presenting in a woman with clinical signs of virilization. A case report with immunohistochemical and ultrastructural findings. *Am J Surg Pathol*. 1992; **16**: 626–631.
12. Barksdale SK, Marincola FM & Jaffe G. Carcinosarcoma of the adrenal cortex presenting with mineralocorticoid excess. *Am J Surg Pathol*. 1993; **17**: 941–945.
13. Lee MS, Park IA, Chi JG, Ham EK, Lee KC & Lee CW. Adrenal carcinosarcoma—a case report. *J Korean Med Sci*. 1997; **12**: 374–377.
14. Sturm N, Moulai N, Laverriere MH, Chabre O, Descotes JL & Brambilla E. Primary adrenocortical sarcomatoid carcinoma: case report and review of literature. *Virchows Arch*. 2008; **452**: 215–219.
15. Coli A, Di Giorgio A, Castri F, Destito C, Wiel Marin A & Bigotti G . Sarcomatoid carcinoma of the adrenal gland: a case report and review of literature. *Pathol Res Pract*. 2010; **206**: 59–65.
16. Feng YC, Yang ZG, Chen TW, Su XY, Deng W & Wang QL. Adrenal sarcomatoid carcinoma: a rare case depicted on multi-detector row computed tomography. *Indian J Med Sci*. 2010; **64**: 1 37-40.
17. Sasaki K, Desimone M, Rao HR, Huang GJ & Seethala RR. Adrenocortical carcino- sarcoma: a case report and review of the literature. *Diagn Pathol*. 2010; **5**: 51.
18. Thway K, Olmos D, Shah C, Flora R, Shipley J & Fisher C. Oncocytic Adrenal Cortical Carcinosarcoma With Pleomorphic Rhabdomyosarcomatous Metastases. *Am J Surg Pathol*. 2012; **36**: 470–477.
19. DeLellis RA, Lloyd RV, Heitz PU & Eng C (2004) World Health Organization classification of tumours. Pathology and genetics of tumours of endocrine organs. IARC, Lyon.
20. Papotti M, Libe R, Duregon E, Volante M, Bertherat J & Tissier F. The Weiss Score and Beyond-Histopathology for Adrenocortical Carcinoma. *HORM CANC*. 2011; **2**: 333-340.
21. Weiss LM. Comparative histologic study of 43 metastasizing and nonmetastasizing adrenocortical tumors. *Am J Surg Pathol*. 1984; **8**: 163-9.
22. De Krijger RR & Papathomas TG. Adrenocortical neoplasia: evolving concepts in tumorigenesis with an emphasis on adrenal cortical carcinoma variants. *Virchows Arch*. 2012; **460**: 9-18.

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Grand Rounds

Diagnostic Lumbar Puncture

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ABSTRACT

Diagnostic Lumbar Puncture is one of the most commonly performed invasive tests in clinical medicine. Evaluation of an acute headache and investigation of inflammatory or infectious disease of the nervous system are the most common indications. Serious complications are rare, and correct technique will minimise diagnostic error and maximise patient comfort. We review the technique of diagnostic Lumbar Puncture including anatomy, needle selection, needle insertion, measurement of opening pressure, Cerebrospinal Fluid (CSF) specimen handling and after care. We also make some quality improvement suggestions for those designing services incorporating diagnostic Lumbar Puncture.

INTRODUCTION

HISTORY

The first reported Lumbar Punctures were performed in the late 19th Century by Heinrich Iraneus Quincke[1] - whose patient with meningitis survived 3 procedures, and around the same time Walter Essex Wynter reported four patients undergoing Lumbar Puncture all of whom died.[1] No imaging techniques were available and these procedures were associated with high mortality, which may have led to an unjustified poor reputation of the procedure.

The advent of computed tomographic imaging allowed identification of brain lesions that would place a patient at risk of tentorial herniation. Prospective[2] and retrospective[3] studies have identified clinical features that are associated with low risks of complication. These include absence of focal neurological deficits, no history of seizure in the previous week, and immunocompetence.[2] In trained hands, Lumbar Puncture is a straightforward procedure with few complications. According to The Health and Social Care Information Centre for England, there were 55,427 episodes of hospital care that included a diagnostic Lumbar Puncture in 2011-12, 0.53% of all hospital consultant episodes, which in Northern Ireland's health system, with 600,000 admissions annually, would equate to about 8 diagnostic Lumbar Punctures per day.[4]

INDICATIONS

There are many indications for Lumbar Puncture (Table 1), but obtaining CSF may be the only way of confirming or refuting subarachnoid haemorrhage, meningitis and neuro-inflammatory diseases. Lumbar Puncture is still required

TABLE 1:

Indications for Lumbar Puncture

To exclude subarachnoid haemorrhage in acute severe headache
To investigate or exclude meningitis • Bacterial • Viral • Tuberculous • Cryptococcal • Chemical • Carcinomatous
To investigate neurological disorders • Multiple Sclerosis • Sarcoidosis • Guillian Barre, Chronic Inflammatory Demyelinating Polyneuropathy • Mitochondrial Disorders • Leukencephalopathies • Paraneoplastic Syndromes
To demonstrate and manage disorders of Intracranial Pressure • Idiopathic Intracranial Hypertension • Spontaneous Intracranial Hypotension
To administer therapeutic or diagnostic agents* • Spinal anaesthesia • Intrathecal chemotherapy • Intrathecal antibiotics • Intrathecal baclofen • Contrast media in myelography or cisternography *The National Patient Safety Agency recommends formal training for those who undertake intrathecal injection[6].

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Table 2:

Tests frequently performed on CSF

Test	Utility	Volume	Form	Additional
Microbiology	Cell count, culture and sensitivity	20 drops	Microbiology	
Biochemistry	Protein and glucose	20 drops	Biochemistry	Paired serum protein and glucose samples
Xanthochromia	Spetrophotometry	20 drops in each of 3 serially numbered bottles	Biochemistry	Transport in opaque envelope or wrap sample container in foil.
Oligoclonal bands	Investigation of CNS inflammation	20 drops	Immunology	Paired serology serum sample
Cytology	Investigation of malignant meningitis	50 drops	Neuropathology	Swift transport to laboratory
Cytospin	Investigation of CNS lymphoma	20 drops	Haematology	Prior arrangement and swift transport to laboratory
Viral PCR	PCR for viral DNA	20 drops	Virology	
ACE	Investigation of neurosarcoidosis	20 drops	Biochemistry	Paired serum ACE sample
Lactate	Investigation of neurodegenerative disorders	20 drops	Biochemistry	Paired serum lactate sample

to obtain indirect measurements of intracranial pressure, although non-invasive methods of intracranial pressure estimation are undergoing validation.[5]

CONSENT AND DOCUMENTATION

Consent should include the risk of Post-Lumbar Puncture Headache (PLPH), which has a published incidence of 32%.[7] Other risks to discuss include failure to obtain CSF, localised bruising, bleeding and local discomfort at the injection site. Iatrogenic meningitis and nerve root injury are exceptionally rare.[8]

The procedure should be documented in the patient's notes. The position and vertebral space selected, local anaesthesic (type, strength and volume), needle type, opening pressure, CSF appearance (clear, cloudy, blood-stained or pigmented) and number of samples collected should be documented, allowing another physician to retrospectively interpret the investigative findings accurately. A proforma (Figure 1) can serve as both aide memoire and audit tool. It is also advisable to document that post Lumbar Puncture advice has been given, and a patient information leaflet is one way to provide this information.

ANATOMY

Knowledge of the anatomy of the lumbar spine[9] is essential for anyone performing Lumbar Puncture. The Lumbar Puncture needle pierces in order: skin, subcutaneous tissue, supraspinous ligament, interspinous ligament, ligamentum flavum, epidural space containing the internal vertebral venous plexus, dura, arachnoid, and finally the subarachnoid space. (Figure 2).

If you are able to visualise the anatomy it will allow re-positioning of the needle, should the initial pass be unsuccessful - Figure 3 demonstrates the relationship between bony structures and the centre of the spinal canal.

The most important bony landmark is the L4 spinous process, which is located at the intersection of the 'intercristal' or 'Tuffier's' line (the line between the top of the iliac crests) and the lumbar spine midline (Figure 4). Radiological studies have shown that this clinical landmark is accurate in over 95% of the population,[10] although in females or obese people Tuffier's Line tends to be found at a higher level than L4.[11]

The approximate distance from the skin to the epidural space is 45 - 55mm and the dura mater may be up to 7mm beyond that depth.[12] Typically, a standard 90mm Whitacre needle (Vygon UK) will need to be inserted to two thirds of its length before it reaches the ligamentum flavum, with CSF obtained at about 10mm beyond that (Figure 5).

CSF SPECIMEN HANDLING

Prior to performing the Lumbar Puncture the practitioner

Fig 1. The lumbar puncture proforma currently in use in Craigavon Area Hospital

Affix Patient Label	Consultant …… Ward ……..		
Indication for LP	Thunderclap headache	Yes ☐	No ☐
	Headache with fever (suspected meningitis)	Yes ☐	No ☐
	Other Acute Headache (CT normal)	Yes ☐	No ☐
	Acute confusion	Yes ☐	No ☐
	Inflammatory/neoplastic CNS disease	Yes ☐	No ☐
	Guillain Barre Syndrome (discuss with Neurology)	Yes ☐	No ☐
	Other (specify)	Yes ☐	No ☐
CT Brain Performed	Yes ☐ No ☐ Reason if not performed……		
Consent form	Yes ☐ No ☐ Not competent ☐ (Discuss with relative if unable to consent)		
Information Leaflet	Yes ☐ No ☐		
Skin Preparation	Chlorhexidine ☐ Betadine ☐ Other (specify)		
Local Anaesthetic	1% Lidocaine ☐ 2% Lidocaine ☐ Amount used …… mL (NB: Maximum dose in adult is c. 2mg/kg) Was sedation required Yes ☐ No ☐		
Gauge of LP needle (Atraumatic 22G recommended)	……G Atraumatic needle Yes ☐ No ☐		
Procedure Details:	Body Position: Left lateral ☐ Right lateral ☐ Sitting ☐		
	Level of LP (L3/4 is recommended) L2/3 ☐ L3/4 ☐ L4/5 ☐		
	Did patient report nerve root pain shooting into foot or calf? Yes ☐ No ☐ If Yes – which leg Right ☐ Left ☐		
	Attempts to pass needle before CSF obtained/procedure abandoned ……		
	Stylet re-inserted prior to needle withdrawal Yes ☐ No ☐		
CSF characteristics	Opening pressure (to be recorded in ALL cases of acute headache) ……cm		
	CSF characteristics Clear ☐ Cloudy ☐ Blood-stained ☐ Frank blood ☐ Straw-coloured ☐		
CSF samples * Label in order of collection – 1, 2, 3 etc This is the required samples for acute headache – only one biochemistry required for other indications	1 2mls Microbiology ☐ 2 2mls Biochemistry – numbered in order of collection ☐ 3 2mls Biochemistry – numbered in order of collection ☐ 4 2mls Biochemistry – numbered in order of collection ☐ 5 2mls Immunology – if indicated ☐ 6 4mls Cytology – if indicated ☐		
Blood samples	Yellow top clotted – Biochemistry ☐ Grey top clotted – Biochemistry ☐ Red top plain – Immunology (if indicated) ☐		
After Care	Dressing to skin Elastoplast € Other dressing €		
	Advice to keep hydrated (2-3 litres of fluid orally in next 24 hours) Lie down if post-LP headache occurs Contact GP if persistent post-LP headache		
Doctor Performing LP	Signed: Block Capitals:		
LP performed	Date: Time:		

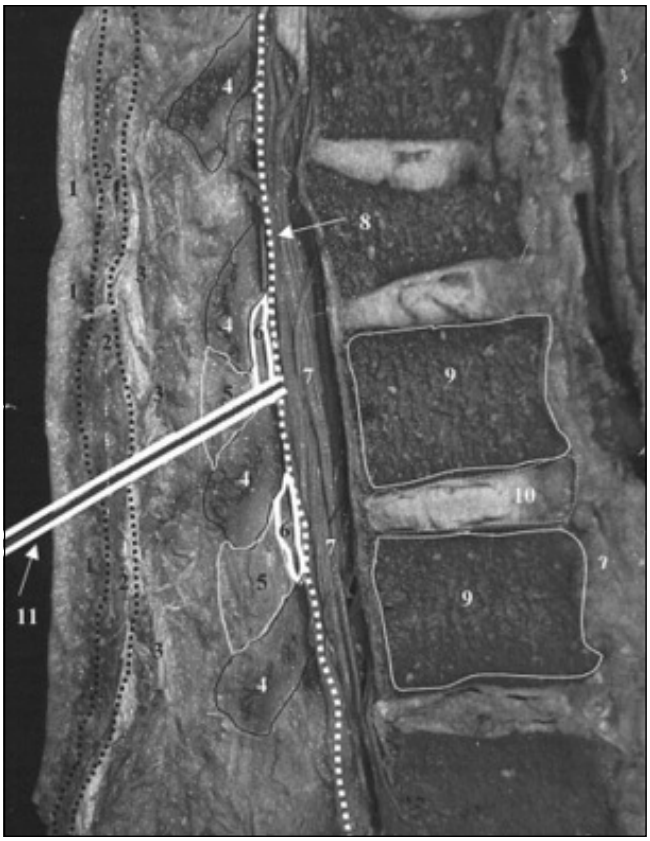

*Fig 2: Cadaveric sagittal section through lumbar spine showing proper needle trajectory (from Boon et al.*9)

Sagittal section of lumbar vertebrae illustrating the course of the lumbar puncture needle through skin (1), subcutaneous tissue (2), supraspinous ligament (3), interspinous ligament (5) between the spinous processes (4), ligamentum flavum (6), dura mater (8), into the subarachnoid space and between the nerve roots of the cauda equina (7). Lumbar vertebral bodies (9), intervertebral disc (10), and lumbar puncture needle (11).

should know which tests are required so that appropriate CSF samples are collected and where necessary paired serum (Table 2). Some samples require larger volumes (e.g. Cytology), and others require rapid transport to the laboratory (Cytospin testing for lymphoproliferative cells). Testing for CSF Xanthochromia (to detect bilirubin from blood breakdown) requires rapid transit of a light protected CSF sample to the laboratory. To protect from light the CSF bottle should be wrapped in foil or placed in an envelope. Samples should be correctly labelled with patient identifiers, time and date. Immediate transport by hand to the laboratory by an emergency porter is preferred to the use of vacuum tube delivery systems, as excessive movement of blood specimens has caused increased rates of haemolysis,[32] which could lead to in vitro CSF oxyhaemoglobin synthesis which would affect interpretation of spectrophotometry analysis.[33]

Isotope dilution studies show that an average adult makes about 500 ml of CSF every 24 hours, and that CSF is replaced about 4 times daily i.e. there is approximately 20 ml of CSF manufactured each hour.[8] About 30 ml of CSF resides in the Lumbar Cistern, so taking about 10 ml of CSF to facilitate diagnostic testing is not likely to endanger the patient. The patient is more likely to come to harm from inadequate CSF samples.

Fig 3. Correct position of tip of Lumbar Puncture needle in centre of Lumbar Spinal Canal at L3/4 level.

ASEPTIC TECHNIQUE

Diagnostic Lumbar Puncture is an aseptic procedure, but as there is no direct injection into the spinal canal, the procedure can be done in the ward setting and does not need to be done in an operating theatre. It should be noted that The Association of Anaesthetists of Great Britain and Ireland recommends that injections into the spinal canal, such as epidural blood patching, should only be performed using aseptic techniques in a theatre environment.[22] In a diagnostic Lumbar Puncture, standard bedside aseptic procedures apply with no-touch technique, sterile drapes and use of chlorhexidine or an equivalent antiseptic.

There has been wide variation in what clinicians, particularly anaesthetists, feel constitute aseptic technique for spinal procedures. Clinicians' views regarding hand-washing technique, donning of gowns or masks, and wearing of jewelry when placing an epidural catheter have been shown to vary.[23] Wearing of masks may be associated with reduced bacterial transfer. A cluster of four cases of streptococcal meningitis was caused by a physician who had chronic tonsillitis.[24]

Bacteria in the orifices of sebaceous glands and hair follicles

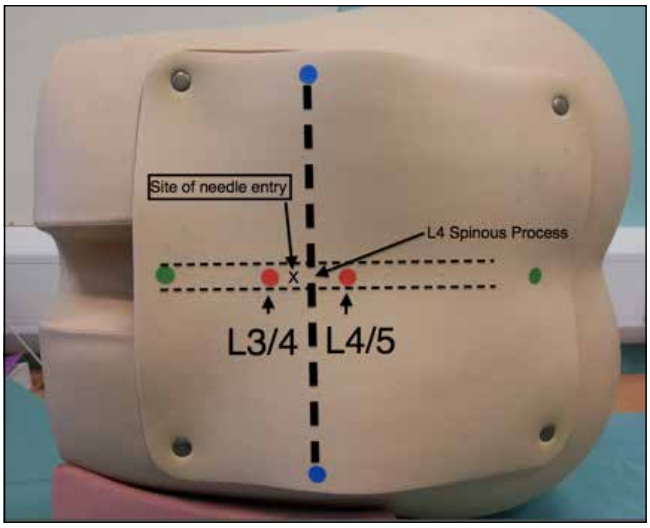

Fig 4: Surface Markings for Lumbar Puncture from Training Mannequin

Blue dots - Iliac crests, and the line connecting them is the Intercristal Line (eponymously Tuffier's Line). Red Dots are either side of the palpated L4 spinous process, the right hand one is in the L4/5 interspinal space and the left hand one in the L3/4 interspinal space. A diagnostic Lumbar Puncture should be performed at the L3/4 interspinal space, marked 'x'.

are protected by the stratum corneum from disinfectants.[25] The overlying skin should therefore be cleaned with a solution that breaches this layer such as povidone-iodine or 0.5% chlorhexidine and 70% alcohol. Traditionally, chlorhexidine had not been recommended for procedures with meningeal exposure due to a possible association with arachnoiditis, but chlorhexidine does not seem to be associated with an increased incidence of neurological complications in spinal anaesthesia,[26] and has been recommended for anaesthetic practice.[24] We routinely use chlorhexidine to prepare the skin for the less hazardous procedure of diagnostic Lumbar Puncture. The Anaesthetic Literature supports use of 0.5% chlorhexidine with 70% alcohol as a suitable antiseptic.[26]

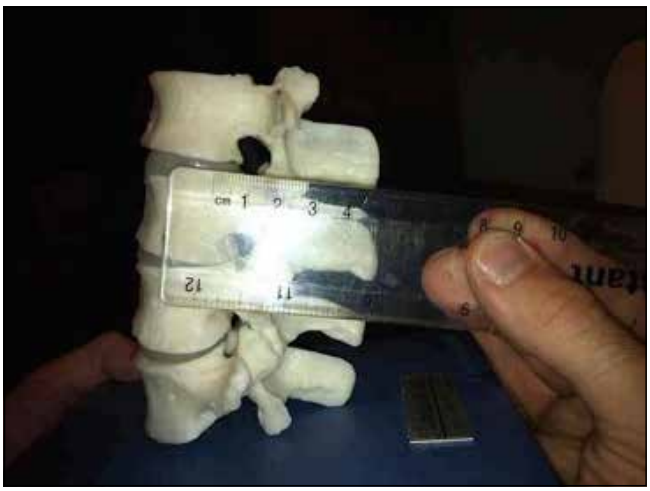

Fig 5. The distance from surface to Ligamentum Flavum is approximately 55mm.

NEEDLE SELECTION

We suggest that the evidence for reduced frequency of PLPH from use of atraumatic needles mandates a change in practice, and physicians in training should no longer be taught to use classic needles routinely. A classic 'Quincke' needle has a cutting, bevelled tip, but an atraumatic needle has a pencil point tip with a side aperture (Figure 6). The recommended needle is a 22 gauge atraumatic needle. In our own practice we use a 22 gauge Whitacre needle, which is now the standard stock Lumbar Puncture needle in our institution. The biggest adjustment for people changing from traumatic to atraumatic needle is that the skin must be punctured first prior to insertion of the Lumbar Puncture needle, as an atraumatic needle will not pierce the epidermis. Options include using the introducer needle provided to pierce the skin, or using the puncture site made by the green 19G local anaesthetic needle as the needle entry point.

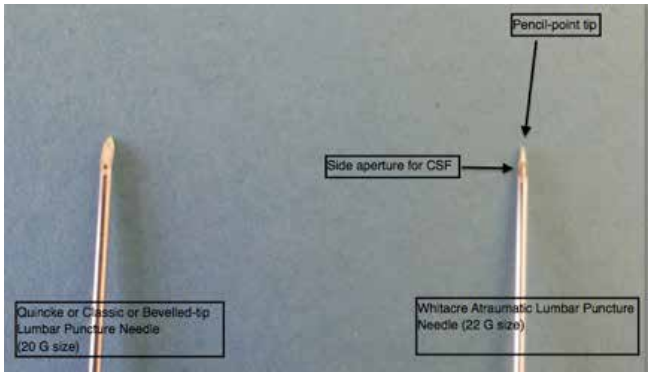

Fig 6. Classic (Quincke, or Bevelled-tip) and Whitacre Atraumatic Lumbar Puncture Needle

Passage of atraumatic needle is a completely different sensation to a classic needle, as the practitioner experiences greater resistance when traversing the tissue planes to the CSF. A good analogy is the difference in sensation felt when cutting through a banana (analogous to the standard needle) and a potato (analogous to an atraumatic needle).[13] In 2005, The American Academy of Neurology recommended atraumatic needles as means of reducing the risk of PLPH[7] but this practice has to date been poorly adopted. However, with appropriate training and support, medical staff will adopt use of atraumatic needles and reproduce the benefits demonstrated in clinical trials in clinical practice.[14-16]

Atraumatic needles have even been shown to be more cost-effective than classic cutting needles.[15] Patients with PLPH can require in-patient care, which makes atraumatic needles both effective and cost-effective options for diagnostic Lumbar Puncture.[17]

Needles of smaller diameter have been demonstrated to be associated with a reduction of risk of PLPH from 24.4% to 12.2%.[7] The smallest diameter needle with which the practitioner can confidently perform the procedure avoiding an increased number of attempts should be chosen,[18] and it is known that larger bore atraumatic needles allow adequate pressure measurement and collection of sufficient CSF.[19]

PATIENT POSITIONING

A right-handed practitioner should position the patient in the left lateral decubitus position, with the vertebrae in line in the horizontal plane and the head in a neutral position and the knees flexed. Opening Pressure at Lumbar Puncture is a surrogate measurement of Intracranial Pressure. An accurate Opening Pressure requires the needle entry point to be on the same level as the midline of the spine (Figure 4), which should also be at the same level as the patient's head. A few centimetres of 'head up' bed tilt or more than one pillow could artificially increase the Opening Pressure measurement.

Always ensure that the patient is comfortable, and that the bed height is appropriate for the operator, as the practitioner risks compromising aseptic technique if the patient has to be re-positioned mid-procedure.

Lumbar Puncture can also be performed in the seated position, providing pressure measurement is not required. There are occasions when pressure measurement is sacrificed in order to obtain a CSF sample, for example in elective Lumbar Puncture for neuro-inflammatory disease. If the procedure is to be performed in the upright position, seated with the chin down and the feet supported, a table and pillow will improve comfort and optimise positioning. This position widens the interspinous distance.[20] Remember that an elevated Opening Pressure may be the only sign of Cerebral Venous Sinus Thrombosis,[21] or Idiopathic Intracranial Hypertension, so in acute headache a Lumbar Puncture should be performed in the lateral decubitus position, whenever possible, to allow a pressure measurement.

HOW TO GET CSF AND MEASURE OPENING PRESSURE

The best location to perform a Lumbar Puncture will depend on local facilities, but a treatment room, or somewhere calm and quiet is preferred to a ward bay. The attitude of operator and assistant should be one of calm confidence and reassurance. An experienced operator will have the patient consented, positioned and comfortable, and from the moment of washing hands until the first CSF sample appears should be about 8 to 10 minutes (personal observation).

Aseptic technique is required, and a pre-prepared epidural pack contains all the equipment needed other than your needle, lidocaine and manometer (Figure 7). The manometer (Figure 8) should be prepared prior to commencing the spinal injection, by connecting the two tubes and loosening the tap (which is always slightly stiff and is difficult to open if you do not loosen it prior to connecting it to the manometer).

Once skin is sterile, local anaesthetic can be administered. Our practice is to raise a small intradermal bleb of lidocaine, which produces almost immediate cutaneous anaesthesia (Figure 9). A small amount of lidocaine can be infiltrated into deeper tissues, but care must be taken not to distort local anatomy by administering too much local anaesthetic. If you anaesthetise the skin and have a correct trajectory, there

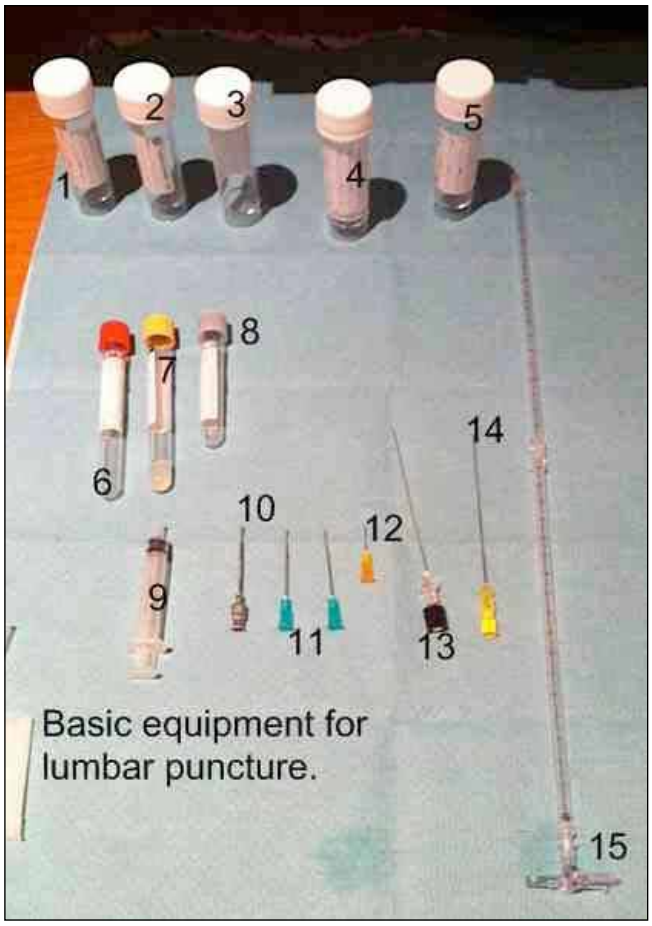

Fig 7. Equipment needed for Lumbar Puncture

1-5 CSF Specimen Bottles
6-7 Serum Specimen Bottles, 8 Serum glucose bottle (fluoride oxalate)
9 Syringe for local anaesthetic
10 Introducer for spinal needle (not always required)
11-12 19G and 25G hypodermic needles to draw up and inject anaesthetic
13 Whitacre 22G spinal needle (atraumatic needle)
14 Quincke 20G spinal needle (no longer recommended)
15 Manometer with 3-way tap

is little benefit to infiltrating large volumes of anaesthetic.

The aperture through which the needle must pass to reach the lumbar cistern is diamond shaped and surrounded by bony structures. The Lumbar Puncture needle should be inserted at an angle that will allow it to pass between the spinous processes (Figure 10). The most common problem encountered by operators is their needle impacting on a bony structure - either the superior surface of the L4 spinous process, or the inferior surface of the L3 spinous process. If the needle tip is advanced beyond 50mm and the needle hits bone, then you have probably impacted on bone around the intervertebral space. Consider the anatomy and needle angle, and thus which bone is likely to have been reached. Withdraw the needle and adjust the trajectory, gradually proceeding until a "give" is felt on passing through the ligamentum flavum (Figure 2), remembering that the distance to ligamentum

flavum is approximately 2/3rds of the length of a standard needle in a non-obese patient. Whichever needle type has been selected, the stylet should be in place when the needle insertion commences, as there have been case reports of implantation of epidermal plugs resulting in the growth of spinal epidermoid tumours.[27]

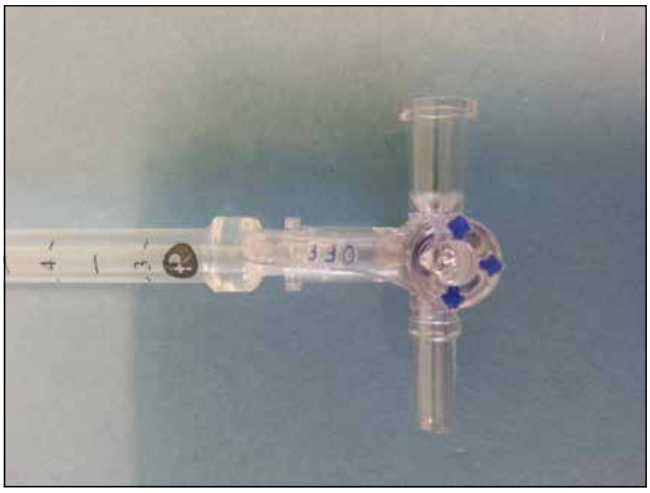

Fig 8. Three way tap attached to end of Manometer

Once the needle is sufficiently advanced, withdraw the stylet slowly and wait about 5 seconds to see if CSF emerges. If it does not, replace the stylet and advance the needle another 2 or 3 mm and check again for CSF. Once CSF is obtained, connect the manometer and measure Opening Pressure (unless the Lumbar Puncture is performed in a seated position). It will take approximately one minute for CSF pressure to be measured and it is normal to observe the meniscus of CSF at the top of the manometer oscillate with respiration. Like all fluid measurements the pressure is the height of the lowest part of the meniscus at the top of the fluid column (Figure 11). Distracting the patient with conversation or other relaxation techniques may be used to ameliorate anxiety and allow a falsely elevated opening pressure to fall. CSF pressure measurements, from large series of adults indicate that CSF pressures between 60mm and 200mm are regarded as normal,[8] although in overweight individuals pressures as high as 250mm can be asymptomatic.[28] Patient anxiety, incorrect head position and excessive flexion of the patient's legs against the abdomen can all artificially elevate CSF pressure.

Samples should ideally be taken either using sterile bottles by the individual performing the procedure, or by an assistant holding an open specimen container underneath the flow of CSF from the end of the spinal needle. Twenty drops per bottle is sufficient for most commonly performed tests (which provides about 2ml of CSF). A minimum volume of 5ml of CSF is required for cytopathological examination for example in suspected malignant meningitis. Replacement of the stylet is associated with a reduced incidence of post Lumbar Puncture headache,[29] and failure to replace the stylet has been associated with nerve root herniation. [30] After the needle has been removed, a sterile dressing should be placed over the puncture site.

IF YOU ARE UNABLE TO GET CSF…

If you are unable to obtain CSF, having optimised position and needle trajectory, consider whether there is another suitably qualified physician available to attempt the procedure. Low CSF pressure, or viscous CSF in cases of malignant or tuberculous meningitis may mean that CSF will not appear despite perfect positioning and technique. Aspiration of CSF is not recommended, as it may cause spinal cord injury. Image guided procedures are often required in overweight people suspected of Idiopathic Intracranial Hypertension. Ultrasound identification of the interspinous space should become routine practice, now that evidence shows a reduced risk of complications and a higher success rate in obtaining CSF with ultrasonic identification of the inter-spinal space.[31]

Fig 9. An intradermal bleb of 0.5ml of 1% lidocaine will produce almost immediate cutaneous anaesthesia

AFTER CARE

A small sterile dressing is placed on the site: a pressure dressing is not required. The patient can mobilise as soon as it is comfortable to do so. Written information should be provided on what to do if a PLPH occurs, and recommended doses of regular analgesics such as paracetamol or NSAIDs are reasonable. Bed rest is more comfortable than being ambulant, but prolonged bed rest does not reduce the incidence of PLPH.[39]

COMPLICATIONS

The most common complication is Post Lumbar Puncture Headache (PLPH). In one meta-analysis, the frequency of PLPH was 32%.[7] An important feature in the diagnosis of PLPH is the postural component; the patient will report a background headache which worsens within a few minutes of adopting upright posture and improves within a few minutes of lying flat.[34] Risk factors include: younger age, female gender, and headache before or at the time of the procedure. The volume of fluid removed is not a risk factor, and the pathophysiology of PLPH is more plausibly explained as a loss of compliance of the spinal compartment, rather than due to loss of CSF volume from a continous CSF leak.[35] Relief of PLPH by adopting a supine posture means that the brain and its supporting dura are not mechanically stretched by the loss of spinal compliance.

The symptoms of PLPH usually develop within 24 hours of Lumbar Puncture, and the natural history is for symptoms to resolve by about 10 days. The pain is usually diffuse, global or bitemporal headache, which can be accompanied by nausea, altered hearing, tinnitus, photophobia or neck stiffness. Low pressure may produce diplopia due to traction on the fourth or sixth cranial nerve.[36]

There is robust evidence that the most important factor in reducing the risk of PLPH is needle selection, and a 22G atraumatic needle is now recommended for diagnostic Lumbar Puncture.[7] In our own practice we reduced the risk of PLPH from 50% to 10% with the introduction of a guideline that required initial attempts with an atraumatic needle.[37] This observation is consistent with the experience from other Neurology Centres.[14]

There is anecdotal evidence that a straightforward procedure may increase the risk of PLPH due to the low levels of trauma and therefore clotting factors that might promote closure of the defect thus preventing CSF leakage.[38] Directing the needle with the bevel parallel to the dural fibres (which run craniocaudally) has been shown to be associated with a reduction in PLPH.[7] This advice only applies to classic 'traumatic' needles so is irrelevant when practitioners transition to using atraumatic needles due to the pencil point shape of the tip (Figure 5). Replacing the stylet has been shown to reduce the risk of PLPH, theoretically because a strand of arachnoid may splint the dural defect open if the needle is withdrawn without the stylet.[29] A Cochrane Review has suggested that there is no benefit to routine bed rest or intravenous fluids in prevention of PLPH after Lumbar Puncture.[39]

Maintaining a supine posture, oral or intravenous fluids and symptomatic management with analgesia and antiemetics are logical first steps to conservative management of PLPH. There is some evidence for the use of intravenous caffeine or intravenous theophylline,[40] but the definitive treatment if conservative management fails is epidural blood patching. The optimum timing of blood patching remains one of clinical judgement. The natural history is for resolution of PLPH by 10-14 days, and unless symptoms are completely disabling, it may be prudent to delay epidural blood patching for this length of time. However, epidural blood patching has been demonstrated to be effective[41] and the prospect of near-immediate relief may be difficult to deny a patient in distress. An epidural blood patch is commonly viewed as causing a tamponade which seals the CSF leak; although it may be more correct to state that epidural blood injection increases spinal compartment compliance.[35] Epidural Blood Patch should be performed under strict asepsis in an operating theatre environment.[22] Prophylactic epidural blood patching is not currently recommended,[41] as it is not proven to be effective and would require all diagnostic Lumbar Punctures to take place in operating theatre conditions.

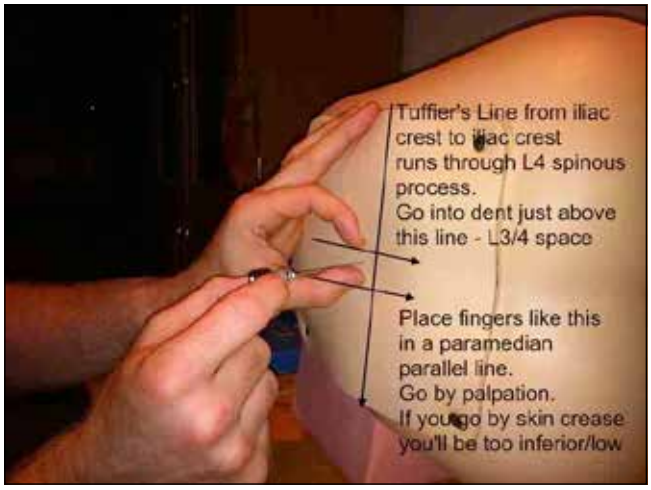

Fig 10. Insertion of needle at an angle to allow passage between spinous processes of L3 and L4 - note anatomical landmarks.

Cortical vein thrombosis,[42] and reversible cerebral vasoconstriction syndrome[43] have been reported as very rare complications of low CSF pressure states. These may present with worsening headache following Lumbar Puncture, and require additional neuro-imaging to confirm their presence.

Imaging studies cannot completely exclude raised intracranial pressure, but they will exclude mass lesions which pose a risk of Tentorial Herniation. Tentorial Herniation is preceded by lateral brainstem shift,[44] so a unilateral mass lesion poses most risk prior to Lumbar Puncture. Observational studies of patients with suspected meningitis indicate that Lumbar Puncture without prior brain imaging is safe in people with normal conscious level, no focal neurological signs and no prior history of immunosuppression.[2]

Severe thrombocytopenia, bleeding diathesis or anticoagulant therapy are contraindications to Lumbar Puncture, although it can be performed safely at platelet counts of 50 x 10^9/l or above.[45] A survey showed that 45% of physicians and paediatricians perform coagulation studies and platelet counts prior to Lumbar Puncture.[46] Aspirin therapy is not associated with a high risk of bleeding in spinal anaesthetic interventions[47], but data on clopidogrel and other GP IIa/

IIIb receptor antagonists are lacking. Guidance on spinal anaesthetic procedures suggest that procedures should be avoided until platelet function has recovered.[48] Warfarin should be stopped 5-7 days in advance of procedures and the INR should be less than 1.2. Low molecular weight heparin can be used in the interim but treatment dose heparin should be stopped for twenty-four hours prior to spinal procedures. Prophylactic doses should be avoided within twelve hours.[48]

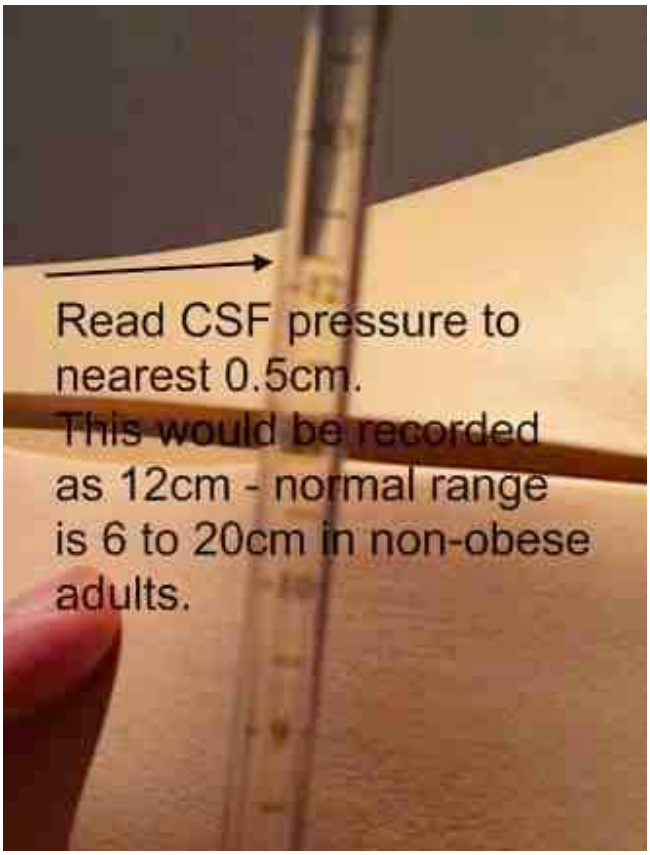

Fig 11. Reading CSF pressure from the top of the CSF fluid column

FUTURE DEVELOPMENTS

Diagnostic Lumbar Puncture is an essential skill for emergency medicine and neurology services. Historically, specialists used to be critical of the unthinking use of Lumbar Puncture,[49] but more recently specialists have been critical of underuse, especially in suspected meningitis.[3] It is important that Lumbar Puncture is performed by practitioners who do them frequently enough to maintain their skills. Lumbar Puncture mannequins (as seen in Figure 4) have been shown to useful for skill development in trainee doctors,[50] and could be used for maintaining or revalidating skills.

Fluoroscopically-guided Lumbar Puncture is an option if a standard Lumbar Puncture has been unsuccessful, but due to x-ray exposure they are not suitable for pregnant women or for repeated procedures. A recent systematic review of the use of ultrasound guidance for both Lumbar Puncture and epidural anaesthesia concluded that compared with standard palpation methods, ultrasound imaging reduced the number of insertion attempts, of needle redirections, and failed or traumatic procedures.[31] Pre-procedural scanning is used to identify vertebral levels, the midline, and the depth to the spinal canal. Dynamic or real time scanning can be used to visualise the progression of the needle. In modern medical practice there is a growing trend toward ultrasound guidance for invasive procedures such as chest drain insertion[50] and vascular procedures.[52]

It is likely that ultrasound guidance will become a routine part of Lumbar Puncture practice in future, particularly in the context of increasing rates of obesity. However, this will probably require the procedure to be concentrated into the hands of people who are both competent in ultrasound localisation and spinal puncture.

The authors have no conflict of interest.

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The Lumbar Puncture Proforma was written by Elaine Johnston who co-ordinated our local audits of practice.

BIBLIOGRAPHY

1. Pearce JM. Walter Essex Wynter, Quincke, and lumbar puncture. *J Neurol Neurosurg Psychiatry*. 1994;**57(2)**:179.
2. Hasbun R, Abrahams J, Jekel J, Quagliarello VJ. Computed tomography of the head before lumbar puncture in adults with suspected meningitis. *N Engl J Med*. 2001;**345(24)**:1727-33.
3. Kneen R, Solomon T, Appleton R. The role of lumbar puncture in suspected CNS infection--a disappearing skill? *ArchDis Child*. 2002;**87(3)**:181-3.
4. Hospital Episode Statistics, Admitted Patient Care - England, 2011-12. Leeds: HSCIC. Health and Social Care Information Centre; 2012.
5. Ragauskas A, Matijosaitis V, Zakelis R, Petrikonis K, Rastenyte D, Piper I, et al. Clinical assessment of noninvasive intracranial pressure absolute value measurement method. *Neurology*. 2012;**78(21)**:1684-91.
6. Department of Health, Social Services and Public Safety, Northern Ireland. NPSA Alert 21. Safer practice with epidural injections and infusions. London: National Patient Safety Agency; 2007.
7. Armon C, Evans RW. Addendum to assessment: Prevention of post-lumbar puncture headaches: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology*. 2005;**65(4)**:510-2.
8. Fishman RA. Cerebrospinal fluid in diseases of the nervous system. 2nd ed. Philadephia: W.B. Saunders Co.; 1992.
9. Boon JM, Abrahams PH, Meiring JH, Welch T. Lumbar puncture: anatomical review of a clinical skill. *Clin Anat*. 2004;**17(7)**:544-53.
10. Ievins FA. Accuracy of placement of extradural needles in the L3-4 interspace: comparison of two methods of identifying L4. *Br J Anaesth*. 1991;**66(3)**:381-2.
11. Chakraverty R, Pynsent P, Isaacs K. Which spinal levels are identified by palpation of the iliac crests and the posterior superior iliac spines? *JAnat*. 2007;**210(2)**:232-6.
12. Hogan QH. Epidural anatomy: new observations. *Can J Anaesth*. 1998;**45(5 Pt 2)**:R40-8.
13. Hatfalvi BI. The dynamics of post-spinal headache. *Headache*. 1977;**17(2)**:64-6.

14. Vakharia VN, Lote H. Introduction of Sprotte needles to a single-centre acute neurology service: before and after study. *JRSM Short Reports*. 2012;**3(12)**:82.
15. Tung CE. Education research: changing practice. Residents' adoption of the atraumatic lumbar puncture needle. *Neurology*. 2013;**80(17)**:e180-2.
16. Thomas SR, Jamieson DR, Muir KW. Randomised controlled trial of atraumatic versus standard needles for diagnostic lumbar puncture. *BMJ*. 2000;**321(7267)**:986-90.
17. Dakka Y, Warra N, Albadareen RJ, Jankowski M, Silver B. Headache rate and cost of care following lumbar puncture at a single tertiary care hospital. *Neurology*. 2011;**77(1)**:71-4.
18. Straus SE, Thorpe KE, Holroyd-Leduc J. How do I perform a lumbar puncture and analyze the results to diagnose bacterial meningitis? *JAMA*. 2006;**296(16)**:2012-22.
19. Carson D, Serpell M. Choosing the best needle for diagnostic lumbar puncture. *Neurology*. 1996;**47(1)**:33-7.
20. Sandoval M, Shestak W, Sturmann K, Hsu C. Optimal patient position for lumbar puncture, measured by ultrasonography. *Emerg Radiol.* 2004;**10(4)**:179-81.
21. Cumurciuc R, Crassard I, Sarov M, Valade D, Bousser MG. Headache as the only neurological sign of cerebral venous thrombosis: a series of 17 cases. *J Neurol Neurosurg Psychiatry*. 2005;**76(8)**:1084-7.
22. Infection control in anaesthesia. Association of Anaesthetists of Great Britain and Ireland. *Anaesthesia*. 2008;**63(9)**:1027-36.
23. Sellors JE, Cyna AM, Simmons SW. Aseptic precautions for inserting an epidural catheter: a survey of obstetric anaesthetists. *Anaesthesia*. 2002;**57(6)**:593-6.
24. Hebl JR. The importance and implications of aseptic techniques during regional anesthesia. *Reg Anesth Pain Med*. 2006;**31(4)**:311-23.
25. Sato S, Sukeyuki S, Dan K. Human skin flora as a potential source of epidural abscess. *Anestheiology*. 1996;**85(6)**:1276-82.
26. Scott M, Stones J, Payne N. Antiseptic solutions for central neuraxial blockade: which concentration of chlorhexidine in alcohol should we use? *Br J Anaesth*. 2009;**103(3)**:456.
27. McDonald JV, Klump TE. Intraspinal epidermoid tumors caused by lumbar puncture. *Arch Neurol*. 1986;**43(9)**:936-9.
28. Corbett JJ, Mehta MP. Cerebrospinal fluid pressure in normal obese subjects and patients with pseudotumor cerebri. *Neurology*. 1983;**33(10)**:1386-8.
29. Strupp M, Brandt T, Muller A. Incidence of post-lumbar puncture syndrome reduced by reinserting the stylet: a randomized prospective study of 600 patients. *J Neurol*. 1998;**245(9)**:589-92.
30. Siddiqi TS, Buchheit WA. Herniated nerve root as a complication of spinal tap. Case report. *J Neurosurg*. 1982;**56(4)**:565-6.
31. Shaikh F, Brzezinski J, Alexander S, Arzola C, Carvalho JC, Beyene J, et al. Ultrasound imaging for lumbar punctures and epidural catheterisations: systematic review and meta-analysis. *BMJ*. 2013;**346**:f1720.
32. Ellis G. An episode of increased hemolysis due to a defective pneumatic air tube delivery system. *Clin Biochem*. 2009;**42(12)**:1265-9.
33. Cruickshank A, Auld P, Beetham R, Burrows G, Egner W, Holbrook I, et al. Revised national guidelines for analysis of cerebrospinal fluid for bilirubin in suspected subarachnoid haemorrhage. *Ann Clin Biochem*. 2008;**45(Pt 3)**:238-44.
34. The International Classification of Headache Disorders: *2nd edition. Cephalalgia*. 2004;**24(Suppl 1)**:9-160.
35. Levine DN, Rapalino O. The pathophysiology of lumbar puncture headache. *J Neurol Sci*. 2001;**192(1-2)**:1-8.
36. Thomke F, Mika-Gruttner A, Visbeck A, Bruhl K. The risk of abducens palsy after diagnostic lumbar puncture. *Neurology*. 2000;**54(3)**:768-9.
37. Peukert T, Gray O, Forbes R. Lumbar puncture audit: do atraumatic needles matter? Abstracts from the ABN Annual Meeting Gateshead. *J Neurol Neurosurg Psychiatry*. 2012;**83**:e1.
38. Rizzoli P. Taking the sting out of lumbar puncture. *BMJ*. 2013;**346**:f1734.
39. Arevalo-Rodriguez I, Ciapponi A, Munoz L, Roque i Figuls M, Bonfill Cosp X. Posture and fluids for preventing post-dural puncture headache. *Cochrane Database Syst Rev*. 2013;**(7)**:Cd009199.
40. Bezov D, Ashina S, Lipton R. Post-dural puncture headache: Part II--prevention, management, and prognosis. *Headache*. 2010;**50(9)**:1482-98.
41. Boonmak P, Boonmak S. Epidural blood patching for preventing and treating post-dural puncture headache. *Cochrane Database Syst Rev*. 2010;**(1)**:Cd001791.
42. Laverse E, Cader S, de Silva R, Chawda S, Kapoor S, Thompson O. Peripartum isolated cortical vein thrombosis in a mother with postdural puncture headache treated with an epidural blood patch. *Case Rep Med*. 2013;**2013**:701264.
43. Schievink WI, Maya MM, Chow W, Louy C. Reversible cerebral vasoconstriction in spontaneous intracranial hypotension. *Headache*. 2007;**47(2)**:284-7.
44. Fisher CM. Brain herniation: a revision of classical concepts. *Can J Neurol Sci*. 1995;**22(2)**:83-91.
45. British Committee for Standards in Haematology. Blood Transfusion Task Force. Guidelines for the use of platelet transfusions. *Br Haematol*, 2003;**122(1)**: 10–23
46. Waldman W, Laureno R. Precautions for lumbar puncture: a survey of neurologic educators. *Neurology*. 1999;**52(6)**:1296.
47. Horlocker TT, Wedel DJ, Schroeder DR, Rose SH, Elliott BA, McGregor DG, et al. Preoperative antiplatelet therapy does not increase the risk of spinal hematoma associated with regional anesthesia. *Anesth Analg*. 1995;**80(2)**:303-9.
48. Layton KF, Kallmes DF, Horlocker TT. Recommendations for anticoagulated patients undergoing image-guided spinal procedures. *AJNR Am J Neuroradiol*. 2006;**27(3)**:468-70.
49. Dripps RD, Vandam LD. Hazards of lumbar puncture. *J Am Med Assoc*. 1951;**147(12)**:1118-21.
50. Uppal V, Kearns RJ, McGrady EM. Evaluation of M43B Lumbar puncture simulator-II as a training tool for identification of the epidural space and lumbar puncture*. *Anaesthesia*. 2011;**66(6)**:493-6.
51. Anonymous. Guidance for the implementation of local Trust policies for the safe insertion of chest drains for pleural effusions in Adults, following the NPSA Rapid Response Report –NPSA/2008/RR003. London: British Thoracic Society, 2008.
52. Hind D, Calvert N, McWilliams R, Davidson A, Paisley S, Beverley C, et al. Ultrasonic locating devices for central venous cannulation: meta-analysis. *BMJ*. 2003;**327(7411)**:361.

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Review

Malignant Melanoma: A Pictorial Review

Collette McCourt[1], Olivia Dolan[1], Gerry Gormley[2]

Accepted

INTRODUCTION

Malignant melanoma (MM) is a malignancy of pigment-producing cells (melanocytes), which are located primarily in the skin, but also found in the ears, gastrointestinal tract, eyes, oral and genital mucosa and leptomeninges. For the purpose of this review the focus will be on malignant melanoma (hereby referred to as melanoma) affecting the skin i.e. cutaneous melanoma. Despite the fact that melanoma is the least common form of skin cancer (accounting for approximately 4% of all new cancer cases in UK), it has the highest mortality rate with more than 2000 deaths UK wide in 2011. [(1)] In Northern Ireland (NI) numbers of melanoma have increased from 103 cases per year in 1984–1992, to 258 per year in 2004–2009. [(2)] In addition, the risk of a second cancer has shown to be increased in patients in NI following the diagnosis of melanoma. [(3)] The incidence continues to rise worldwide and whilst some of the increase may be due to increased surveillance and earlier detection, most are considered to be linked to changes in sun-related behaviour e.g. increase in frequency of holidays abroad over time and the use of sunbeds. [(4-7)]

The diagnosis of MM can have devastating consequences for a patient and their relatives. Early detection of MM has been shown to significantly improve survival. [(8)]

In this review we will discuss pathophysiology and risk factors with a focus on history, examination and differential diagnosis. Assessment tools to aid early detection are reviewed and referral pathways based on how and when to refer to secondary care will be discussed briefly.

PATHOPHYSIOLOGY

The sequence of events whereby normal melanocytes transform into melanoma cells (melanogenesis) is not fully understood. It is most likely due to a multistep process of genetic mutations that alter the cell cycle and render the melanocytes more susceptible to the carcinogenic effects of UVR. [(9)] Different pathways are likely to be involved in different subtypes of MM, for example superficial spreading MM (SSMM) is known to be associated with acute intermittent sun exposure and a high propensity to higher naevus counts. [(10,11)] In contrast lentigo maligna melanoma (LMM) more often occurs on chronically sun-exposed skin. [(11)]

CLASSIFICATION

Melanoma can be classified into 4 different clinical subtypes: superficial spreading melanoma (SSMM), lentigo maligna melanoma, nodular melanoma and acral lentiginous melanoma (characterized by the site of origin; palm, sole or subungal). Malignant melanoma in-situ and lentigo maligna are considered premalignant lesions.

SSSM

Commonly displays the ABCDE warning signs [(12)]

Table 1.

It tends to present as a flat or slightly elevated brown lesion with variegated pigmentation (i.e. black, blue, pink or white discoloration) with an irregular shape often > 6mm.

ABCDEs of melanoma	
A	Asymmetry
B	Border irregularity
C	Colour variation
D	Diameter > 6mm
E	Evolving (changing)

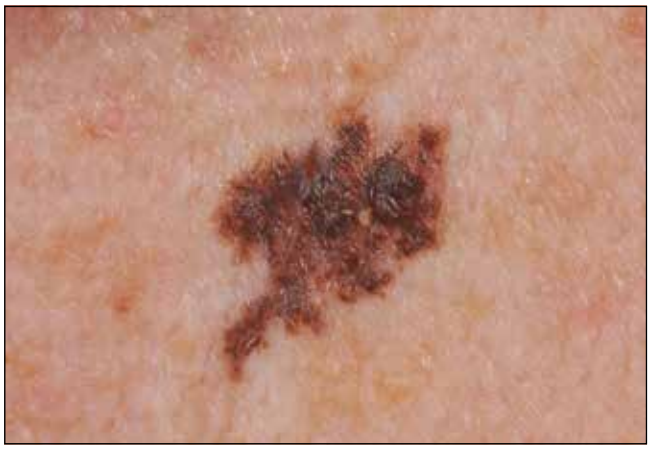

Image 1. (a) Malignant melanoma –asymmetrical lesion with irregular borders and variegated pigment

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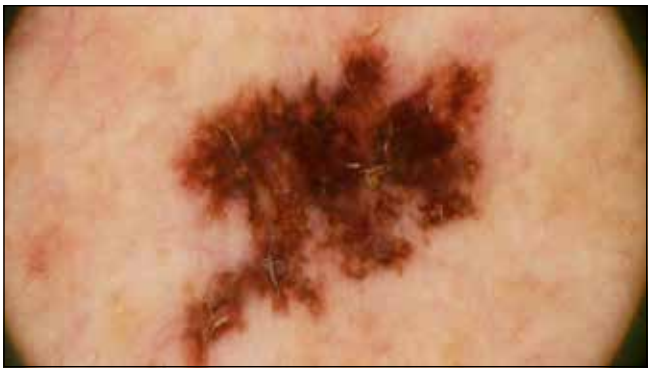


Image 1. (b) Dermoscopy image –irregular broad pigment network with radiating streaks at periphery of lesion

LENTIGO MALIGNA (LENTIGO MALIGNA MELANOMA)

Lentigo maligna melanoma presents as a slowing growing or changing patch of discoloured skin with variegated shape and colour. They often show slow progressive changes from in situ lentigo maligna (LM) to invasive LMM and may be detected using the ABCDE rule.

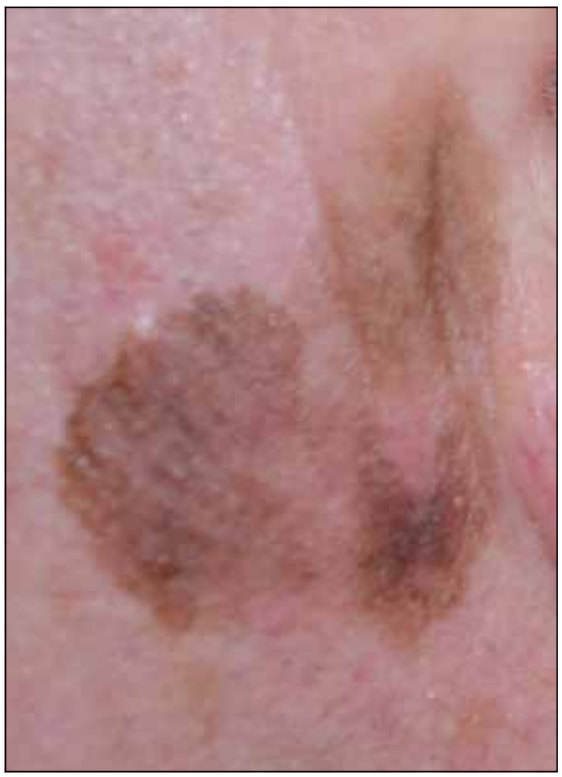


Image 2. Lentigo maligna – irregularly pigmented patch with irregular borders

NODULAR MELANOMA

A nodular melanoma may arise on any site, but is most common on exposed areas of the head and neck and usually presents as a rapidly enlarging lump (weeks to months). One third of nodular melanomas are amelanotic i.e. non-pigmented and may be ulcerated. This can often lead to diagnostic difficulty. However any new ulcerated nodular skin lesion should alert the clinician to the high possibility of skin cancer.

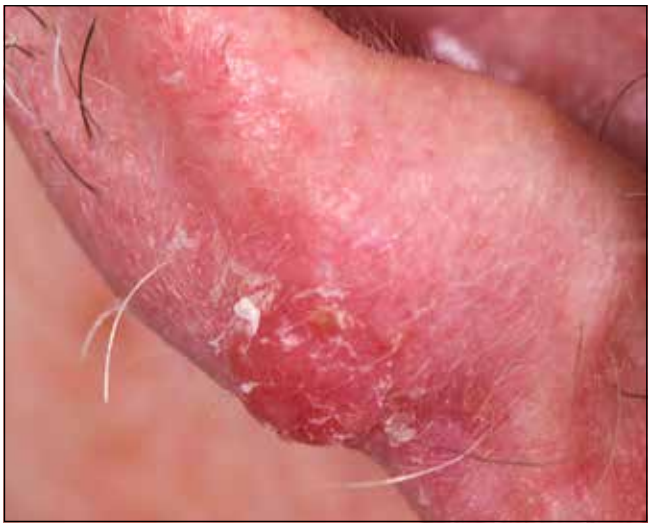
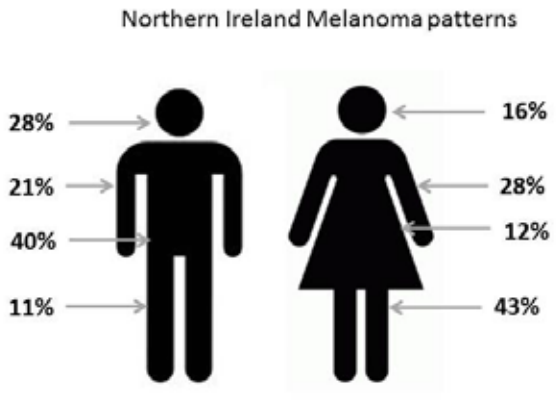


Image 3. Non-pigmented erythematous telangiectatic nodule at site of previous lentigo maligna melanoma

ACRAL LENTIGINOUS MELANOMA

This type of melanoma starts as a slowly enlarging flat patch of discoloured skin and tends to follow the ABCDE rule. Although initially smooth at first, it later becomes thicker with an irregular surface.

SSMM is by far the most common clinical subtype of melanoma in white skin and accounts for approximately 70% of cases diagnosed. In contrast, acral lentiginous melanoma is the least common subtype in white patients, more often seen in patients with African-American skin types. This is thought to be due to different genetic mutations, with kit mutations occurring in more of the later [13] and up to 50% SSMM demonstrating BRAF mutations. [13] Some of the newer treatments for metastatic MM target these mutations. There are also clear gender differences with regard to site of occurrence. Melanoma occurs most commonly on the trunk in white males (approximately 40% of cases) and the lower legs (approximately 43%) in white females. [14]



Percentage of lesions occurring on various body areas based on Northern Ireland Cancer Registry's report 'Care of Patients with Malignant Melanoma of Skin in Northern Ireland 2006'.

Fig 1.

DIFFERENTIAL DIAGNOSIS

The differential of melanoma is wide and includes benign lesions such as seborrhoeic keratosis, benign melanocytic naevi, blue naevi and vascular lesions e.g. spider angiomas and pyogenic granulomas. Pre-malignant or malignant differentials include dysplastic naevi, squamous cell carcinoma, pigmented basal cell carcinoma and pigmented actinic keratosis.

SEBORRHOEIC KERATOSIS

These lesions usually appear as slightly raised, skin coloured or brown spots, which gradually thicken and develop a rough warty surface. Over time they may darken to become dark brown to black. A clue to their diagnosis is the 'stuck on' appearance.

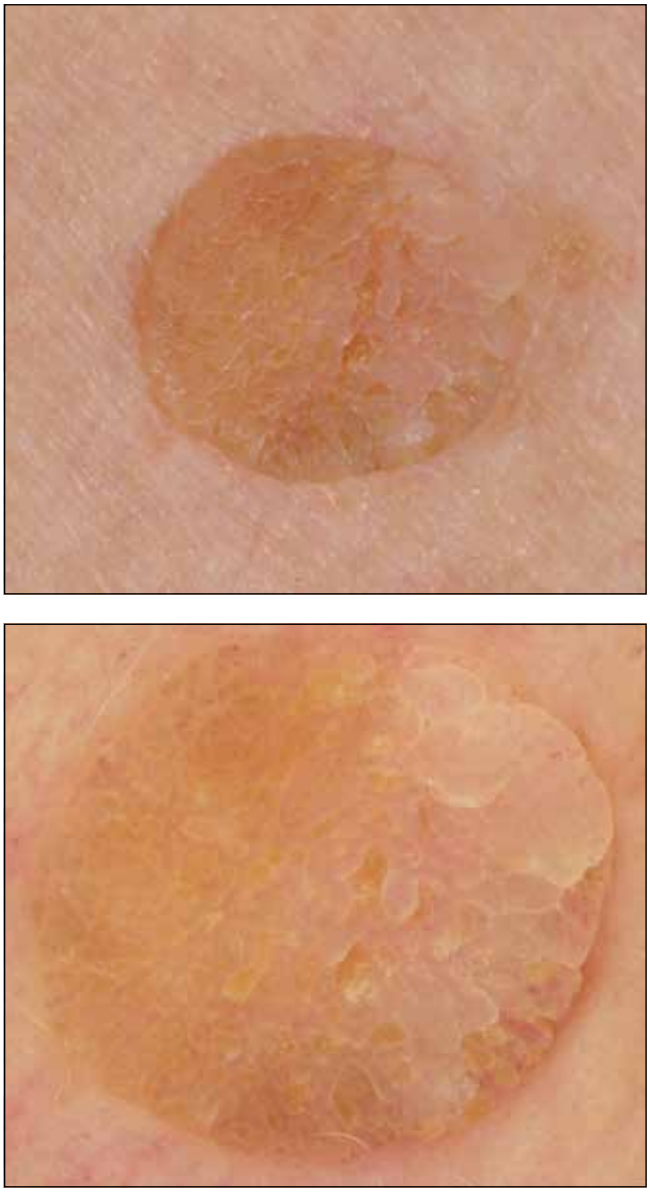


Image 4. (a) Clinical appearance of seborrhoeic keratosis – stuck on appearance (b) Dermoscopy image – cerebriform appearance and lack of pigment network

PYOGENIC GRANULOMA

These lesions appear as small red papules that grow rapidly (weeks) and usually bleed easily and ulcerate. They are common in children and young adults, may follow trauma and most frequently appear on the head, neck, upper trunk and hands (fingers) and feet.

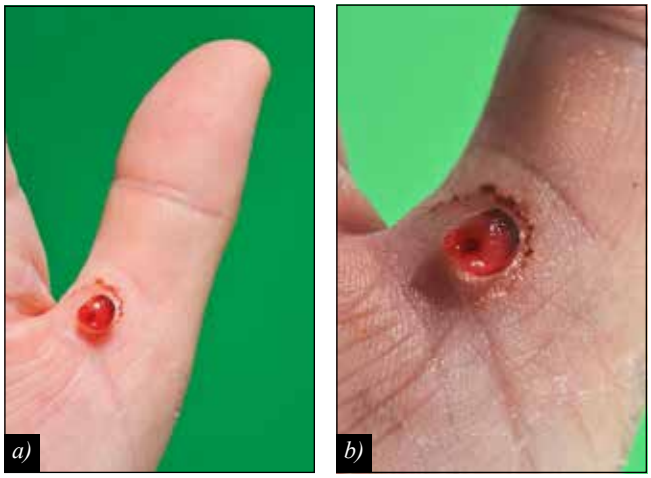


Image 5. a) Friable vascular nodule on the base of the thumb b) close up

BENIGN MELANOCYTIC NAEVUS

These can be divided into congenital or acquired (junctional, dermal, compound types) naevi. They are regular and symmetrical with uniform pigment.

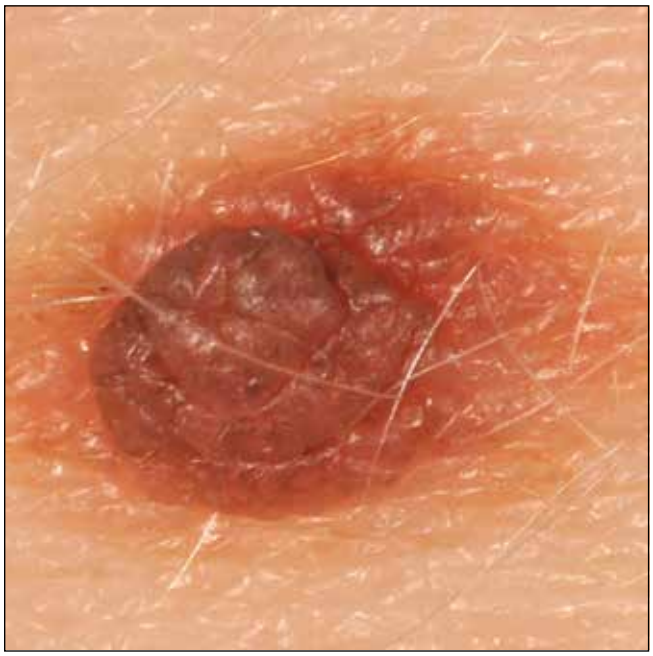


Image 6. Benign melanocytic naevus. Regular, symmetrical and uniformly pigmented lesion.

DYSPLASTIC/ATYPICAL NAEVUS

Unusual appearance with at least 3 of the following features: blurred or ill-defined borders, irregular shape, variegated colour, flat and raised components or size 6mm or more.

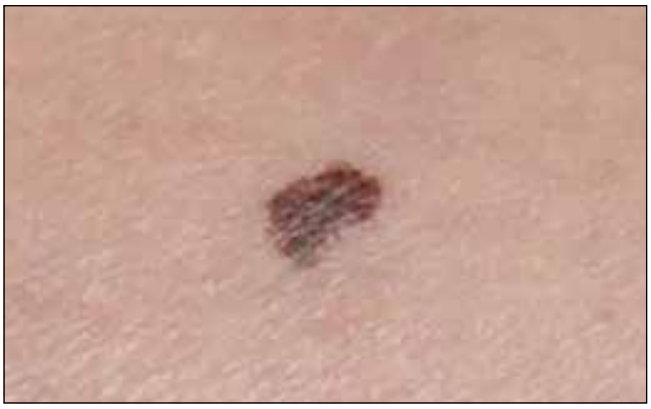


Image 7. Dysplastic naevus – irregularly shaped darkly pigmented naevus. 'Ugly duckling.'

CHERRY ANGIOMA

These lesions usually develop on the trunk and can appear red or blue/black in colour. Cherry angiomas usually increase in number in middle-aged individuals and are otherwise known as Campbell de Morgan spots.

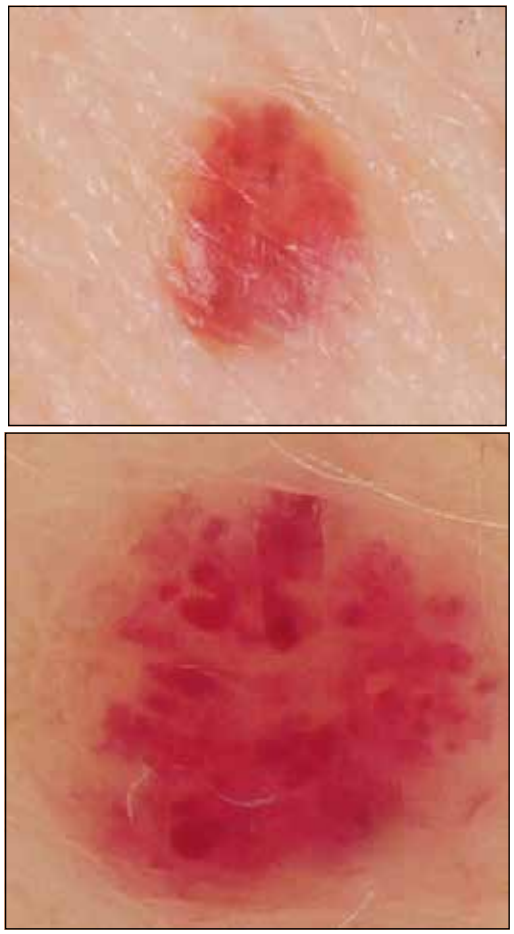


Figure 8. (a) - clinical image of cherry angioma with vascular appearance (b) Dermoscopic image – vascular lagunes visable.

PIGMENTED BASAL CELL CARCINOMA

These tumours are typically slow growing over months to years. The pigmented type may mimic melanoma.

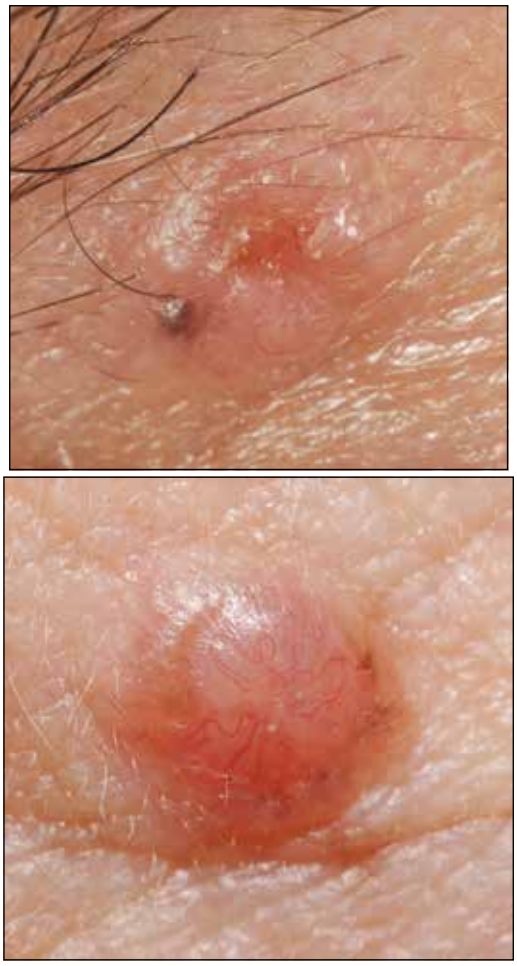


Image 9. (a) + (b) – Pigmented basal cell carcinoma. Pearly telangietatic nodules. Note peripheral pigmentation at bottom left in (a) and along right lateral edge in (b).

DERMATOFIBROMA

These are benign slow growing dermal nodules, often occurring on the limbs. Although they may have a pigmented halo, they are symmetrical, helping distinguish them from melanoma.

WHO IS AT RISK OF MELANOMA?

Clinical history and careful skin examination will assist the clinician in identifying those most at risk of developing melanoma.

HISTORY

SEVEN POINT CHECKLIST

When assessing a patient with a new or changing lesion the history is extremely important. There are several assessment tools available for assessing risk, one of which in widespread use is the Glasgow 7-point checklist [15] which awards 2 points to any of the major criteria; change in size, change in colour and change in shape with 1 point awarded to any of the following; ooze, change in sensation, inflammation or diameter >7mm. A score of 3 points or any one criterion with strong concerns about cancer should prompt a red flag referral to the dermatology service in secondary care. [16]

TABLE 2.

Glasgow 7-point checklist

Major features	Minor features
• Change in size (2) • Irregular shape (2) • Irregular colour (2)	• Diameter > 7mm (1) • Inflammation (1) • Oozing (1) • Change in sensation (1)

ABCDE RULE

Another commonly used tool for early detection of melanoma is the ABCDE acronym (Asymmetry, Border irregularity, Colour variegation, Diameter >6mm and Evolution or history of change) introduced to alert patients and health professionals to the diagnosis of melanoma. [12]

TABLE 3.

Northern Ireland Cancer Network (NICaN) Referral Guidelines for Suspected Skin Cancer
Urgent referral: • Melanoma: change in a lesion is a key element in diagnosing malignant melanoma. Do not excise in primary care. Lesions scoring 3 points or more (as below) are suspicious. • Major features of lesions • Change in size • Irregular shape • Irregular colour • Minor features • Diameter >7 mm • Inflammation/oozing • Change in sensation Squamous cell carcinomas: non-healing keratinizing or crusted tumours >1 cm in diameter with induration on palpation. Commmonly on face, scalp or back of hand; with documented expansion over 8 weeks New or growing cutaneous lesions after organ transplant – squamous cell carcinoma common with immunosuppression Histological diagnosis of squamous cell carcinoma Basal cell carcinomas can be referred non-urgently

It is important to be aware that although melanoma may develop in precursor melanocytic naevi (e.g. congenital naevi), up to 70% of cases are believed to arise de novo (ie, not from a preexisting pigmented lesion). In addition, for nodular and amelanotic subtypes, these algorithms are less accurate. In these cases the 'ugly duckling' sign may be more useful, whereby the melanoma can be recognised as an 'outlier' by differing clinical appearances. [17]

SKIN TYPE AND NAEVI COUNT

The most important phenotypic markers for melanoma are fair skin and above-average mole count.

TABLE 4.

Recommendation (adapted from the The prevention, diagnosis, referral and management of melanoma of the skin: concise guidelines. 2007)

1. Identifying people at risk

People should be considered to have higher risk (approximately 10-fold) if they have:

- >100 normal moles
- atypical moles
- two or more cases of melanoma in first-degree relatives.

Lower (approximately 2- to 3- fold) levels of risk are associated with:

- freckles
- red hair or skin that burns in the sun
- any family history of melanoma.

2. Primary prevention

- People at risk of skin cancer should protect their skin from the sun by avoidance and clothing primarily.
- They should also use a sun protection factor (SPF) of 20 to 30, and five star ultraviolet A (UVA)

3. Secondary prevention

- People who are in any of these higher risk (10-fold) categories above should be referred for risk estimation and education directed towards self-examination with a dermatologist specializing in moles and pigmented lesions (routine appointment)
- Base-line photography is a useful aid to monitoring moles

4. Urgent referral to a dermatologist

The following should be regarded as suspicious lesions requiring urgent referral to a dermatologist within 2 weeks:

- a new mole which is growing quickly over the age of puberty
- a long-standing mole which is changing progressively in shape or colour regardless of age
- any mole which has 3 more more colours or has lost its symmetry
- any new nodule which is growing and is pigmented or vascular in appearance
- a new pigmented line in a nail
- something growing under a nail
- a mole which has changed in appearance and which is also itching or bleeding

Summary of: (8) Bishop JN, Bataille V, Gavin A, Lens M, Marsden J, Mathews T *et al*. The prevention, diagnosis, referral and management of melanoma of the skin: concise guidelines. 2007.

Genetic factors include; Fitzpatrick skin type I (often burns and rarely tans), red hair, blue eyes and freckles, >100 naevi, the presence of atypical naevi and a personal or family history of melanoma.

Table 5.

Skin Photo types

Skin Type	Typical features	Tanning ability
Type I	Tends to have freckles, red or fair hair, and blue or green eyes.	Often burns, rarely tans.
Type II	Tends to have light hair, and blue or brown eyes.	Usually burns, sometimes tans.
Type III	Tends to have brown hair and eyes.	Sometimes burns, usually tans.
Type IV	Naturally black-brown skin. Often has dark brown eyes and hair.	Rarely burns, often tans.
Type V	Naturally black-brown skin. Often has dark brown eyes and hair.	
Type VI	Naturally black-brown skin. Usually has black-brown eyes and hair.	

Adapted from: Fitzpatrick T B 1975 Soleil et peau *J. Med. Esthet.* **2** 33-4.

Atypical naevi are defined as moles with 3 or more of the following features; diameter >5mm, irregular shape, blurred outline, irregular margins, varying shades of colour and flat and bumpy components) Similarly, patients with Familial Atypical Multiple Mole-Melanoma syndrome (FAMMM), defined as one or more first-degree or second-degree relative with MM, the presence of numerous, often >50 naevi, some of which are atypical and naevi that are dysplastic on histopathology, are at higher risk of MM. [18] Although the majority of melanoma occurs in patients with fair skin type, a rare subset of melanoma known as acral lentiginous melanoma (i.e. affecting the acral skin of the hands and feet) is more common in African-American skin types. Because this type of melanoma presents at a later stage owing to the site, the prognosis is often poor

UVR EXPOSURE

The most important environmental cause of skin cancer is exposure to the sun. Patients should be asked about sun exposure including use of sunbeds, sunny holidays and blistering sunburns in childhood as well as the use of sun protection and sunscreen and sun protection measures. Ultraviolet radiation (UVR) is associated with the development of melanoma [19] and can be broadly categorised into UVA (315-400 nm), UVB (280-315 nm), and UVC (100-280 nm). All UVC and most UVB wavelengths are blocked by the ozone layer with only a fraction of UVB and all UVA reaching the Earth's surface. Indoor tanning or sunbeds have become the main non-solar source of exposure to UV light in light-skinned individuals. Indoor tanning equipment mainly emits UVA light with a small fraction (<5%) in the UVB range. Indoor tanning devices and the UV light spectrum were classified as a group 1 carcinogen to humans in 2009. [20]

A study published in 2011 [21] estimated that approximately 86% of malignant melanomas in the UK in 2010 were linked to exposure to UVR from the sun and sunbeds. Similarly, a large meta-analysis published in 2012 [22] based on 27 studies demonstrated that ever use of sunbeds was associated with a summary relative risk of 1.2 (95% CI 1.08-1.34). Furthermore, 13 of these studies demonstrated an overall summary relative risk of 1.87 (95% CI 1.41-2.48) with first use of sunbeds before 35 years. [22] It is hopeful that the Sunbeds Act (NI) 2011 [23] will lead to a reduction in the incidence of melanoma in future years.

Fig 2.

EXAMINATION

When assessing a patient with a new or changing naevus ideally a total-body skin examination should be performed. Not only does this increase the chances of diagnosing an incidental melanoma/melanoma in-situ, [24] but it also allows the clinician to compare the morphology of the index lesion to that of other naevi and recognise the so-called 'ugly duckling' sign. [17] Crucial to a good skin examination is a well-lit examination room. Ideally it would be good practice to perform a total body examination, taking account of the number of naevi present on the patient's skin and the using the ABCDE criteria used to differentiate early melanomas from benign naevi. If melanoma is suspected, the patient should also be examined for the presence of lymphadenopathy in all lymph node groups, particularly the draining basin corresponding to the lesion.

DERMOSCOPY AND PHOTOGRAPHY

Dermoscopy or epiluminescence microscopy can be used by trained physicians to assess the patient's naevi rapidly.

This involves using either a non-polarised light and surface oil or a polarised magnifying lens with no oil medium, to examine a lesion.

Useful adjuncts to management include serial photography techniques, such as 'mole-mapping' using dermoscopy. Computerized image analysis can then store images of the lesions and makes them available for comparison over time e.g. for monitoring patients in FAMM.

DERMATOSCOPY FOR TRIAGE (TELEDERMATOLOGY)

With increasing constraints on the provision of healthcare and an increased volume of suspected skin cancer referrals to secondary care, teledermatology may be a useful triaging tool and is used with increasing frequency in Dermatology. The clinician in primary care is responsible for taking high quality photographs of the index lesion and corresponding digital dermoscopy images along with a clinical history (usually on an agreed proforma) to allow the dermatologist to triage the patient more appropriately. This 'store and forward' type of teledermatology is particularly useful as it lends itself to triage as it allows the clinician to review the stored images at a convenient time and place. It is important that if teledermatology is used it should complement the existing service and be part of an integrated local dermatology service. [25] In addition guidance on patient consent and information governance should be in place to monitor the effectiveness and safety of these pathways but also to protect patient confidentiality and ensure safe transfer of clinical information particularly photographic images.[25]

REFERRAL PATHWAYS AND MANAGEMENT

If a patient with a suspected malignant melanoma is seen in primary care there are clear referral pathways for urgent/red flag referral to secondary care. The National Institute for Health and Care Excellence (NICE) [16] 'Referral Guidelines for Suspected Cancer' state that 'an urgent referral to a dermatologist or other suitable specialist with experience of melanoma diagnosis should be made and excision in primary care avoided.'[16]

The Northern Ireland Cancer Network (NICaN) [15] has issued clear guidance for referral of suspected skin cancer into secondary care (http://www.cancerni.net/files/file/ReferralGuidanceMay2007.pdf). As mentioned previously, a changing lesion or a score of 3 or more in the Glasgow 7-point checklist is suspicious of melanoma. The importance of clear accurate clinical information cannot be emphasized enough as this allows patients to be triaged appropriately and therefore seen in a timely manner. Patients should be referred into secondary care as a 'red flag' and are seen within 2-weeks. It is emphasised in the NICE Guidance that such lesions should not be excised in primary care and strongly recommended that incisional or incomplete excisions are avoided, particularly because of sampling error and the risk of inaccurate diagnosis. [8] All excised skin specimens even those regarded as benign should be sent for histopathological analysis. [16] The practitioner should also maintain a 'fail-safe' log of all procedures performed with details of the outcome and action following histological diagnosis.

OTHER CONSIDERATIONS

SECONDARY PREVENTION

Following a diagnosis of melanoma secondary prevention is paramount as a history of melanoma increases the risk of a metachronous melanoma. Patients should be counseled on the importance of effective sun protection measures, avoidance of sunbeds and the correct use of sunscreen. It is recommended that patients should use a sun protection factor (SPF) of 20-30 and five star ultraviolet A (UVA). [8] Regular self-examination of the skin should be encouraged. Useful resources are available to download from the British Association of Dermatologists website (http://www.bad.org.uk). [26]

VITAMIN D

Once patients are diagnosed with melanoma, they are asked to use sun protection measures. The reason for this is two-fold; to reduce the risk of a second melanoma and to reduce the risk of immunosuppression from UV light. Often patients through fear of recurrence or worry over developing another skin cancer will completely sun avoid putting them at high risk of Vitamin D deficiency. This not only has implications for bone health but has also been associated with poorer survival following melanoma.[27] As the amount of time required for safe exposure to sunlight in order to promote skin stores of Vitamin D remains controversial, currently the advice for patients with a history of melanoma is still to sun protect and if concerned about Vitamin D deficiency to take supplements. [28] Current guidance from NHS Choices recommends up to 1000 IU (25 micrograms) per day[29]. The Melanoma Genetics Consortium[30] currently recommend that patients with a history of melanoma consider taking between 600-1000 IU of vitamin D per day and that the dose should be discussed with their doctor, with consideration made for measuring baseline Vitamin D. It is also prudent to check baseline renal function and bone profile prior to initiating therapy. Rarely Vitamin D supplementation can unmask primary hyperparathyroidism so serum calcium levels should be checked one month after starting supplementation. It is advisable to wait at least 6 months after starting supplements before rechecking Vitamin D levels.

SUMMARY AND OVERVIEW

In summary, the incidence of melanoma continues to rise. Health promotion measures, which highlight the risks of excessive sun exposure and use of sun beds are very important. It is also essential that there is ongoing education for clinicians in primary care on the early signs of melanoma and continued awareness of the appropriate referral pathway

for suspicious lesions. Early detection is the key factor determining a good prognosis.

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REFERENCES:

1. Cancer Research UK. Skin cancer incidence statistics. London: Cancer Research UK. Available online from: http://www.cancerresearchuk.org/cancer-info/cancerstats/types/skin/incidence/ Last accessed May 2014.
2. Hunter HL, Dolan OM, McMullen E, Donnelly D, Gavin A. Incidence and survival in patients with cutaneous malignant melanoma: experience in a U.K. population, 1984-2009. *Br J Dermatol*. 2013; **168(3)**:676-8.
3. Cantwell MM, Murray LJ, Catney D, Donnelly D, Autier P, Boniol M, et al. Second primary cancers in patients with skin cancer: a population-based study in Northern Ireland. *Br J Cancer*. 2009; **100(1)**:174-7.
4. de Vries E, Coebergh JW. Cutaneous malignant melanoma in Europe. *Eur J Cancer*. 2004; **40(16)**:2355-66.
5. de Vries E, Coebergh JW. Melanoma incidence has risen in Europe. *BMJ*. 2005; **331(7518)**:698.
6. Dennis LK. Analysis of the melanoma epidemic, both apparent and real: data from the 1973 through 1994 surveillance, epidemiology, and end results program registry. *Arch Dermatol*. 1999; **135(3)**:275-80.
7. Lovegrove T. Travel Trends: a report on the 2005 International Passenger Survey. Norwich: Office for National Statistics. 2006.
8. Bishop JN, Bataille V, Gavin A, Lens M, Marsden J, Mathews T, et al. The prevention, diagnosis, referral and management of melanoma of the skin: concise guidelines. *Clin Med*. 2007; **7(3)**:283-90.
9. Demierre MF, Nathanson L. Chemoprevention of melanoma: an unexplored strategy. *J Clin Oncol*. 2003; **21(1)**:158-65.
10. Silva Idos S, Higgins CD, Abramsky T, Swanwick MA, Frazer J, Whitaker LM, et al. Overseas sun exposure, nevus counts, and premature skin aging in young English women: a population-based survey. *J Invest Dermatol*. 2009; **129(1)**:50-9.
11. Kvaskoff M, Pandeya N, Green AC, Perry S, Baxter C, Davis MB, et al. Site-specific determinants of cutaneous melanoma: a case-case comparison of patients with tumors arising on the head or trunk. *Cancer Epidemiol Biomarkers Prev*. 2013; **22(12)**:2222-31.
12. Abbasi NR, Shaw HM, Rigel DS, Friedman RJ, McCarthy WH, Osman I, et al Early diagnosis of cutaneous melanoma: revisiting the ABCD criteria. *JAMA*. 2004; **292(22)**:2771-6.
13. Tsao H, Chin L, Garraway LA, Fisher DE. Melanoma: from mutations to medicine. *Genes Dev* 2012; **26(11)**:1131-55.
14. Smith A, Gavin A. Care of patients with malignant melanoma of skin in Northern Ireland. 2006. Belfast: Northern Ireland Cancer Registry; 2008. Available online from: http://www.qub.ac.uk/researchcentres/nicr/FileStore/PDF/Filetoupload,119767,en.pdf Last accessed May 2014.
15. Northern Ireland Cancer Network (NICaN). Northern Ireland referral guidance for suspected cancer. Belfast: NICaN. 2007. Available online from: http://www.cancerni.net/files/file/ReferralGuidanceMay2007.pdf. Last accessed May 2014.
16. National Institute for Health and Care Excellence (NICE). (2005) Skin cancer – suspected. London: NICE. 2005. Available online from: http://cks.nice.org.uk/skin-cancer-suspected#!topicsummary. Last accessed May 2014.
17. Grob JJ, Bonerandi JJ. The 'ugly duckling' sign: identification of the common characteristics of nevi in an individual as a basis for melanoma screening. *Arch Dermatol*. 1998; **134(1)**:103-4.
18. NIH Consensus conference. Diagnosis and treatment of early melanoma. *JAMA*. 1992; **268(10)**:1314-9.
19. International Agency for Research on Cancer (IARC). Solar and ultraviolet radiation. IARC Monographs on the evaluation of carcinogenic risks to humans. 55. Lyon, France: IARC. 1992.
20. El Ghissassi F, Baan R, Straif K, Grosse Y, Secretan B, Bouvard V, et al. A review of human carcinogens--part D: radiation. *Lancet Oncol*. 2009; **10(8)**:751-2.
21. Parkin DM, Mesher D, Sasieni P. 13. Cancers attributable to solar (ultraviolet) radiation exposure in the UK in 2010. Br J Cancer. 2011; 105 Suppl 2:S66-9.
22. Boniol M, Autier P, Boyle P, Gandini S. Cutaneous melanoma attributable to sunbed use: systematic review and meta-analysis. *BMJ*. 2012; **345**:e4757.
23. Department of Health, Social Services and Public Safety. Sunbeds Act (Northern Ireland) 2011. Belfast: Department of Health, Social Services and Public Safety Northern Ireland. Available online from: http://www.dhsspsni.gov.uk/sunbeds-act-2011-guidance.pdf. Last accessed May 2014.
24. Aldridge RB, Naysmith L, Ooi ET, Murray CS, Rees JL. The importance of a full clinical examination: assessment of index lesions referred to a skin cancer clinic without a total body skin examination would miss one in three melanomas. *Acta Derm Venereol*. 2013; **93(6)**:689-92.
25. Primary Care Commissioning. [PCC]. Quality Standards for Teledermatology: using 'store and forward' images. Supplement to Quality standards for dermatology: providing the right care for people with skin conditions 2011. Leeds: Primary Care Commissioning. Available online from: http://cdn.pcc-cic.org.uk/sites/default/files/articles/attachments/telederm_report_aw_web4.pdf. Last accessed May 2014.
26. British Association of Dermatologists (BAD). Various useful resources available for the public and healthcare professionals. Available online from: http://www.bad.org.uk. Last accessed May 2014.
27. Newton-Bishop JA, Beswick S, Randerson-Moor J, Chang YM, Affleck P, Elliott F, et al. Serum 25-hydroxyvitamin D3 levels are associated with breslow thickness at presentation and survival from melanoma. *J.Clin.Oncol*. 2009; **27(32)**: 5439-44.
28. British Phototherapy Group/ British Association of Dermatologists [BAD]. Vitamin D and the Sun. London: BAD. 2013. Available online from: http://www.bad.org.uk/desktopDefault.aspx?TabId=1221. Last accessed May 2014.
29. NHS Choices. Vitamins and minerals - Vitamin D. Leeds: NHS Choices. 2014. Available online from: http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Vitamin-D.aspx. Last accessed May 2014.
30. GenoMEL, the Melanoma Genetics Consortium. Patient information. Sun protection and Vitamin D after a diagnosis of Melanoma. Leeds: GenoMEL. 2012. Available online from: http://www.genomel.org/patient_information.php?link=sun_protection. Last accessed May 2014.

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Medical History

Robert Alexander McCance, and his forays into Experimental Medicine with Elsie Widdowson.

Caoimhghín S Breathnach and John B Moynihan.

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RA McCance was born in Dunmurry and, after naval air service in the First World War and time on a dairy farm, went to Sidney Sussex College in Cambridge with the intention of taking the Diploma in Agriculture. However, he was persuaded that a career in medicine might be more practicable and after success in the Natural Sciences Tripos he worked with Gowland Hopkins for three years. As a married medical student in London he studied the use of the recently discovered insulin in gainful employment with RD Lawrence in King's College, where in the Hospital kitchen he met Elsie Widdowson in 1929. This was the start of a life-long collaboration, typified by their classic textbook 'The Chemical Composition of Foods'. Onerous work was no problem to the pair, and a lengthy investigation of fluid and electrolyte balance in adults kept on a salt-free diet for 14 days led him to examine renal function in infants. He was surprised to find that growth aided homeostasis by reducing the load on the kidneys.

Iron metabolism in polycythaemia revealed that iron regulation is achieved by excretion not absorption, and the resultant paper led to an invitation to him and his small team to set up a laboratory in Cambridge in 1938. Supplemental calcium with 85 per cent wholemeal brown bread was shown to provide a healthy diet in wartime rationing – and led to an invitation to describe the work in Dublin in January 1944. Survival at sea had become a problem of national importance and the team proved conclusively that sea water should not be drunk by mariners (when potable water supplies ran out). They also showed the importance of avoiding hypothermia after immersion in seawater. After twenty years as Professor of Experimental Science at Cambridge from 1945 to 1966, retirement was no more than an official term: the effects of wartime shortages on children in Germany and infant malnutrition in East Africa were examined in detailed studies. McCance recovered well after a cycling accident in Cambridge, but a fall in his home was more difficult to overcome, and he died in 1993. Elsie survived him by seven years until 2000.

INTRODUCTION

In the pleasant countryside of County Antrim south-west of Belfast Robert Alexander McCance was born on 9 December 1898 to John Stouppe Finlay McCance and Mary Letitia Bristow. John trained as a barrister, but returned from Dublin to manage the family linen works in Dunmurry. His two brothers, Finlay and Harry, had been educated at St. Bees, Cumbria, and like them Robert made the short trip, aged 13, from Woodbourne, Dunmurry, across the Irish Sea after his schooling in Mourne Grange, Kilkeel, County Down. He retained great affection for St Bees and later became a Governor. A younger sister, Elizabeth, completed the family. After service in 1918 as a pilot with the Royal Naval Air Service', which involved hair-raising take-offs from primitive launching platforms, he worked for six months in 1919 at the County Farm near Antrim (town) before setting off for Sidney Sussex College, Cambridge, in October. Uncertainty in a rebellious Ireland persuaded him to take the Natural Sciences Tripos instead of his original choice of the Diploma in Agriculture – this was not agriculture's loss for his life's work never moved far away from that field, even if it was fundamental rather than applied. The professor of physiology, his fellow Ulsterman Joseph Barcroft (1872-1947), who was at that juncture preparing for his expedition to Cerro de Pasco in the Peruvian Andes, won his admiration. Barcroft's fundamental work on the respiratory function of the blood was of crucial interest to medicine and may have been an influence in the selection of medicine by McCance when agriculture was not feasible.

THE LIGHTS OF LONDON

Earning enough as a supervisor in physiology, he married a student at Girton College, Mary Lindsay MacGregor, in 1922, and after three years work in biochemistry and a PhD under Gowland Hopkins (FRS, Nobel Prize 1929, 1861-1947), he moved to King's College, London, to finish his medical studies. He obtained his M.B. in 1927, and M.D. in 1929. M.R.C.P. followed in 1930 and F.R.C.P. in 1935. Meanwhile laboratory work was not neglected for he analysed food samples for RD Lawrence.[1] The discovery of insulin in the summer of 1921 increased the importance of knowledge of the carbohydrate content of cooked fruit and vegetables,

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and McCance separated the available carbohydrates (sugar, dextrins and starch) from the polysaccharides nowadays designated as dietary fibre. [2] The Medical Research Council (MRC) was duly impressed and provided funds for a detailed study of the composition of meat and fish, as he encountered them in the hospital kitchen. The results were published in 1933 as the Medical Research Council Special Report No. 187 'The Chemistry of Flesh Foods and their Losses on Cooking' by R. A. McCance and H. L. Shipp.

Fig 1. **Woodbourne House, Dunmurry, in later use as a hotel.**

Source: http://tuckdb.org/postcards/19695, reproduced under the terms of the Creative Commons (http://creativecommons.org/licenses/by-sa/3.0/)

Into this milieu strayed his lifelong collaborator, Elsie Widdowson (21 October 1908-14 June 2000). At her school in Dulwich, southeast London, the chemistry mistress persuaded Elsie to take chemistry rather than zoology when she went on to Imperial College in 1925. After graduation she worked for Helen Archbold (later Helen Porter FRS, 1899-1987) for three years leading to her PhD on the changes in the individual carbohydrates in apples as they mature, ripen and are stored. In 1932 she spent a year working in the Middlesex Hospital with Professor EC Dodds (1899-1973), who advised her to take the one-year postgraduate course in dietetics – the up-and-coming profession – at King's College. As a preliminary she was sent to learn something about large-scale cooking in the main kitchen at the hospital. Luck is often better than skilful planning, and one day Elsie plucked up courage to speak to McCance, who told her about his current and earlier work. And, *mirabile dictu*, Elsie had enough courage to inform him that his figures for carbohydrate in fruit were too low, for some of the fructose must have been destroyed by acid hydrolysis. The gentleman scholar was not offended, but got a grant from the MRC so that she could join him while allowing her to finish the Dietetics Diploma. [3] It was Elsie who recognised the need for British food tables, and this was the start of a long collaboration with McCance which culminated in their classic textbook, running to many editions: *McCance and Widdowson's Composition of Foods*. [4]

Diabetic coma was hazardous for the physician as well as the patient. One of the problems to be solved was the absence of chloride from the urine, and this observation led to experimental and quantitative study of salt deficiency. Man is the best person to employ in this type of research and McCance decided to use him – a 'herculean' task for it involved persuading healthy young men and women to continue on a tasteless, unpalatable salt-free diet, and lie and sweat under radiant heat on a macintosh sheet for two hours every day for 14 days. The salt loss was measured by washing the subjects, and their sheets with distilled water after each session and analysing the washings; water loss was measured by weight loss.[5] When they were salt deficient renal function was tested in various tests; the old adage that horses sweat, men perspire and women glow was borne out by one female student was unable to lose more than about a litre of sweat in two hours and never became seriously salt-deficient. [6] These experiments helped clinicians to attend to the roles of fluids and electrolytes, and to remember the dictum of one of McCance's favourites Claude Bernard (1813-1878), that 'the stability of the internal environment is the condition of the free life'; [7] the fundamental difference between two medical specialties is that the investigator is interested in his problem, the physician in his patient. [8]

McCance was allowed some beds for his patients in King's College Hospital about 1934, and when his house physician, Winifred Young (1909-1969), moved to the Children's Hospital in Birmingham she continued the practice of testing the patients' urine and was surprised to find almost no chloride therein. When she reported these results to her King's College friends they were taken aback that even in full-term infants renal function was poor compared to adults. In animals as well as in man newborns were capable of maintaining homeostasis provided they were growing on a suitable diet – the milk of the mother, and so did not present a heavy load to the kidneys. [9]

THE CALL TO CAMBRIDGE

A woman admitted with polycythaemia rubra vera inadvertently changed the course of history when McCance and his colleagues reported that intravenous acetyl-phenylhydrazine (which lysed the red cells) did not cause the release of iron into the urine. They confirmed in themselves that iron is not regulated by excretion but by controlled absorption. [10] The account, when it was published in the *Lancet* in 1937, led to an invitation to McCance to join John Ryle (1889-1950), the Regius Professor of Physic, as Reader in Medicine at Cambridge with a Fellowship in his old College. The offer was accepted on condition that the team of Elsie Widdowson and technician Alec Haynes also moved. The transfer took place during the Munich crisis in September 1938 and the first year was spent in completing the food tables and their study of children's diets. [1, 3]

When war broke out in September 1939 problem solving had to take on a more practical than academic bent. As Chairman of a joint MRC and Royal Naval Committee on the Care of Shipwrecked Personnel set up in 1941 which commissioned much research (continuing long after the war ended), McCance helped establish that sea water should never be drunk in response to dehydration after shipwreck. [11] Sea

sickness responded best to L-hyoscine, after the trials were moved from the (uncooperative) Atlantic to Portsmouth. As a bonus it was realised that 100g of glucose, cane sugar, or even boiled sweets were metabolised to 100g water – items more easily incorporated in survival rations. Sudden immersion in freezing water was another problem investigated, and the considerable individual differences in effect were not consistently explained by body fat. The collaborators' post-war studies (continuing into the 1950s) revealed the huge importance of hypothermia in accelerating death in these conditions. McCance himself was at the heart of this work, often carried out on small vessels in fierce Atlantic gales. [12]

Fig 2. **Mourne Grange School, Kilkeel, Co. Down as it appeared in the early 20th century:**

Source: the National Library of Ireland collection, http://catalogue.nli.ie/Record/EAS_1299, reproduction rights owned by the National Library of Ireland, reproduced under the terms of the Creative Commons CC0 1.0 Universal Public Domain Dedication.

But food supplies, nutrition and rationing assumed prime importance. A study of rationing was initiated in eight 'in-house' volunteers to see how far home-grown food would suffice for supplying the population. Milk, meat, eggs and other delicacies were reduced 'intolerably': total weekly allowances per person were four ounces of fat, five ounces of sugar (*in toto*), one egg, four ounces of cheese, six ounces of fruit, sixteen ounces of meat and fish combined, and one and three-quarter pints of milk per day. Wholemeal bread and vegetables including potatoes were not rationed. Physical fitness, tested during a trip to the Lake District, did not suffer, and the main conclusion was that calcium supply (already low, rations of milk and cheese being small) was further impaired by a constituent of brown bread – phytic acid. So a long series of balance experiments measured mineral intake and excretion in 10 subjects (over 3 or 4 weeks individually) lasting nearly a year as the subjects rotated through the five kinds of bread. Vitamin D did not improve the intestinal absorption, but fortifying the flour with calcium carbonate did, and the practice was later adopted nationally – in spite of the crank Isaac Harris's *The calcium bread scandal*. [1, 13] Mandatory addition of calcium to flour produced in the United Kingdom, and its beneficial effects on the skeletal health of the nation's children to be sustained through their adult lives, continues to the present day.

Elsie Widdowson recalled:

> Somehow, Professor Jessop got to hear of our experiments and we were invited to describe them to a group of doctors and politicians including the Taoiseach, Mr De Valera. As a result it was decided to lower the extraction rate of flour used for bread-making [from 100% to 85%] in Eire, and later to add calcium phosphate to it, and the incidence of rickets in children over one year was decreased. [3]

WJE (Jerry) Jessop (1903-1980) was professor of biochemistry at the Royal College of Surgeons in Ireland when the Cambridge pair came over to Dublin in January 1944; he later headed the Department of Social and Preventive Medicine in his alma mater, Trinity College Dublin.

THE EUROPEAN DIMENSION

In 1945, McCance became the first Professor of Experimental Medicine in the UK, holding the chair in Cambridge until his retirement in 1966. The MRC sponsored a visit to post-war Germany to see what effects war-time rationing and food shortages had on children. The six month visit extended to three years when Elsie and Rex Dean found a suitable orphanage at Duisburg under the care of Dorothy Rosenbaum, 30 miles from their headquarters at Wuppertal in the Rhineland.

> The underweight and under-height children, between 5 and 14 years, gained weight and height equally rapidly on bread made from all five types of flour: 100% (whole meal), 85% and 72% extraction (white), and white enriched with B vitamins and iron to the amounts in 100% and 85% extraction flour. All flour contained added calcium carbonate. Bread provided 75 per cent of the energy, and the diets contained only 8g of animal protein per day. The experiment lasted for 18 months; the children improved physically, and it was impossible for the outsider to tell what kind of bread the child had been eating. [14]

One girl from each group travelled – to their delight – with Elsie to the annual meeting of the BMA in Cambridge in 1949. After a frosty start, this interlude went very smoothly through the assistance of Dr Dorothy Rosenbaum who had an English mother and herself spoke colloquial English: "Here, you can't go up there". (p 31) [3] During the war the professor had kept pigs near his home at Bartlow 16 miles from Cambridge, and the pigsties were there in 1949 when the team returned from Germany. This was the first programme to use experimental animals – and lasted 16 years. Pigs were so severely undernourished from 10 days of age that at 1 year they weighed 5 or 6 kg (without any body fat to keep them warm) when they would normally have scaled 200 kg. They recovered well and gained weight when given more food but they never outclassed their litter mates, although they mated successfully and their offspring gave no hint of their parents' deprivation. Their ability to recover from such a degree of malnutrition and put on weight was undoubtedly a tribute to animal husbandry as practised by Terry Cowen at Bartlow. The professor arrived at Terry's home one Sunday

afternoon to interview him for the post but left without giving a decision, until a month later he called and told the youth it was about time he started work. 'When ?' I asked, 'Thursday sounds a good day'. [1]

Elsie Widdowson remained at Cambridge, continuing to study the effects of undernutrition of pigs, when McCance retired from his professorship in 1966. That was the year his wife died, and he travelled to Uganda to supervise the Medical Research Council Infantile Malnutrition Research Unit in Kampala. To approach the problems of malnutrition he was assisted by a paediatrician, Dr Brian Wharton, and an old friend from his boyhood in Dunmurry, Tom Hall, a retired Public Health Officer. The protein deficiency in kwashiorkor was more difficult to remedy than marasmus, for the marasmic children were very hungry and had little trouble taking the food they needed. The wards that were very hot in daytime got very cold at night; blankets provided the remedy. [1] Observing bird- and wild-life was a welcome bonus.

Fig 3. **From left to right: Dr. R.A. McCance, Mr. E. de Valera and Dr. E.M. Widdowson attending a meeting arranged by the Dietetic Council of the Irish Medical Association at the Royal College of Physicians in Dublin on 20th January 1944 to discuss "the nutritive value of bread of various extractions".**

(With thanks to Irish Newspaper Archives and The Irish Press.)

Returning to England in 1968, his last twenty five years were spent in Cambridge in touch with academic life in Sidney Sussex College, cycling up to twenty miles a day in the city and countryside until he was knocked off his bicycle on Midsummer Common by a woman pedestrian in the 1970s. But he still enjoyed pedestrian life until disabled about 10 years later by a fall, down the stairs from his flat, which forced him into sheltered accommodation. He continued to write and publish on nutrition, mineral metabolism and physiology until his last paper (entitled 'The birth and early development of infant physiology') appeared in 1992. He died on 5 March 1993. [15]

McCance was elected Fellow of the Royal Society in 1948 and appointed

CBE (Commander of the Order of the British Empire) in the New Year Honours for 1953 in recognition of the national importance of his work, but he was also not without honour in his native land. Queen's University in Belfast honoured him with a DSc in 1964. John Cowley, who spent a sabbatical year in Cambridge in 1962, and taught in Queen's from 1968 to 1975, recalled: 'When he visited us it was not unknown country and he was able to see some of his boyhood haunts, … the world of nature and adventure'. [1]

AN ALLIANCE MADE IN HEAVEN.

Elsie reminisced that 'RA and I used to go to the [King's College] hospital kitchen in the basement to get the big joints cooked in the hospital oven'. 'There', as he said himself in 1993, 'I encountered Elsie Widdowson, a momentous meeting, for we have now remained together for 60 years'. [1]

'Those who worked with McCance, according to Elsie, loved his little eccentricities and many stories were told about them, some of them true, but others greatly exaggerated'. Romaine Hervey 'never worked with Elsie but remembered her mainly in the *interface* between McCance and the outside world; she was a great soother of nerves in the Department and was intensely loyal to the professor'. [1] Douglas Black (1913-2002) worked in the department when Isaac Harris opposed McCance's scientific evidence for adding calcium to bread: 'Mac used to rage about Harris [and his booklet *The calcium bread scandal*], and about millers who didn't want to add calcium to the flour, and Elsie would have to calm him down'. [1] In their first walk together in the Harz mountains in Germany, Eric Glazer (d 1992) realised that Mac was

> 'a truly remarkable man; and it took longer and a more gradual understanding to realise that Elsie was no less remarkable. … It took me some time to conclude that both contributed equally to their phenomenally successful partnership, though each provided different aspects of their work. There is no remote relevance in such suggestions as "Elsie does the work, Mac does the talking", or that other extreme, "Elsie is a good technician dragged along by Mac's genius". The talents are entirely complementary. … The result is a perfect blend of their talents in which the effect is far greater than a mere summation of their skills'. [1]

Hamad Elneil, from Khartoum put it in a nutshell: 'The professor provided the *breadth* for a project, and Elsie provided the *depth'*. [1] An Ulsterman, Ashton B Morrison, added a hard-headed note that 'the professor was never a diplomat, and was capable of making the most critical, but often accurate, remarks about colleagues. Worse still, he sometimes made them rather directly … a very brilliant man who could, at times, be difficult. He had a certain winning charm … and Dr. Widdowson, fortunately, … was always there to keep things going and to act as an arbitrator' [1].

In 1968 her own distinguished career continued with her appointment as head of the Infant Nutrition Research Division of the Medical Research Council's Dunn Nutrition Laboratory. On her retirement from that post in 1973, she went on to work in the Department of Investigative Medicine (formerly

Professor McCance's Department of Experimental Medicine) at Addenbrooke's Hospital in Cambridge until 1988 when Professor Ivor Mills retired from the Chair. Ten years later, the Elsie Widdowson Laboratory was set up in Cambridge to house an MRC Unit for Human Nutrition Research, and in 2000 the newly-created Food Standards Agency included the Elsie Widdowson Library in their new headquarters in London. At various times Dr Widdowson was President of the British Nutrition Foundation, the Nutrition Society and the Neonatal Society.[16] She died at Addenbrooke's Hospital after suffering a stroke while on holiday in Ireland.

The author has no conflict of interest.

REFERENCES

1. McCance RA. Autobiography. In: Ashwell, M, editor. *McCance and Widdowson, A scientific partnership of 60 years 1933-1993*. London: British Nutrition Foundation; 1993. p.19 - 32.
2. McCance RA, Lawrence RD. *The carbohydrate content of foods. Special Report Series; 135. Medical Research Council.* London: HMSO; 1929.
3. Widdowson EM. Autobiography In: Ashwell, M, editor. *McCance and Widdowson, A scientific partnership of 60 years 1933-1993*. London: British Nutrition Foundation; 1993. p. 31-43.
4. McCance RA, Widdowson EM. *The chemical composition of foods. Special Report Series; 235. Medical Research Council.* London: HMSO; 1940.
5. McCance RA. Experimental sodium chloride deficiency in man. *Proc R Soc Lond B.* 1936; **119(814)**:245-68.
6. Whitteridge D. Recollections. Ashwell, M, editor. *McCance and Widdowson, A scientific partnership of 60 years 1933-1993*. London: British Nutrition Foundation; 1993. p. 136-8.
7. Bernard C. Lectures on the phenomena of life common to animals and plants. Springfield, IL: Charles C Thomas; 1974.
8. McCance RA. The practice of experimental medicine. *Proc Roy Soc Med.* 1951; **44(3)**: 189-94.
9. McCance RA, Young WE. The secretion of urine in newborn infants. *J Physiol.* 1941; **99(3)**:265-82.
10. McCance RA, Widdowson EM. Absorption and excretion of iron. *Lancet.* 1937; **2(5951)**: 680-4.
11. McCance RA. The excretion of urea, salts and water during periods of hydropaenia in man. *J Physiol.* 1945; **104(2)**: 196-209.
12. Crosfill JW, McCance RA, Ungley GC, Widdowson EM. *The hazards to men in ships lost at sea, 1940-1944. Special Report Series; 291. Medical Research Council.* London: HMSO; 1956.
13. Harris I. *The calcium bread scandal.* London: The Hogarth Press; 1942.
14. Widdowson EM, McCance RA. *Studies on the nutritive value of bread and on the effect of variations in the extraction rate of flour on the growth of undernourished children. Special Report Series; 287. Medical Research Council.* London: HMSO; 1954.
15. Widdowson EM. Robert Alexander McCance – 9 December 1898 – 5 March 1993. *Biogr Mem Fellows R Soc.* 1995; 41: 263-80.
16. Ashwell M. Elsie May Widdowson – 21 October 1906 – 14 June 2000. *Biogr Mem Fellows R Soc.* 2002; **48**:483-506.

Letters

CHOLECYSTOSTOMY FOR ACALCULOUS CHOLECYSTITIS WITH HAEMOBILIA IN A LUNG TRANSPLANT PATIENT; A CASE REPORT.

Editor,

We report on a 64 year old gentleman who developed an early broncho-pleural fistula following a double lung transplant for end-stage COPD/Bronchiectasis and was transferred to his referring institution for palliative management.

Ten weeks post-transplant, the patient developed sudden-onset severe epigastric/right upper quadrant abdominal pain. He was tachycardic, normotensive, and had a palpable tender mass in the right hypochondriac region. Blood tests revealed an elevated white cell count and an acute derangement of his liver function tests.

Urgent Computed Tomography (CT) scan of chest, abdomen and pelvis showed a distended gallbladder of mixed attenuation with no peri-inflammatory changes as shown in Figure 1. There was no previous history of gallstones and no gallstones were seen in imaging.

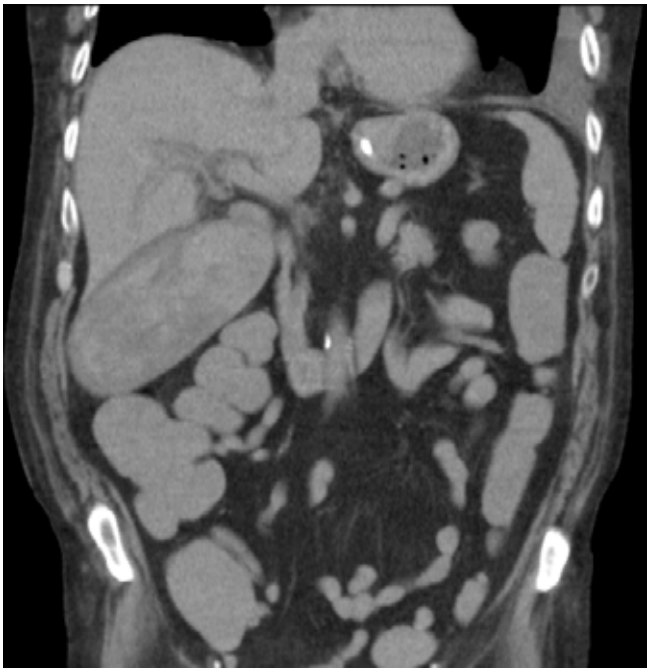

Fig 1. CT scan of abdomen demonstrating a distended gallbladder of mixed attenuation with no peri-inflammatory changes

Due to the critically ill nature of the patient, an urgent percutaneous cholecystostomy was undertaken by ultrasound guidance and a pigtail catheter inserted, which drained a mixture of bile and blood. He was empirically treated with Tazocin (Piperacillin and Tazobactam) 4.5g three times a day.

CMV Polymerase Chain Reaction analysis was positive for both serum and bile and a diagnosis of CMV acalculous cholecystitis with haemobilia was established. The patient was treated with intravenous ganciclovir for 25 days followed by 18 days of oral valganciclovir. T-Tube cholangiogram 2 weeks following initial insertion demonstrated no flow out of the common bile duct into the duodenum. A Magnetic Resonance Cholangiopancreatography (MRCP) scan (with a view of proceeding to ERCP) demonstrated a normal biliary tree, but showed debris in the gallbladder suggestive of post-haemorrhagic components. A repeat T-tube cholangiogram one week later showed an obstruction at the gallbladder neck. This was managed with two instillations of 25000I/U of streptokinase into the cholecystostomy drain 12 hours apart. Repeat T-tube cholangiogram following this demonstrated normal flow of contrast through the common bile duct into the duodenum. The pig tail drain was subsequently removed (day 42) and the patient made a good post-procedure recovery.

CMV infection is common in transplant patients and develops in 3 ways: primary infection (transmission from a seropositive donor allograft to a seronegative recipient), reactivation of latent infection (CMV resembles other members of the herpesviridae in establishing latent infection and so immunodeficiency predisposes to reactivation of CMV) and re-infection (donor-transmitted infection superimposed on reactivation of latent infection).[1] CMV can affect almost any organ system, with infection of the gastrointestinal tract being the most common manifestation of tissue-invasive CMV. It is a rare cause of acalculous cholecystitis in immunocompromised patients with human immunodeficiency virus,[2] and has been reported in patients following solid organ transplant.[3]

Ganciclovir remains first-line treatment for CMV disease,[4] given at a dose of 5mg/kg twice-daily (dose-adjusted for renal impairment). As the drug has no hepatobiliary excretion,[5] drainage of the gallbladder is mandatory. Treatment duration is patient-specific and should be based on virologic and clinical improvement.

The management of critically ill patients who develop cholecystitis is complex, with percutaenous cholecystostomy an option in the critically ill patient and in patients who are at high risk of general anaesthesia.The procedure allows immediate decompression and drainage of an acutely inflamed gallbladder and can either be used as a temporary bridging measure or as definitive management.

This case is unique in that there are no previous reports of acute CMV cholecystitis developing following lung transplant, and because, as the patient was not fit for cholecystectomy, he was managed with percutaneous cholecystostomy. This case emphasises the usefulness of percutaneous cholecystostomy in the critically ill patient who is unsuitable for surgery.

The authors have no conflicts of interest

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REFERENCES

1. Eid AJ, Razonable RR. New developments in the management of cytomegalovirus infection after solid organ transplantation. *Drugs.* 2010;**70(8)**: 965–81

2. Aaron JS, Wynter CD, Kirton OC, Simko V. Cytomegalovirus associated with acalculous cholecystitis in a patient with acquired immune deficiency syndrome. *Am J Gastroenterol.* 1988; **83(8)**: 879–81.

3. McMullan DM, Patel V, Radovancevic B, Hochman FL, Frazier OH. Cytomegalovirus cholecystitis in a heart transplant recipient. *Transplant Proc.* 2002; **34(4)**: 1271–2.

4. Humar A, Snydman D. AST Infectious Diseases Community of Practice. Cytomegalovirus in solid organ transplant recipients. *Am J Transplant.* 2009;**9 Suppl 4**: S78–86.

5. Jacobson MA, Mills J. Serious cytomegalovirus disease in the acquired immunodeficiency syndrome (AIDS). *Ann Intern Med.* 1988;**108(4)**: 585-94.

DIALYSIS RELATED AMYLOID ARTHROPATHY ON ^{18}FDG PET-CT

Editor,

A 60 year-old male patient with end stage kidney disease secondary to Alport syndrome presented with worsening swelling and pain in both shoulders. He had been on regular haemodialysis for 20 years, having had two failed renal transplants previously and had renal amyloidosis confirmed on renal biopsy. Radiographs of the shoulders showed evidence of an erosive arthropathy affecting the glenohumeral and acromioclavicular joints without significant degenerative change (Figure 1). In view of advanced renal failure and contraindication to MRI, a PET-CT scan was performed with 18-fluorodeoxyglucose (^{18}FDG) to assess for amyloid involvement in the shoulders. This demonstrated periarticular radiotracer uptake in both shoulder joints with greater involvement on the left, compatible with bilateral amyloid arthropathy in the shoulder joints (Figure 2).

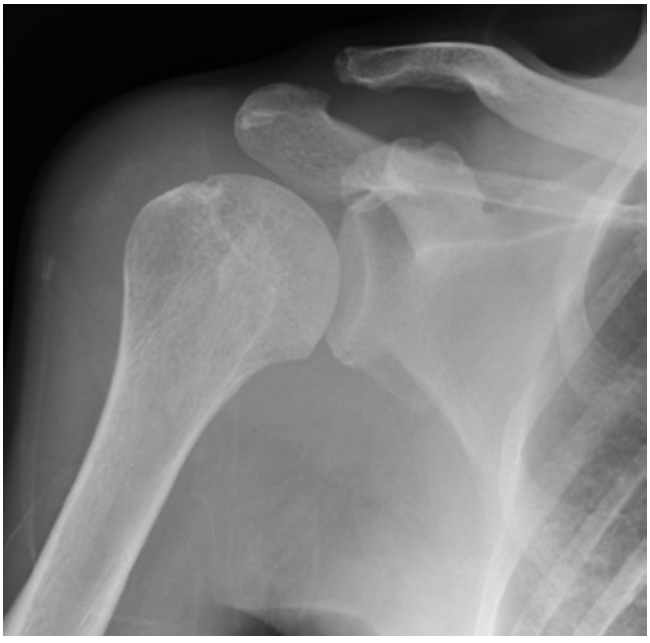

Fig 1. Anteroposterior radiograph of the right shoulder showing erosions affecting the coracoid process, humeral head and acromioclavicular joints. The glenohumeral joint space is preserved with no subchondral cystic change present.

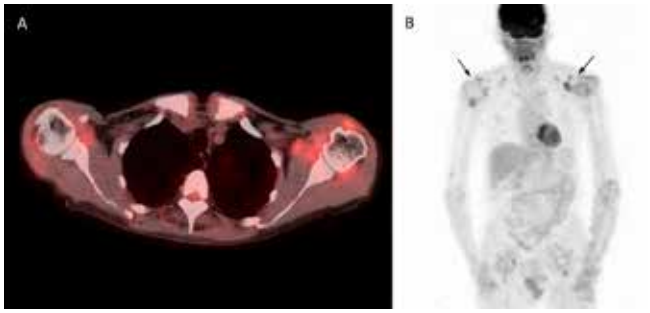

Fig 2. (A) Fused axial 18FDG-PET/CT image demonstrating periarticular radiotracer uptake in both shoulder joints with greater involvement on the left. (B) Coronal maximum-intensity projection 18FDG-PET/CT attenuation corrected image demonstrating FDG uptake in the periarticular regions (arrows) consistent with amyloid arthropathy.

Amyloidosis is characterised by extracellular deposition of protein and protein derivatives. The disease becomes clinically significant when its diffuse form affects organ function or when local deposition creates a mass. Our patient had dialysis-related amyloidosis (DRA) which is a well recognized complication in patients on long-term dialysis.[1, 2] Amyloid deposition with β2-microglobulin has high affinity for collagen and predominantly affects the osteoarticular system.[3, 4] DRA is clinically manifested by an erosive and destructive osteoarthropathy particularly in the form of scapulohumeral periarthritis, carpal tunnel syndrome, bone cysts, spondyloarthropathy and pathologic fractures.[1] As histopathological confirmation is not always possible and because increased serum β2-microglobulin levels are not diagnostic, the diagnosis is often made by imaging. Diagnosis is essential to prevent more serious complications such as pathologic fractures.

Plain radiography may demonstrate advanced DRA findings such as bone erosions and cystic lesions, but it is not sensitive in the demonstration of early changes and can also underestimate the extent of the disease. Ultrasound can be helpful in the detection of amyloid deposition in the periarticular soft tissues. CT and MRI are useful for the detection of lesions especially in the non-axial skeleton.[1, 3] On MRI, amyloid arthropathy typically demonstrates homogenous low-to-intermediate signal intensity on both T1 and T2-weighted images, and there can be high T2 signal in areas of cystic change. Periarticular amyloid may

enhance mildly after gadolinium administration.[5, 6] However, the administration of gadolinium has been linked to the development of nephrogenic systemic fibrosis in patients with advanced renal failure, in particular patients on dialysis and is contraindicated in this patient group.

PET-CT with ^{18}FDG has been reported to be a useful imaging modality to demonstrate areas of systemic amyloid deposition. Cases of amyloid arthropathy in patients with multiple myeloma and light-chain amyloidosis diagnosed with ^{18}FDG PET-CT have been described.[7, 8] Our case complements these reports in showing the utility of ^{18}FDG PET-CT in the diagnosis of amyloid arthropathy secondary to DRA, which is particularly useful in this patient population due to the contraindication to gadolinium which renders MRI evaluation suboptimal. ^{18}FDG PET-CT represents a non-invasive imaging modality which can be of value when conventional radiographs are not helpful in establishing the diagnosis or when disease extent is underestimated in patients with suspected amyloid arthropathy.

The authors have no conflicts of interest

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REFERENCES

1. Kiss E, Keusch G, Zanetti M, Jung T, Schwarz A, Schocke M et al. Dialysis-related amyloidosis revisited. *AJR Am J Roentgenol* 2005;**185(6)**: 1460-7.
2. Koch KM. Dialysis-related amyloidosis. *Kidney Int* 1992;**41(5)**: 1416-29.
3. Georgiades CS, Neyman EG, Barish MA, Fishman EK. Amyloidosis: review and CT manifestations. *Radiographics* 2004;**24(2)**: 405-16.
4. Slavotinek JP, Coates PT, McDonald SP, Disney AP, Sage MR. Shoulder appearances at MR imaging in long-term dialysis recipients. *Radiology* 2000;**217(2)**: 539-43.
5. Katoh N, Tazawa K, Ishii W, Matsuda M, Ikeda S. Systemic AL amyloidosis mimicking rheumatoid arthritis. *Intern Med* 2008;**47(12)**: 1133-8.
6. Sheldon PJ, Forrester DM. Imaging of amyloid arthropathy. *Semin Musculoskelet Radiol* 2003;**7(3)**: 195-203.
7. Mekinian A, Ghrenassia E, Pop G, Roberts S, Prendki V, Stirnemann J et al. Visualization of amyloid arthropathy in light-chain systemic amyloidosis on F-18 FDG PET/CT scan. *Clin Nucl Med* 2011;**36(1)**: 52-3.
8. Teixeira AdR, Haygood TM, Shah J, Madewell JE. Multimodality Imaging Including PET/CT in a Patient with Amyloid Arthropathy and Multiple Myeloma. *Radiology Case Reports [Online]* 2009;**4**:254.

"NO TIME FOR TEACHING AT OUR TEACHING HOSPITALS."

Editor,

Depending on the speciality choice you have made you may spend anywhere between zero and one hundred percent of your direct clinical contact time in an outpatient setting. The UK Patient charter, now designated the NHS Constitution, sets out the standards of care that patients can expect including the maximum waiting time for a routine outpatient appointment which currently stands at 18 weeks in the United Kingdom[1]. Within Otorhinolaryngology outpatient referrals have increased year on year. With increasing referral numbers and fixed waiting times outpatient clinics are at risk of being overloaded with decreasing time available for patients to spend with their doctor and potential decreases in the quality of care that they may obtain.

ENT UK have drawn up guidelines for safe patient numbers at clinics for consultants, registrars, SAS and junior trainees[2]. No such guidelines are present for other specialities. Mention is made in the ENT UK guidelines with regards to reducing clinic numbers for consultants supervising trainees , however no mention is made with regards to medical student teaching for either consultant or registrar grades.

In 1845 the number of students studying medicine at Queens University was 55, while today the number of full-time students is approximately 1200[3]. This is a substantial increase and is common across all Universities in the UK. Interestingly a review into admission rates to Medical and Dental Schools in the UK has shown that admissions have exceeded recommendations for at least the past five years and the government have recommended a 2 per cent reduction in intakes from next year[4].

This increasing number of medical students will all engage in clinical tuition to some extent throughout their undergraduate career with a proportion of this occurring in the outpatient setting. A study in 1999 suggested that medical student satisfaction is higher when they have the opportunity to both sit in on consultations and get an opportunity to take histories and certainly this is a key aspect of medical training[5]. The slow erosion of supporting profession activities (SPA) sessions is resulting in the relocation of medical student teaching from non clinical sessions into clinical time. Unfortunately this places additional demands on the supervising doctors in these clinics to provide both high quality patient care and tuition and one would question whether this well versed form of teaching is sustainable. In addition medical school admissions are increasingly competitive as are foundation job placements which has led to increased student expectations and demand for a greater duration of higher quality teaching.

Increasingly teaching is being diluted in our teaching hospitals to allow the prioritization of service provision. In an era of increasing litigation, time pressure and patient demand we need to ensure that our clinics are productive, safe, sustainable and provide adequate learning opportunities for medical students and junior doctors. This may mean that patients numbers at outpatient clinics need to be reduced to ensure successive doctors remain competent to treat them.

The authors have no conflict of interest.

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REFERENCES:

1. NHS Choices. The NHS Constitution: the NHS belongs to us all. Reddich: NHS England; 2013. Available online from: http://www.nhs.uk/choiceintheNHS/Rightsandpledges/NHSConstitution/Documents/2013/the-nhs-constitution-for-england-2013.pdf. Last accessed March 2014.
2. Recommended safe numbers seen in clinics. London: ENT UK at the Royal College of Surgeons; ca 2012. Available online from: https://entuk.org/docs/prof/misc/Recommended_numbers_in_ENT_clinics. Last accessed March 2014.
3. Queen's University Belfast. School of Medicine, Dentistry and Biomedical Sciences. History of the Medical School. Belfast: Queen's University; 2013. Available online from: http://www.qub.ac.uk/schools/mdbs/AboutUs/history/. Last accessed March 2014.
4. The Health and Education National Strategic Exchange. Great Britain, Department of Health. Review of medical and dental school intakes in England. Leeds: Department of Health; 2012. Available online from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/213236/medical-and-dental-school-intakes.pdf. Last accessed March 2014.
5. Hajioff D, Birchall M. Medical students in ENT outpatient clinics: appointment times, patient satisfaction and student satisfaction. *Med Educ*. 1999;**33(9)**:669-73.

ACUTE FULMINANT NECROTISING LYMPHOCYTIC MYOCARDITIS IN A PATIENT WITH MIXED CONNECTIVE TISSUE DISEASE: A RAPID CLINICAL RESPONSE TO IMMUNOSUPPRESSION

Editor

Myocarditis is an uncommon condition encompassing a spectrum from asymptomatic cases to fulminant heart failure. Acute fulminant myocarditis is characterised by severe haemodynamic compromise often necessitating circulatory support. The diagnosis and management of myocarditis remains challenging with uncertainty surrounding the role of immunosuppression therapy. We describe a case of biopsy-proven acute necrotising lymphocytic myocarditis which responded rapidly to steroids, mycophenolate and immunoglobulins.

A 53 year old male was admitted to a District General Hospital with a 4-day history of chest pain and 'flu-like symptoms. He had a history of mixed connective tissue disease (MCTD). Physical examination revealed sinus tachycardia (126bpm) and mild pulmonary oedema.

The ECG on admission showed sinus rhythm with Q waves in the anterior chest leads and T wave inversion in leads I, aVL and V3-V6. High-sensitivity troponin T (hsTNT) was 5220ng/L and the C - reactive protein (CRP) was 328mg/L. Within 24 hours he developed cardiogenic shock with severe pulmonary oedema, left bundle branch block and severe left ventricular systolic dysfunction (LVSD). Transfer was arranged due to clinical instability. At cardiac catheterisation, the aortic pressure was 83/55mmHg with a left ventricular end-diastolic pressure of 35mmHg. Coronary angiography showed no obstructive disease and an intra-aortic balloon pump (IABP) was sited.

With the progressing ECG abnormalities, echocardiographic findings and rising biomarkers, a diagnosis of acute myocarditis was made. Urgent right ventricular endomyocardial biopsies were undertaken with frozen section analysis confirmed acute necrotising myocarditis. There was no evidence of vasculitis and giant cells were absent on histopathology (Figures 1 & 2). Immunohistochemistry was negative for Epstein Barr virus (EBV) and parvovirus. Viral polymerase chain reaction (PCR) was weakly positive for both. Screening for hepatitis B, C, cytomegalovirus (CMV), erythrovirus B19, streptococcus pneumoniae and picornavirus was negative.

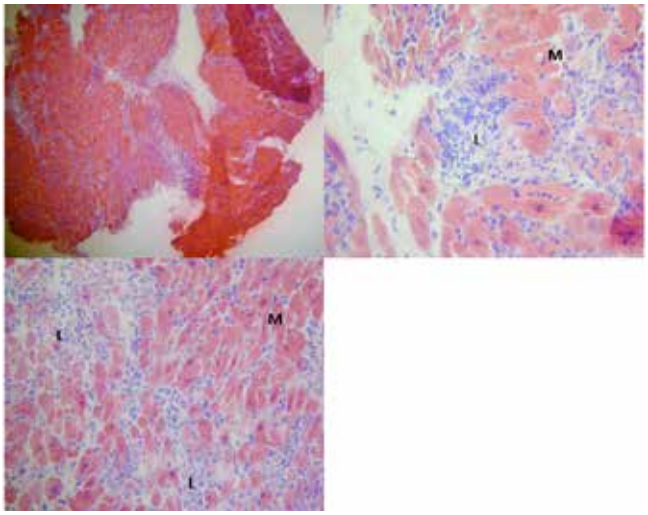

Fig 1. Histology specimen from the endomyocardial biopsy demonstrating myocardium with a dense infiltrate of inflammatory cells (L)-(dark blue nuclei) separating the myocytes (M)

Oral prednisolone (40mg OD) and mycophenolate mofetil (500mg BID) were commenced on rheumatological advice. A total dose of 300g of Human Immunoglobulin [Privigen® (CSL Behring, PA, US)] was administered over 5 days.

A rapid clinical improvement ensued, facilitating IABP removal and discontinuation of inotropes after 72 hours. Standard heart failure therapy was commenced. Repeat echocardiography by day 9 showed only mild global left ventricular systolic impairment. Temporary interruption in mycophenolate therapy occurred due to shingles (treated with Ganciclovir). He was discharged on day 15.

DISCUSSION

The diagnosis of myocarditis should be considered in any patient presenting with acute heart failure. Non-invasive imaging modalities (ECHO and Cardiac MR) are helpful in establishing the diagnosis. Ultimately, myocarditis is a histopathological diagnosis. Multiple endomyocardial biopsy samples are required as sampling error can occur in the setting

of patchy disease. The most common histopathological form of acute myocarditis is a lymphocytic pattern. The mainstay of treatment in acute myocarditis is inotropic agents and circulatory support. The efficacy of intravenous immunoglobulin (Ig) and immunosuppression remains unproven. Studies have demonstrated mortality benefits with early IG and steroid administration.

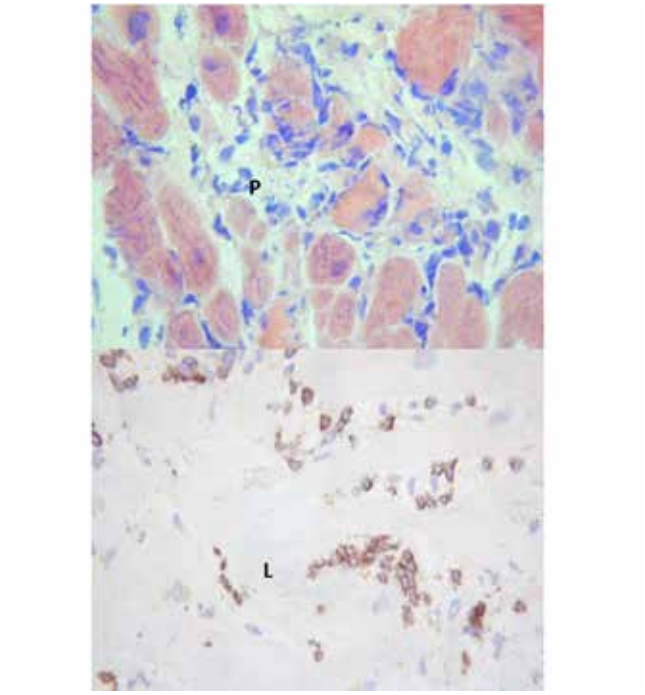

Fig 2. Histology specimen from the endomyocardial biopsy demonstrating extensive myocyte necrosis and phagocytosis (P). Immunohistochemistry has been performed highlighting the T lymphocytes (L)

The authors have no conflicts of interest

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MOLECULAR PROFILING OF GLIOMAS - TIME FOR A REGIONAL SERVICE.

Editor,

Gliomas form a heterogeneous group of intrinsic primary brain neoplasms in terms of pathological and clinical features.[1] Low-grade (WHO grade II) gliomas (e.g. astrocytomas and oligodendrogliomas) inevitably recur and progress to higher grade (WHO III-IV) anaplastic tumours. Although they have traditionally been classified using histological criteria, there is increasing evidence that gliomas can be further subtyped based on molecular profile which can predict prognosis and response to treatment.[2]

Longterm follow-up data has demonstrated a significant survival advantage with anaplastic oligodendroglioma (AO)/oligoastrocytoma (AOA) tumours co-deleted for chromosomal arms 1p and 19q following combined chemo-radiotherapy compared with non-1p19q codeleted cases. These findings validated in both European (EORTC 26951)[3] and North American trials (RTOG 9402)[4] have meant that 1p19q status predicts post-surgical treatment. The current standard of care is that co-deleted cases receive chemoradiotherapy while non-deleted cases receive only radiotherapy due to the lack of efficacy of combined treatment in this group.

Prior to this recent change in practice, all patients with anaplastic oligodendroglial tumours were treated with radiotherapy upfront and received chemotherapy (typically procarbazine, lomustine and vincristine) on relapse. The aim of this regional retrospective study was to establish as a baseline NI clinical outcomes using this pre-1p 19q stratification as a comparator for future outcomes studies.

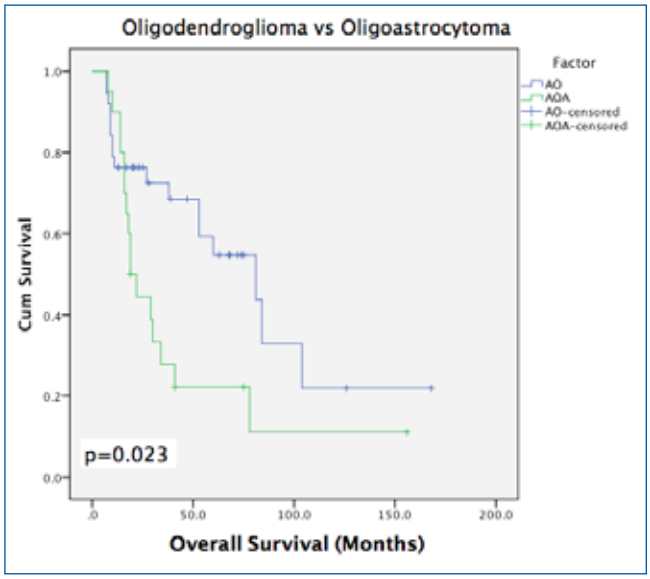

Fig 1. Kaplan-Meier survival curves for anaplastic oligodendroglial (AO) versus anaplastic oligoastrocytoma patients treated in NI over a 5-year period (2007-2012).

RESULTS

Clinical, pathological and molecular profile data (available in 20 cases) were analysed in 58 consecutive patients with a histological diagnosis of anaplastic oligodendroglial tumour diagnosed over a five-year period (2007 to 2012). The median survival of all patients was found to be 53 months (95% CI 22-84 months). The median survival of patients with AO (n=38) was found to be 81 months (95% CI 37-125 months). The median survival of patients with AOA (n=20) was found to be 19 months (95% CI 14 to 25 months). Log-rank analysis confirmed that AO patients had a significantly longer median survival than those with AOA tumours (p=0.023) comparable with other reports (Fig. 1).[5]

Patients with the 1p/19q co-deletion (n=13) had a median survival of 74 months (95% CI 21-127 months), while those without the co-deletion (n=7) had a median survival of 60 months (95% 47-74 months) although the difference was not significant to the small size of this preliminary dataset (p=0.782).

DISCUSSION

Our review of anaplastic oligodendroglial tumours treated "pre-1p19q stratification" indicates our clinical outcomes are comparable with other published reports. This study serves as an important baseline for future comparative studies following the recent change in practice. It is also a requirement of ongoing national cancer peer review to report regional outcomes for patients and benchmark them with the national standards. Furthermore, with the emergence of molecular profiling of all gliomas as a mandatory requirement in the forthcoming amended WHO diagnostic criteria, it will be important to have access to a regional service that can provide molecular profile in tandem with routine histology reports. Not only will this ensure our patients receive the same standard of care as other UK neuro-oncology centres but also minimise anxiety associated with delays in molecular profile reports returning from outside institutions.

The authors have no conflict of interest apart from the pressing clinical need of a regional molecular profiling service.

Cathal Hannan,[1] Dr Shahnaz Al-Rashid,[2] Dr. Brian Herron,[1] Dr. David Conkey,[1] Dr. Jacqui Harney,[1] Julie Lyness,[1] Joanne Moss,[1] Dr. Tom Flannery.[1,2]

Regional Neuro-oncology Multidisciplinary Team, Belfast Health & Social Care Trust.[1]

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REFERENCES

1. Louis DN, Ohgaki H, Wiestler OD, Cavenee WK, Burgery PC, Jouvet A, *et al.* The 2007 WHO Classification of tumours of the central nervous system. *Acta Neuropathol*. 2007; **114(2):**97-109.
2. Weller M, Stupp R, Hegi ME, van den Bent M, Tonn JC, Sanson M, *et al.* Personalized care in neuro-oncology coming of age: why we need MGMT and 1p/19q testing for malignant glioma patients in clinical practice. *Neuro Oncol*. 2012; 14(Suppl **4**):iv100-8.
3. van den Bent MJ, Brandes AA, Taphoorn MJ, Kros JM, Kouwenhoven MC, Delattre JY, *et al.* Adjuvant procarbazine, lomustine, and vincristine chemotherapy in newly diagnosed anaplastic oligodendroglioma: long-term follow-up of EORTC brain tumor group study 26951. *J Clin Oncol.* 2013; **31(3):**344-50.
4. Cairncross G, Wang M, Shaw E, Jenkins R, Brachman D, Buckner J, *et al.* Phase III trial of chemoradiotherapy for anaplastic oligodendroglioma: long-term results of RTOG 9402. *J Clin Oncol.* 2013; **31(3):**337-43.
5. Sepulveda Sanchez JM, Martinez Montero JC, Diez-Lobato R, Hernandez-Lain A, Cabello A, Ramos A, *et al.* Classification of oligodendroglial tumours based on histopathology criteria is a significant predictor of survival – clinical, radiological and pathologic long-term follow-up analysis. *Clin Neuropathol*. 2009; **28(1)**:11-20.

A SHOTGUN INJURY TO THE BUTTOCKS; GETTING TO THE HEART OF THE MATTER.

Editor,

CASE:

A 19-year-old male presented with a shotgun injury to the buttocks. Entry wounds were visible on both buttocks. There were no other wounds. A pelvic radiograph revealed multiple pellets projected over the right hemi-pelvis (Figure 1). A chest radiograph demonstrated two small foreign bodies in the region of the right heart (Figures 2 and 3). Subsequent computed tomography showed extensive shrapnel in the right transgluteal and perineal regions and two pellets embedded in the right atrium. This embolisation is attributable to entry into the circulation via the pelvic venous system. The patient underwent debridement of the buttock wounds. An echocardiogram excluded a patent foramen ovale. No attempt was made to retrieve the embolised pellets and the patient has remained asymptomatic.

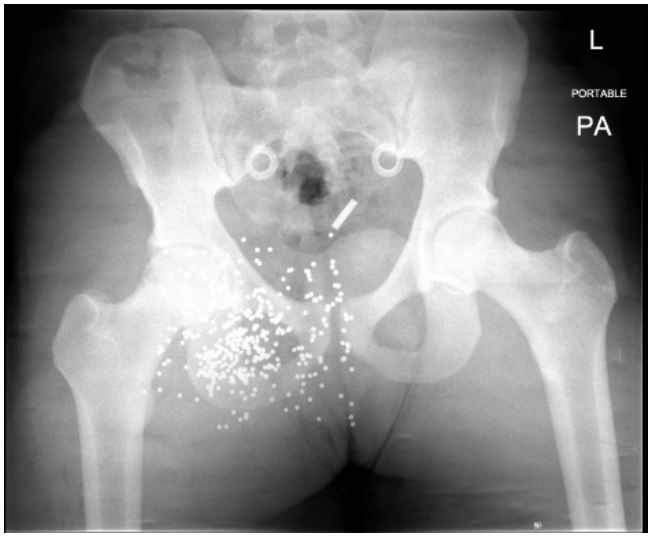

Fig 1.

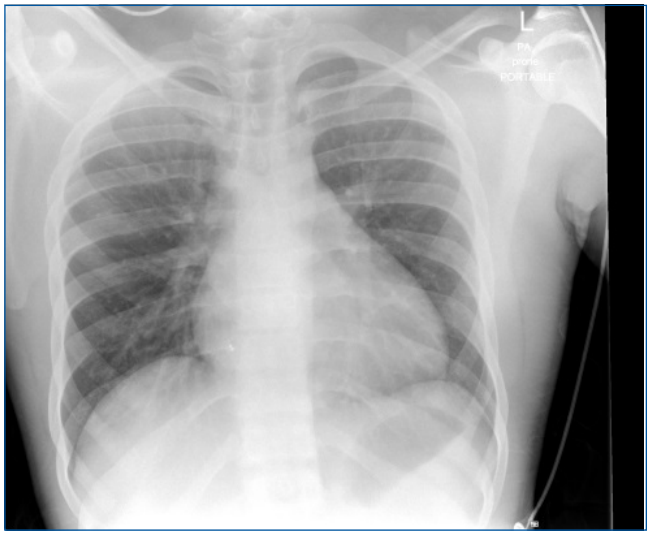

Fig 2.

DISCUSSION:

Foreign body embolisation is a rare complication of penetrating trauma from firearms. The incidence of bullet embolisation after penetrating injury is estimated to be 0.3 – 1% (1). Patients may be asymptomatic, however the development of complications such as distal limb ischaemia, endocarditis, pulmonary embolism or stroke should prompt consideration of emboli. The diagnosis of bullet embolisation should also be considered when there is a discrepancy between the number of penetrating wounds and the foreign bodies identified, the location of the bullet does not match that which would be expected by the trajectory or when migration of bullets are demonstrated on serial radiographs.

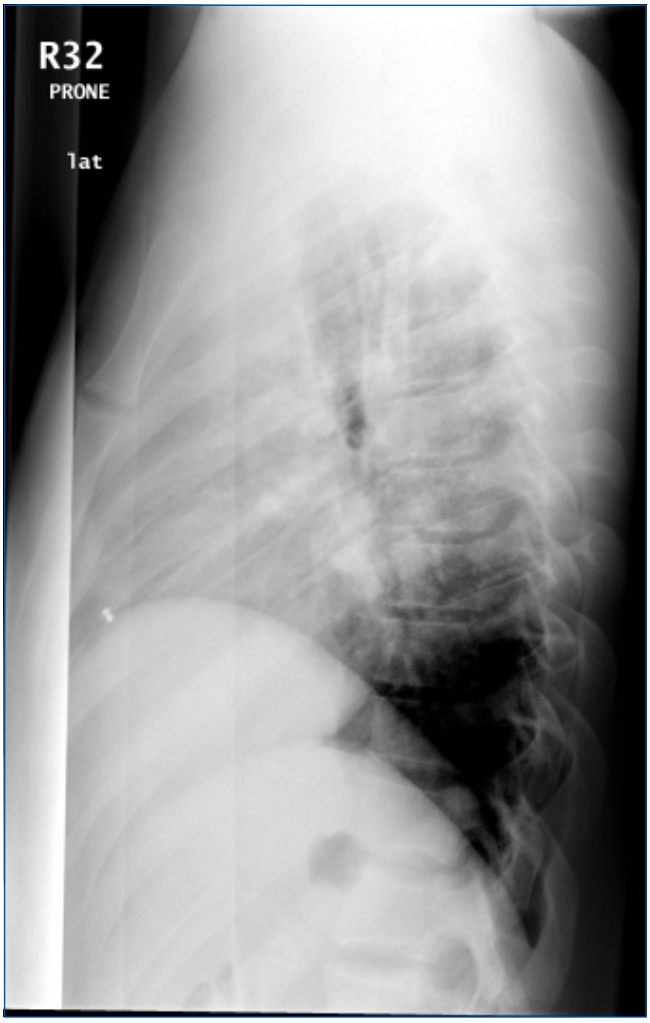

Fig 3.

The most common destination of venous emboli is the right ventricle followed by the pulmonary artery. Embolisation to the right atrium represents less than 5% of the final destination of all such emboli (2). The most common destination of bullet emboli within the arterial system is the femoral artery. The main risk associated with venous emboli is pulmonary embolism, however arterial complications may still occur from right heart emboli if a patent foramen ovale is present. The incidence of patent foramen ovale in the general population is estimated at 25% (3). Emboli in the arterial system are symptomatic in 80% of cases compared to 33% of venous system cases (4).

Foreign bodies that embolise to and remain within the heart have been managed both conservatively and surgically in the literature (5). There may be a role for percutaneous intervention in some cases, however this has not been explored in detail. The presence of complications including endocarditis or arrhythmias may be an indication for intervention. Intra-cardiac emboli may be entrapped within endocardial trabeculations and with time can become encapsulated within fibrous tissue. The long-term risks of endocarditis or mural thrombus formation are not known.

CONCLUSION:

Foreign body embolisation should be considered in patients presenting with unexpected symptoms, signs or radiological findings following firearms injury. An echocardiogram should be performed for right heart emboli to exclude a patent foramen ovale due to the risk of arterial embolisation.

The authors have no conflicts of interest

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REFERENCES:

1. Nolan T, Phan H, Hardy A, Khanna P, Dong P. Bullet embolization: multidisciplinary approach by interventional radiology and surgery. *Semin Intervent Radiol.* 2012; **29(3)**: 192–6.
2. Springer J, Newman W, McGoey R. Intravascular bullet embolism to the right atrium. *J Forensic Sci.* 2011;56 Suppl 1:S259-62.
3. Komar M, Podolec P, Przewlocki T, Wilkolek P, Tomkiewicz-Pajak L, Motyl R. Transoesophageal echocardiography can help distinguish between patients with "symptomatic" and "asymptomatic" patent foramen ovale. *Kardiol Pol*. 2012; **70(12):**1258-63.
4. Michelassi F, Pietrabissa A, Ferrari M, Mosca F, Vargish T, Moosa H. Bullet emboli to the systemic and venous circulation. *Surgery.* 1990 **107(3):** 239-45.
5. Actis Dato GM, Arslanian A, Di Marzio P, Filosso PL, Ruffini E. Posttraumatic and iatrogenic foreign bodies in the heart: report of fourteen cases and review of the literature. *J Thorac Cardiovasc Surg.* 2003 **126(2):** 408-14.

Ulster Med J 2014;**83(2):**123-125

Abstracts

Ulster Society of Gastroenterology, Spring Meeting, 15th March 2012

Hilton Hotel, Templepatrick

President	Dr A Varghese
Secretary	Dr P Lynch
Treasurer	Dr G Caddy

PROGRAMME

1:30pm	Coffee/ Registration
2 – 3:30pm	Free papers
3:30 – 3:45pm	Coffee/ exhibition stand
3:45 – 4:15pm	*The Regional Endoscopy Reporting System* Mr K Khosraviani Consultant Colorectal Surgeon Royal Victoria Hospital
4:15 – 5pm	*Alcohol, Society and the Doctor's Role* Prof Sir Ian Gilmore BSG President-Elect Consultant Gastroenterologist Royal Liverpool University Hospital
5pm	Business meeting
6pm	Dinner
	USG Free Paper Abstracts

AN EARLY EXPERIENCE OF LAPAROSCOPIC RECTOPEXY

McIlmunn CG, Jones C, Byrnes C
Department of Surgery, Antrim Area Hospital, NHSCT

Introduction

Laparoscopic rectopexy for rectal prolapse has come into vogue in recent years with advancements in laparoscopic surgery. This is a retrospective audit of patients who underwent laparoscopic rectopexy in a single centre, comparing outcomes with previously published data.

Method

All patients who underwent laparoscopic rectopexy over a three-year period were included. Patients were retrieved from computerised operating records, searching for the term 'laparoscopic rectopexy'. Patient notes were retrieved, and data regarding patient demographic, operative details, short-term complications and long-term outcomes collected.

Results

Seven patients (6 female, 1 male) were recorded as having undergone laparoscopic rectopexy. Two were excluded, one patient underwent an open redo rectopexy and another had an EUA only. Five patients were included with median age 75 (33 - 83). Four had a laparoscopic rectopexy and the fifth had a laparoscopic-assisted resection rectopexy. The operation lasted a mean of 124 minutes (range 64 -164 minutes). The patients had a median inpatient stay of 8 days (range 6-17 days). No mortalities were reported. One patient required a post-operative blood transfusion and another had a laparoscopic port wound infection requiring oral antibiotics. Patients were followed for a median of 6 months (range 4 to 12 months). Two patients reported occasional faecal incontinence at first review; all patients reported improvement in symptoms by second review. There were no incidences of prolapse recurrence or sexual dysfunction.

Conclusion

This study demonstrated promising early experience with laparoscopic rectopexy in keeping with previously published data.

PROTON PUMP INHIBITORS - ARE WE PRESCRIBING THEM CORRECTLY?

Stratton L, Addley J, Mainie I
Belfast City Hospital

Introduction

Proton pump inhibitors (PPIs) are one of the most frequently prescribed medicines worldwide. However in many cases they are inappropriately prescribed in both primary and secondary care.

Objective

The aim of this audit was to examine the PPI prescribing practice of junior doctors in a large teaching hospital and to assess patient knowledge with regard to their medication.

Method

A questionnaire was distributed to junior doctors, general medical inpatients and nursing staff with respect to PPI administration. Junior doctors were asked further questions regarding IV PPI therapy.

Key findings

There were 50 inpatients in this study (21 males, 29 females)

with an average age of 66 (range 28-90). The main indication was for symptoms of gastro-oesophageal reflux in 38%. Only 10% were taking the medication at the correct time in relation to meals, and most had never been trialled off their PPI.

Of 50 doctors questioned, few gave lifestyle advice to their patient (36%) and less than half were aware of the timing of PPI administration (48%). Knowledge of IV PPI prescribing was poor. 81% of nursing staff recognized that PPI should be given before a meal.

Discussion

Overall knowledge with respect to all aspects of PPI prescribing, both oral and IV, appears to be very poor amongst junior medical staff. Education for both patient and doctors is paramount to ensure correct prescribing and that maximum efficacy is achieved.

ADENOCARCINOMA OF THE SMALL INTESTINE - CASE SERIES AND LITERATURE REVIEW

Neely D, Ong J, Skelly R, Patterson J
Department of Surgery, Causeway Hospital, NHSCT

Aim - To identify patients diagnosed with small intestinal adenocarcinoma in our institution and to review the current literature regarding investigations and management strategies.

Methods – A chart review was conducted of all patients diagnosed with small intestinal adenocarcinoma over the last two years; highlighted from the electronic patient database. Nature of presentation, presenting symptoms, investigations and treatment received were noted. A review of the recent literature on recommended investigation and management was then conducted via medline.

Results – Three patients were diagnosed with small intestinal adenocarcinoma (mean age of 64 years) in the allocated time frame. Each presented with non-specific GI symptoms and required multiple imaging modalities prior to surgery. Investigations used were OGD (2), CT Abdomen (3), SBS (2), Enteroscopy (1) and CT PET (1). Each of the lesions were located within the proximal jejunum and were amenable to surgical resection with one patient requiring adjuvant chemotherapy. All three patients remain under surgical follow-up.

Conclusion – Adenocarcinoma of the small intestine is rare and often presents at an advanced stage due to non-specific symptomatology. A high index of suspicion combined with multiple imaging methods is essential for a prompt diagnosis. More recent advances in small intestinal visualization facilitate accurate diagnosis in patients with suspected small intestinal neoplasia. These include MR enteroclysis, double balloon enteroscopy and video capsule endoscopy. Surgical resection remains the only treatment modality with curative potential. The role of adjuvant chemotherapy is unclear however; combination of oxaliplatin and 5FU appears to confer survival benefit.

SPONTANEOUS SPLENIC RUPTURE IN INFECTIOUS MONONUCLEOSIS

Hillemand CGP, Nicholson C, Lynch PM
Department of Gastroenterology, Antrim Area Hospital, NHSCT

Spontaneous splenic rupture (SSR) is an uncommon but potentially life-threatening complication of infectious mononucleosis and is also seen in other pathology affecting the spleen. While splenomegaly itself is common in the setting of infectious mononucleosis, the incidence of SSR is thankfully low, with studies reporting 1-2 cases per 1000. There is however a high mortality associated with this condition, with misdiagnosis probably due to an absence of trauma in the patients history. We present the case of a 27-year-old man with spontaneous splenic rupture secondary to infectious mononucleosis as well as a discussion of possible aetiologies, diagnosis and management of this condition.

WHAT DO YOUNG PEOPLE AND PARENTS WANT FROM AN INFLAMMATORY BOWEL DISEASE (IBD) SERVICE?

Little R, Imrie C, Derby A, Gillespie P, Caddy G, Tham TCK
Ulster Hospital, Belfast; Altnagelvin Hospital; Crohn's Colitis UK (N Ireland)

Introduction:

Presently, the UK Inflammatory Bowel Disease (IBD) Standards framework on optimal service provision for paediatric and adolescent patients offers guidance on the formation of transition IBD clinics. However due to a lack of data on what constitutes an ideal service this framework is based on opinion and intuitive reasoning.

Aim:

To develop a comprehensive understanding of the key service requirements for young people with IBD and their parents.

Methods:

Patients aged 6 – 18 years were identified from databases in two teaching hospitals and membership of the Northern Ireland branch of Crohn's and Colitis UK. Anonymous questionnaires regarding perceived quality of care, clinic care, specialist input, support and information plus any suggestions were sent to these patients and their parents separately.

Results:

105 questionnaires were sent and 51 participants responded (49% response rate). 84% were happy with the quality of care being received. Participants were reluctant to attend clinics due to: blood tests, specialist staff unavailable and lack of car parking. Nurse specialist, dietician, IBD surgeon, psychologist, skin / eye specialist input was deemed beneficial by 95%, 81%, 71%, 59%, and 45% respectively. Immediate contact, including via email, with healthcare personnel for disease flare, support groups, financial advice and knowledge about IBD research were deemed important for service improvement.

Conclusions:

The majority of young IBD patients and their parents are satisfied with their care. The knowledge accrued, especially regarding specialist services support and rapid access to professional advice, is fundamental to designing an optimal IBD service.

PATIENT SATISFACTION WITH THE CONSENT PROCESS IN GASTROINTESTINAL ENDOSCOPY

Skelly BL, Gray RT, McCain RS, MacCormack BJ, Neill AK
Department of General Surgery, Daisy Hill Hospital Newry

Aim

Patients undergoing elective gastrointestinal endoscopy are referred from many sources. Best practice dictates that patients are counselled and given information to read before returning to document written consent pre-procedure. Our study aimed to assess patient satisfaction regarding the timing of consent and how the process was performed.

Method

From September to October 2011, a prospective cohort of patients undergoing upper and lower gastrointestinal endoscopy, completed a questionnaire when attending for their procedure. Satisfaction with the consent process was assessed using a Likert scale.

Results

138 completed questionnaires were analysed in patients with a median age of 53 (IQR 42-68) years (male=65, 51%). Referral source was GP 38%; surgical 32%; medical 14%. Procedure counselling occurred at two intervals, pre-day of procedure 52.2%, or day of procedure 47.8%. Overall patient satisfaction was high with a median score of ten (IQR 9-10). There was no difference in satisfaction between pre-day of procedure versus day of procedure cohorts (p=0.66). Patients have no single preference regarding the timing of consent.

Conclusion

The practice of obtaining informed written consent for endoscopy varies. It is ideally performed when appropriate information is presented in a manner comprehendible to the patient and they are given time to make informed decisions. BSG guidelines suggest that such counseling should occur ideally at least 24 hours before the procedure, before the patient be asked to sign a consent form. This study suggests that patients are equally satisfied when consent is obtained either prior to or on the day of the procedure.

DOES ILEOCAECAL VALVE SHAPE DETERMINE EASE OF TERMINAL ILEUM INTUBATION?

Hillemand CGP, Ali SM
Department of Gastroenterology, Antrim Area Hospital, NHSCT

Background: Intubation of the terminal ileum and ileoscopy can be a useful diagnostic tool at colonoscopy to confirm completion of the procedure and to assess for terminal ileal pathology in e.g. suspected Crohns disease, as well as allowing therapeutic procedures such as dilatation of distal small bowel strictures. It has been noted during routine colonoscopy in this centre that the ileocaecal tends to be 1 of 3 shapes: circular, oval or sickle shaped. We sought to determine whether the shape of the ileocaecal valve has any effect on the ease of intubation of the terminal ileum.

Methods: 100 patients had full colonoscopy and attempt at ileocaecal intubation. The shape of the ileocaecal valve was noted as well as whether or not terminal ileum intubation was successful.

Results: 9 patients had circular IC valve, 34 had oval shaped IC valve and 57 had sickle shaped IC valve. The successful rate of terminal ileum intubation was 100%, 97% and 69% respectively.

Conclusion: Terminal ileum intubation is more challenging in sickle shaped valves which accounted for over half of the cases in this study. We also noted that intubation of the terminal ileum was easier if there was any pathology present.

COLONIC STENT USE FOR ACUTE BOWEL OBSTRUCTION

Adgey C, McCallion K, Tham TCK, Caddy G
Division of Gastroenterology, Ulster Hospital, Dundonald.

Objective- Approximately 20% of malignant colorectal tumours will present with bowel obstruction requiring emergency treatment. Management options for these patients include emergency surgery or insertion of a self expanding metal stent (SEMS) with interval elective surgery. The purpose of this study was to assess the use of SEMS for colonic decompression in these patients.

Methods- Patients were identified for the study from the endoscopy database between October 2006 and January 2011. Regarding the SEMS insertion, data recorded included time to stent, Dukes staging, time to surgery (if applicable), location of tumour and outcome.

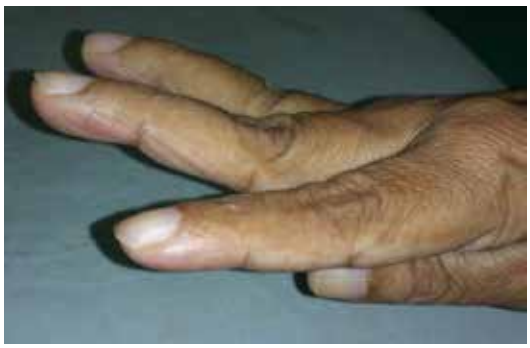
Results- 59 patients were recorded as having SEMS insertion attempted between these dates. 20 of these patients were admitted electively (33.8%). 44 patients had confirmed adenocarcinoma on biopsy, 5 had negative biopsy however a colonoscopic appearance of adenocarcinoma. Out of the 49 cancer patients there were 10 failures at insertion. Of the remaining 39 patients SEMS were inserted an average of 4 days from admission. The majority of the palliative patients died in within 3 months after SEMS. 12 of the 39 patients went on to have curative surgery following SEMS insertion (30.7%). 11 out of these 12 patients are alive post procedure (median 4 months). 10 of the 12 patients had primary surgery with anastomosis and the remaining 2 patients required a stoma.

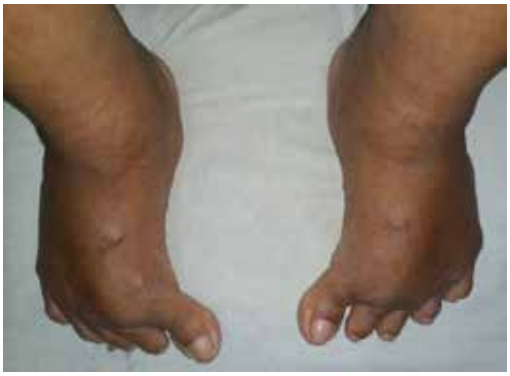
Conclusion- SEMS for acute obstruction in our hospital is mainly palliative. The patients that have received SEMS as a bridge to surgery have positive outcomes and the majority have not required a stoma.

Curiositas

MEDICAL STUDENT QUIZ

A 48 year old female had been symptomatic for the last two decades with pain, swelling and stiffness of the small joints of her hands and feet. She had been taking herbal medications for the last 6 years. Examination revealed swelling of the small joints of her hands, wrist, ankle and foot joints as well as deformities of hands and feet. She was positive for anti-cyclic citrullinated peptide (Anti CCP) antibody. (A) Identify the deformities? (B) What is the most probable diagnosis?

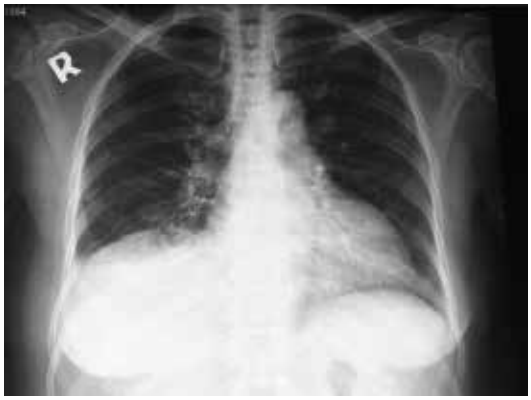




Dr George Sarin Zacharia , Senior Resident, Department of Internal Medicine, Government Medical College, Kottayam, Kerala, India

POSTGRADUATE QUIZ

A 48 year old woman with a past history of treated lymphoma was admitted with slowly increasing breathlessness. She was systemically well and apyrexic. A chest radiograph revealed a right pleural effusion.

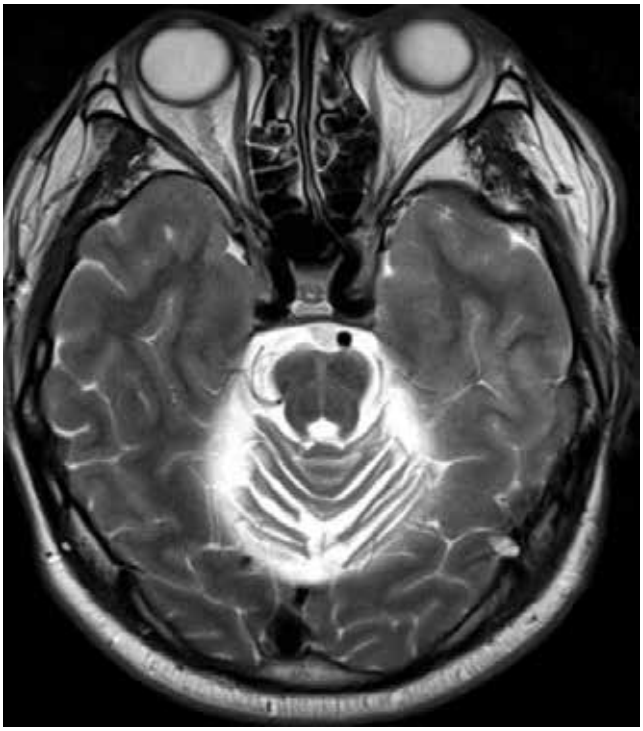


She proceeded to thoracocentesis. The material shown in the specimen bottles was drained from her pleural cavity. (A) What is the most likely diagnosis? (B) What are the typical laboratory findings? (C) What possible underlying causes would you be concerned about?

Dr Ian Bickle, Consultant Radiologist, Raja Isteri Penigran Anak Saleha Hospital, Bandar seri Begawan, Brunei Darussalam and Dr Paul Hamilton, Specialty Registrar, Chemical Pathology, Belfast Health and Social Care Trust, Northern Ireland.

AND FINALLY…..

What does the MRI appearance of this patient's pons remind you of and can you name the typical cause?



Dr Ian Bickle, Consultant Radiologist, Raja Isteri Penigran Anak Saleha Hospital, Bandar seri Begawan, Brunei Darussalam.

ANSWERS See overleaf.

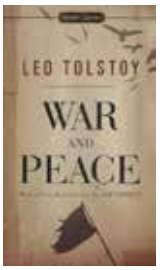
CONSIDER CONTRIBUTING TO CURIOSITAS?
Please refer to '*Curiositas: Guidelines for contributors*' http://www.ums.ac.uk/curiositas.html and email *curiositas@ums.ac.uk* with your ideas and submissions

Book Case

Professor Peter Stanton considers six of his favourite books.

You can get information from books, or enjoy characters, plots, or places. Yet there can also be a physical pleasure in the act of reading, the joy taken from words well chosen, quite separate from their meaning.

WAR AND PEACE

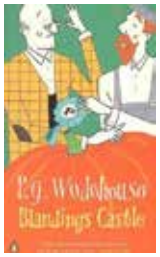


For me, this represents the greatest pleasure that reading can provide. Do not be intimidated by its length, the flow of language makes it pass surprisingly quickly, and you soon get used to the Russian names. Its control of character and plot over such a huge canvas is unmatched.

PARADISE LOST

Milton had a magnificent 'ear' for the English language. His is poetry that cries out to be read aloud, to enjoy the sound of it as much as its sense. Shakespeare has many such moments as well, but sadly we have cared less and less as time has gone by about beauty of expression. Since Milton, probably only Keats had such musicality.

PG WODEHOUSE

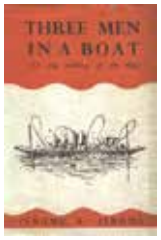


An apparently effortless evocation of a latter day Eden, mixed with consistent, gentle humour. He is one of the funniest writers in the language. Any of his books would serve, but I would probably choose one of those set at Blandings Castle- an idyllic setting and a splendid array of characters ranging from the eccentric to the barking mad.

PRIDE AND PREJUDICE

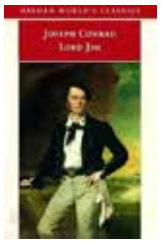
A trite choice but it is Austen's masterpiece. From the most famous opening line in English, its elegant style never falters. It wears its subtle criticism of the mores of the social class it describes very lightly, but the subversion is everpresent beneath the gentle humour. Austen was an astute critic of the world in which she lived.

THREE MEN IN A BOAT



Unlike my other choices, this was a one-off success for the author. On the peg of a travelogue of a Thames rowing trip is hung a consistently accurate satire of the foibles of human nature. Witty and urbane, it is splendidly evocative of leisured life in late Victorian England.

LORD JIM



I marvel at the command of English by a man who did not learn it until he was in his 20s. Both the prose and ideas are complex in this most intensely psychological drama about a man's struggle to overcome his internal demons, but when it comes to describing the sea Conrad waxes lyrical. Few have written with such love about the mariner and his medium.

Curiositas: Answers

MEDICAL STUDENT QUIZ

(A) Swan neck deformity and Hallux varus deformity. A swan neck deformity is characterized by hyper-extension at the proximal interphalangeal joint with flexion at the distal interphalangeal joint. Hallux varus is characterized by medial deviation of the great toe from the first metatarsal bone.

(B) Rheumatoid arthritis. Arthritis involving multiple small joints of hands and feet lasting for more than six weeks in the presence of antibodies to cyclic citrullinated peptide (anti-CCP) meets the 2010 American College of Rheumatology/European League Against Rheumatism Rheumatoid Arthritis Classification Criteria.

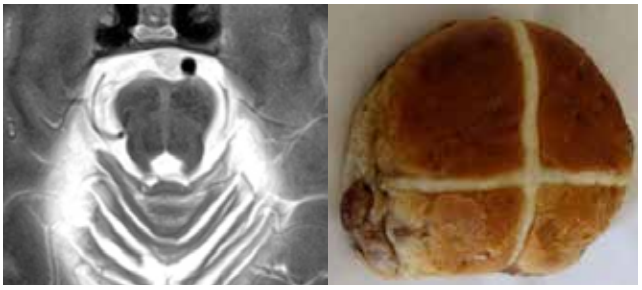
POSTGRADUATE QUIZ

(A) Turbid, milkly fluid has been drained from the pleural cavity. In this case, the patient had a chylothorax, but fluid with a similar appearance may be found in those with empyema or pseudochylothorax. Empyema is less likely here since the patient was systemically well.

(B) Chylothorax fluid will remain milkly after centrifugation. It typically contains chylomicrons and triglyceride in elevated concentrations.

(C) A chylothorax may be the presenting feature of several disease processes, most commonly in the setting of thoracic trauma or neoplastic disease. It is the result of disruption to the thoracic duct. In this instance the patient was found to have a relapse of her lymphoma.

AND FINALLY…..



The 'Hot cross bun' sign refers to the distinct appearance of the pons as seen in several neurodegenerative diseases, most commonly the Parkinson plus syndrome, multiple system atrophy (MSA). Linear hyperintense T2 signal forms a cross through the pons on axial sequences, identical to that on the top of the western bakery delicacy the hot cross bun. The cross on the bun has religious connotations, representing the crucifixion of Christ, hence the seasonal appearance of these buns largely around Easter time.

(Hot cross bun kindly made and photographed by Mr Rodger V Bickle, Kettering, Northamptonshire. Radiographic images courtesy of Dr Ian Bickle, Consultant Radiologist, Raja Isteri Penigran Anak Saleha Hospital, Bandar seri Begawan, Brunei Darussalam)

Game Changers

MORE SUGAR TO THE TOP OF THE TABLE.

Al Dorman

The world health organisation advise halving sugar consumption.[1] Although amounts of sugar consumed in the UK is concerning, not all sugar molecules are bad. Cyclical sugars or cyclodextrins have an important role in anaesthesia.

The cyclical structure of this molecule has been previously employed in various industries: In low fat dairy spreads, hydrophobic cholesterol is removed using a process by lodging it inside the cyclodextrin. Hydroxypropyl-β-cyclodextrin (HPβCD) is the principle active compound in the fabric odour eliminator *Febreze*[2], the cyclodextrin simply envelops any malodorous molecules leaving even my running shoes tolerable.

Sugammadex is a modified γ-cyclodextrin[3] which envelops the non-depolarizing amino-steroid muscle relaxant rocuronium, leaving it unavailable to bind to the neuromuscular junction acetylcholine receptor thus enabling rapid reversal in the 'can't intubate and can't ventilate' situation with return to spontaneous respiration and relative safety.

High dose rocuronium (0.9mg/kg) has a fast onset time. With the introduction of sugammadex, the rocuronium-sugammadex combination can be used for rapid sequence induction of anaesthesia. Sorensen and colleagues found the offset of neuromuscular blockage significantly quicker when compared with succinylcholine[4]. Debate continues as to the quality of view at direct laryngoscopy with high dose rocuronium compared to succinylcholine and if this technique will replace current practice. If sugammadex does mark the end of the use of succinylcholine, which has been used for rapid sequence induction in Europe since 1951, it will certainly be a Game Changer.

Finally, the ability to reverse the effects of muscle relaxation without the associated autonomic instability caused by neostigmine should not be overlooked, particularly for procedures that involve anastomosis within the gastrointestinal tract.

1. World Health Organization. WHO opens public consultation on draft sugars guideline. Geneva; World Health Organization. 2014. Available online from: http://www.who.int/mediacentre/news/notes/2014/consultation-sugar-guideline/en/. Last accessed May 2014.
2. Reis A. The curious case of molecular stealth. How Febreze works. In: The Chemical Blog. Perth, UK; 2012: Nov 17. http://www.thechemicalblog.co.uk/the-curious-case-of-molecular-stealth-how-febreze-works/
3. Miller R Sugammadex: an opportunity to change the practice of anaesthesiology? *Anaesth Analg*. 2007; **104(3)**: 477-8.
4. Sorensen MK, Bretlau C, Gatke MR, Sorensen AM, Rasmussen LS. Rapid sequence induction and intubation with rocuronium-sugammadex compared with succinylcholine: a randomized trial *Br J Anaesth*. 2012; **108(4)**: 682-9.

VASCULAR SURGERY PROVISION IN NORTHERN IRELAND

Robin Baker

2013 will be seen as a milestone in Vascular Surgery for three reasons. It has now been accredited with independent sub-specialty status, individual surgeon's morbidity and mortality figures are now published and vascular trainees have been appointed to a national vascular training scheme. Vascular Surgery should no longer be regarded as a branch of General Surgery.

In an effort to lower elective and emergency morbidity and mortality rates the Vascular Society of Great Britain and Ireland require all units, providing vascular care, to have 24/7 access to a specialist vascular team (vascular surgeons, specialist nurses, anaesthetists, interventional radiologists, clinical vascular scientists, physiotherapy etc.) with recognition that higher volume centres have better outcomes.

Over the last decade, due to rapid technological advance, the number of units in the province performing arterial vascular procedures has rapidly diminished and it is anticipated that all arterial work will be centralized in Belfast in the near future. However, The Vascular Society also recognize that all patients with vascular disease should be able to access a vascular team rapidly in all parts of the UK. Northern Ireland is actively developing a modern clinical network which will provide equality of access for all patients with vascular disease.

The Vascular Society of Great Britain and Ireland. The provision of services for patients with vascular disease 2012. Edinburgh: Vascular Society of Great Britain and Ireland; 2012. Available online from: http://www.vascularsociety.org.uk/wp-content/uploads/2012/11/Provision-of-Services-for-Patients-with-Vascular-Disease.pdf. Last accessed May 2014.

DEVELOPING CARDIAC SURGERY: "BYPASSING THE LIMITS"

Mark Jones

Cardiac surgery has a long history of innovation thus confounding Paget's 1896 prediction that, "surgery of the heart has probably reached the limits set by Nature to all surgery; no new method, no new discovery can overcome the natural difficulties that attend a wound of the heart". Take the cardiopulmonary bypass machine and deep hypothermic circulatory arrest enabling intracardiac and thoracic aortic surgery, for example.

Current technological advances may by comparision seem more incremental, even small. However, combined with stringent outcomes analysis, today's steady flow of developments is ensuring increasingly complex operations can be performed on sicker patients with excellent survival results.

Recent visits I made to Africa and India highlighted interesting contrasts, whilst both pointed to the transformative power of innovation. In Zambia, cardiac surgery is very limited but is being developed with overseas support. Here I joined a successful international multidisciplinary team, the fruition of New Zealand surgeon Harsh Singh's groundbreaking idea. India, on the other hand, has a vast self-sufficient cardiac surgery program. There I visited Devi Shetty who has applied the "Walmart" concept to heart surgery; at his centre in Bangalore over 30 cardiac surgery cases per day are performed significantly reducing costs. In Belfast we do up to 6 cases per day. Furthermore, Devi Shetty manages to balance the demands entailed with the pursuit of excellence and educational development.

Innovative developments in cellular therapy may compliment more traditional forms of cardiac surgery; gene therapy for ischaemia, heart failure, arrhythmia[1] as well as myoblast transfer. Perhaps even more astounding are Doris Taylor's ghost hearts where a patient's own stem cells populate a decellularised scaffold[2]. Each scientific development is in itself a gamechanger but then again so are individuals like Singh, Shetty and Taylor. For future innovation to flourish we should not only value their creativity but approach our own work with an openness to possibility.

1. Wolfram JA, Donahue JK. Gene therapy to treat cardiovascular disease. *J Am Heart Assoc*. 2013;**2(4)**:e000119.
2. Maher B. Tissue engineering: How to build a heart. *Nature* 2013;**499(7456)**:20-2.

So you want to be a **medical student in the UK (and you come from mainland Europe)?**

Agata Stanek

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INTRODUCTION

So you're from mainland Europe and decided to become a doctor? Why not study at one of the UK universities? With centuries-long traditions and worldwide recognition, no encouragement should be necessary, however, coming from Poland, I was the only European student at QUB medical school in my year. Whether it is the legendary British weather or rising fees that drive foreign students away - either way, I hope this article gives a fair account of the differences between being a medical student in mainland Europe and in the UK.

GETTING IN

The process of getting into your dream degree course in Poland and in the UK certainly varies. There is no UCAS system and you need to apply for all universities separately. In the UK the major surprise to me was the importance of extra-curricular activities – were you an athlete at school? Were you involved in a volunteering project in Africa? In Poland no one would even think of being asked that. That is not to say students back there have no additional achievements, it is simply that those do not matter while applying for a medical school and you are judged exclusively on the basis of your educational achievements and, sometimes, entry exams. Another surprise for me was the interviews – Polish potential students are not subjected to the torture of sitting in front of a panel and being asked all sorts of questions - from the standard "so, why did you choose to become a doctor?" to being asked to interpret medical data.

FEES

Unlike many European countries, UK does not offer free higher education. That made me nervous for a bit, however I was quickly reassured – it was such a relief to find out I was entitled to not only tuition fee loan, but also maintenance loan. The amount of grants and scholarships available to students was also a positive surprise – very few of those are offered to Polish medical students.

COURSE STRUCTURE

While five years of medicine at Queen's weren't exactly a breeze, I was really pleased with the course structure – the healthy mix of lectures, practicals, tutorials and seminars followed by the clinical phase. But you can forget about years of anatomy and biochemistry, where you are taught names of every single bone in the human body, or chemical formulas so lengthy that you can start writing in on one wall of the room and finish on another (true story, told by my dad who studied medicine at one of Polish universities many years ago). There is obviously still plenty of knowledge to be conveyed (to the contrary of what my Polish friends believe – frequently asking "is it true that medical courses in the UK are far easier?") but rather doing it in a haphazard manner, different systems are covered in turns.

Two words that you will hear repeatedly throughout your time in a UK medical school are "communication" and "dignity", words which I believe have nowhere near as much meaning in the European schools. The importance of communication skills is emphasised right from day one in the UK and the amount of communication skills workshops offered ensures that even if you're not a "people's person" you will be able to behave appropriately in all sorts of clinical scenarios. As for dignity – while doing my elective in one of the hospitals in my home country, I was surprised by how little attention was paid to one's privacy - exposing patients for a long time in front of others (since there were no curtains around beds). without consideration for their psychological comfort was a standard and something that you will be taught never to do in the UK.

STUDENT LIFE

But it is not just hard work, sweat and tears. While medical students around the world are well known to be a fun bunch, I was surprised by how rich and well organised student life is in the UK. In Poland there are certain clubs and societies within the university and medical school itself and once in a while there is a night out organised. Here however, there is a whole society dedicated to ensuring that medical students get their breaks from hard work.

WHEN THINGS GO WRONG

One thing you can be sure of here, is that in hard times you will not be left alone. I have heard my friends in Poland complain of having to chase their lecturers, or join the queue to the dean's secretary's office...here you will be assigned a personal tutor that you will meet regularly and that you can confide in or expect advice from. There is also a free counselling service available to all students .

CONCLUSION

So, from the account I gave above it seems that UK universities simply "do it better". Of course, nothing is perfect and while there are a few things that could be tweaked here and there overall I am very happy with the experience of being a medical student in the UK. I feel well prepared for the job I am now doing and there was always a healthy balance of work to fun student life that I know for a fact is not as commonly experienced across other European countries – and isn't that the most important thing of all for a potential student?

THE ULSTER MEDICAL JOURNAL

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Front cover: David Hadden with an infant suffering from Kwashiorkor (malnutrition)