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WJMER

World Journal of Medical Education and Research

An Official Publication of the Education and Research Division of Doctors Academy

5th International Medical Summer School, It's fun to learn

A career in Military Medicine

An Introduction to Emergency Medicine

Anatomy of Trauma, Emergency Medicine and Operative Procedures

Introduction

The World Journal of Medical Education and Research (WJMER) (ISSN 2052-1715) is an online publication of the Doctors Academy Group of Educational Establishments. Published on a quarterly basis, the aim of the journal is to promote academia and research amongst members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from around the world. The principal objective of this journal is to encourage the aforementioned, from developing countries in particular, to publish their work. The journal intends to promote the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting edge technology and those who need to innovate within their resource constraints. It is our hope that this will help to develop medical knowledge and to provide optimal clinical care in different settings. We envisage an incessant stream of information flowing along the channels that WJMER will create and that a surfeit of ideas will be gleaned from this process. We look forward to sharing these experiences with our readers in our editions. We are honoured to welcome you to WJMER.

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WELCOME

We are delighted to bring you the fifth edition of the World Journal of Medical Education and Research (WJMER). This edition has a fantastic spread of articles on original clinical and basic science research, clinical audit, review and educational pieces, report on events and career options. Our opening article microscopically dissects the intricate role of the 'Furry (FRY) gene' in regulating the integrity of the rear cytoskeleton. The study investigated the role of FRY gene in Dictyostelium discoideum, where its location in the cortex might suggest a potential role in chemotactic cell migration. The possible involvement of the FRY gene in maintaining polarized cell extensions proves an enticing read for inquisitive minds. This is followed by a cadaveric study investigating the accuracy, safety and potential efficacy of the fascia iliacus block using anatomical landmarks ('landmark technique') compared to ultrasound guided block. Following on from this theme, students from Bristol medical school report about their exposure to a novel interactive teaching method for learning clinical anatomy that involved surface anatomy demonstrations pertaining to emergency medicine, trauma and operative surgery. They are fascinated with this innovative approach, which complements learning anatomy from books and in the dissection room.

Moving on to clinical practice, an audit study evaluates the assessment of stable chest pain at the largest University Teaching Hospital in Wales, UK, and compares it against the guidelines suggested by the UK National Institute of Clinical Excellence. Following this, a clinical review on the 'addiction' is discoursed in detail, covering aspects such as addiction theoriesm, dependence, molecular neurobiology and behavioural responses. We also have the pleasure of bringing to you a testimonial from the winner of the Doctors Academy World University Anatomy Challenge 2013. As the competition was encompassed within the International Medical Summer School in Manchester, UK, he also provides a succinct synopsis about the event. Career articles on Emergency Medicine and Military Medicine are very informative and enlightens the interested reader about the career path and training structure in these specialities.

We hope that you find this edition enlightening and enjoyable to read.

With very best wishes,

Ms Karen Au-Yeung
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WJMER

Using a microfluidic device to investigate the role of the furry (FRY) gene in *Dictyostelium discoideum*

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Keywords:

Furry gene, FRY gene, Dictyostelium discoideum, Microfluidic device, Cytoskeleton, Cell migration

Abstract

Background: *The Furry (FRY) gene is an evolutionary conserved gene that is present in yeast, Slime moulds, Drosophila, and humans. In Drosophila the FRY gene has shown to have a role in maintaining polarized cell extensions during the development and patterning of sensory neurons. The function of FRY in slime moulds which have no neurons and humans remains unknown. The aim of this study is the investigation of the role of FRY in Dictyostelium discoideum, where its location in the cortex might suggest a potential role in chemotactic cell migration. Due to the similarity of cell migration mechanisms between Dictyostelium and human neutrophils, this research could give insight into the role of the FRY gene in human cells.*

Experimental design: *The FRY gene was knocked out in wild type Dictyostelium cells and rescued by reintroducing the FRY gene into the knockout strain. These strains were examined and their movement behavior compared against wild type cells. A microfluidic device was used to provide a controlled environment for rapid single cell chemotactic movement analysis using a confocal microscope for observation. The images retrieved specified the phenotype of the cell and were used to calculate cell velocity.*

Results: *FRY was shown to have only a minor effect on the average cell velocity but a tail-like phenotype extending from the back of the cell was produced in the FRY knockout strain.*

Conclusion: *These findings could localize the FRY gene at the back of the cell and suggest that FRY is involved in regulating the integrity of the rear cytoskeleton. The cell migration mechanics of amoeba are similar to human neutrophils and further research could elicit the role of FRY in human cells.*

Introduction

The furry gene (FRY) is an evolutionary conserved gene present in humans, Drosophila and *Dictyostelium discoideum.* However its role in humans and *Dictyostelium* is largely unknown. Emoto et al (2004)[1] has shown that FRY is involved in dendritic branching of sensory neurons whilst Fang et al (2005)[2] theorize that FRY is involved in maintaining polarized cell extensions through acting on the cytoskeleton. Polarized cell extensions are an important part of cell migration of *Dictyostelium* and thus FRY could have a role in regulating cell extensions in these cells[3,4]. *Dictyostelium* is a social amoeba that lives as a single cell in soil. It has the ability to transform from a single cell to a multicellular organism though chemotaxis[5]. *Dictyostelium* cells are ideal candidates to investigate the role of genes, such as the FRY gene, and the study of cell migration. *Dictyostelium* has a haploid genome and show efficient homologous recombination, which makes genetic manipulation and analysis of phenotypes easier[6]. Furthermore they display a very similar mechanism of cell migration as human neutrophils. This is clinically relevant as the more we learn from Dictyostelium we can apply to

human neutrophils and hopefully therefore further our understanding of human biology. The aim of this experiment is to investigate the role of the FRY gene in the cell migration of *Dictyostelium*, and to investigate if the FRY gene had a role in the velocity of cell migration.

Experimental Procedure

Dictyostelium cells were harvested from an anexic cell culture. They were then starved for nutrients and placed in a controlled environment and exposed to periodic nanomolar pulses of the chemo-attractant cyclic adenosine monophosphate (cAMP). Three different clones of FRY knockouts (KO) were produced and their motility analysed separately. Clones rescued by reintroduction of the FRY gene were also analysed.

A polydimethysiloxane (PDMS) microfluidic chip sealed to a glass slide provides a controlled environment. The chip is composed of 2 main reservoirs on either side of the chip connected by narrow 2x5 µm channels 1.5mm in length. This allows *Dictyostelium* cells to be deposited on one side of the chip and cAMP on the other. This creates

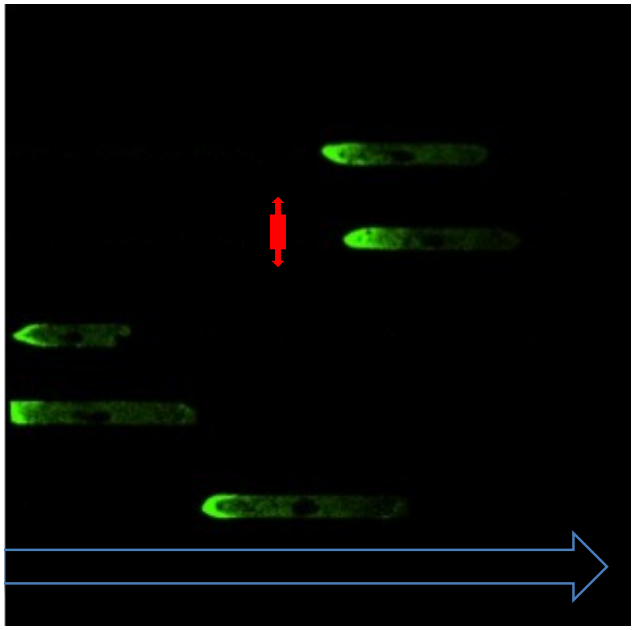

***Figure 1**: Myosin labelled GFP cells moving through the channels within the PDMS chip. The blue arrow indicates direction of movement. The red arrow indicates the width of the channel 5µm. The height of the channel was 2µm.*

a concentration gradient of cAMP which the cells can follow and chemotaxis through the connecting channels. This chip allows rapid single cell analysis of *Dictyostelium* cells moving through a confined space.

The cells were placed within the chip and after 60 minutes of exposure to cAMP the chip was imaged using a confocal microscope for 300 frames at 3-second time intervals. The images were analysed using Fiji software. The velocity of single cells was calculated using the time and distance points from the Fiji software software.

Statistical method

Cells were discounted from the statistical analysis if their velocity was not constant. A constant velocity was defined by using the coefficient of determination and a cut-off value of R^2 value of 0.95 or above was chosen. This was determined by creating graphs for each individual cell from their data points in time and distance in Excel 14.2.2. The velocity is extracted from the graph equation $y = mx + c$, where m is the velocity and c is the y intercept. The data was tested for normality by using a Shapiro-wilk test and Q-Q plots. This was done as the distribution of the data determines whether a parametric or non-parametric test should be used. Due to the distribution of the data a non-parametric one-way analyses of variance test called the Mann-Whitney-U Test was used to detect difference between the means of the data groups. This is the level of statistical difference between the data groups and was used to determine if there was a statistical significant difference between the cell groups velocities. If so this would suggest that the different in velocities was less likely to have occurred by chance. A p-value of less than 0.05 highlights a statistical significant difference. The data was statistically analyzed using SPSS statistics version 20.

Results

In total 168 cells were imaged and analysed and 17 discounted as the cell velocity was not constant.

Cell speed

The mean velocity for each cell group along with the 95% confidence interval (CI) and the range is shown in table 1. The control group velocity ranged from 5.34µm/min to 16.74µm/min with a mean velocity of 8.99µm/min. The FRY2B rescue group had the lowest average velocity at 3.37µm/min with the groups' velocities ranging from 1.49µm/min to 8.16µm/min. The FRY1B rescue group had the highest average velocity at 10.39µm/min with the data ranging from 3.84µm/min to 22.75µm/min.

Cell group Wild type	Number of cells analyzed 19	Number of cells dis-counted 1	Mean veloc-ity (µm/min) 8.99	95%CI 7.39-10.59	Standard deviation 3.32	Min-Max (µm/min) 5.34 16.74
FRY 1B KO	21	5	6.95	5.99-7.92	2.11	3.28-9.77
FRY 1B Rescue	27	0	10.39	8.66-12.13	4.38	3.84-22.75
FRY 2B KO	23	4	4.66	3.62-5.70	2.40	1.51-11.61
FRY 2B RESCUE	20	4	3.37	2.53-3.99	1.56	1.49-8.16
FRY5 KO	22	2	8.34	6.40-10.28	4.38	2.80-15.10
FRY5 RESCUE	19	1	6.98	5.35-8.60	3.37	1.49-8.16

The wild type group had a standard deviation of 3.32. Both FRY1B rescue and FRY5 knockout had the highest standard deviation of 4.38. The lowest standard deviation was for FRY2B rescue at 1.56.

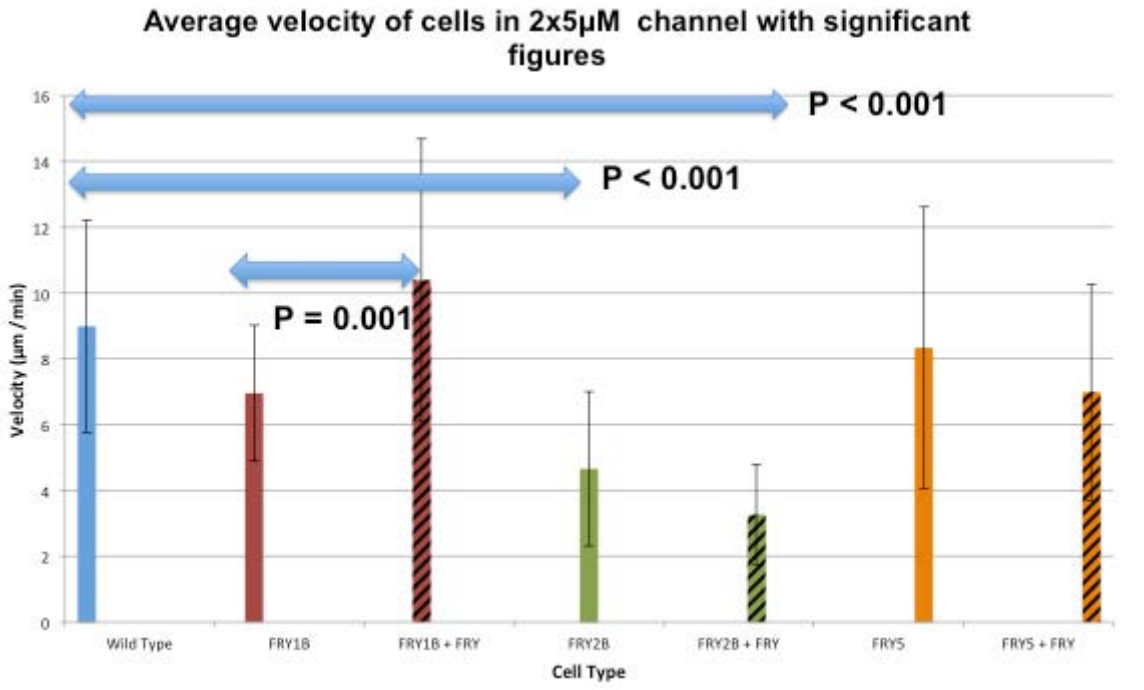

Figure 2: Summary of cell velocity

The most significant difference in cell speed was found between the wild type group and the FRY2B KO group, and between the wild type group and the FRY2B rescue group. A significant difference was found between the FRY1B KO group and the FRY1B rescue group.

Cell phenotype

A tail-like phenotype was observed at the back of cell in each gene knockout group and in a proportion of cell in the rescue cell groups. The wild type group had no cells displaying this phenotype. This phenotype is illustrated in Figure 3. The group with the highest percentage of cells was the FRY2B knockout cells with 86.96% of cells showing this phenotype. After reintroducing FRY into the FRY2B knockout cells the percentage of cells showing the phenotype was 40%. The FRY1B knockout and FRY5 knockout had a similar percentage of cells showing the phenotype at 76.19% in the FRY1B knockout group and 77.27% in the FRY5 knockout group.

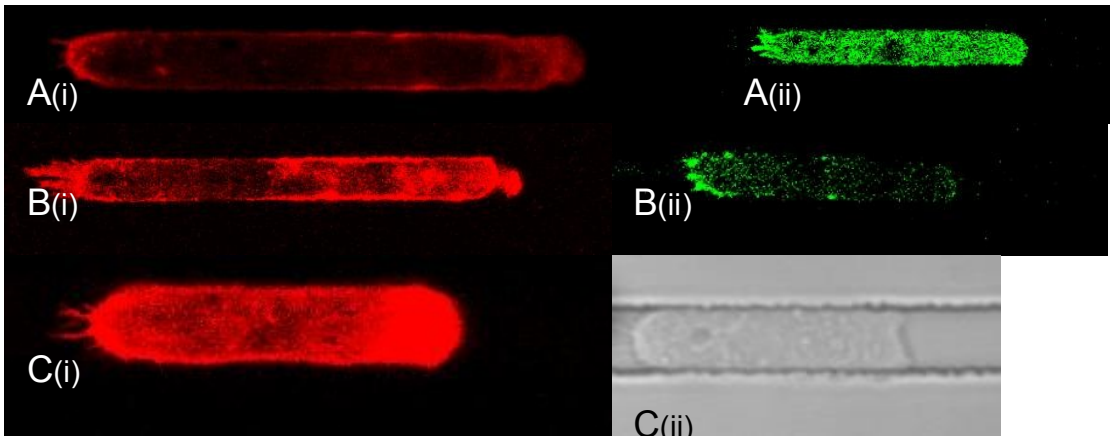

Figure 3: *Ai) FRY1B KO cell. Aii) FRY1B Rescue cell. Bi) FRY2B KO cell. Bii) FRY2B Rescue cell. Ci) FRY5 KO cell. Cii) FRY5 rescue cell.*

Discussion

Cell speed

FRY5 cells used in this study were believed to be true knockout cells and this knockout did not have a statically significant affect on the cell velocity. This could be due to the small sample size and therefore further experiments with an increased number of cells could enhance this finding. It has been suggested in previous research by Lammermann et al[7] that *Dictyostelium* are able to change their mechanics of cell migration between a 2 dimensional surface and a 3 dimensional surface. As FRY plays a role in maintaining polarized cell extensions in Drosophila it is possible that FRY could be involved in maintaining polarized cell extensions in *Dictyostelium*. These extensions may be adhesion dependent migration specific and the defect would not appear in the particular assay used in this experiment. Investigating *Dictyostelium* using different types of assays, for example a flat agar plate, may show the true role of the FRY gene.

Cell phenotype

In each knockout group a tail-like phenotype was observed extending from the back of the cell. This was not present in the wild type cells. This was also present in the rescued cells however this could be explained by the FRY gene being over transcribed when reintroduced into the cell, and therefore the tail phenotype remains present in a proportion of the cells within this group. Cell morphology defects have been found in previous studies of FRY knockouts in *Drosophila*. It is possible that FRY has a role in the morphology and the organization of the cytoskeleton in *Dictyostelium* as knocking the gene out causes changes in the structure of the cell. It is possible that FRY could localize at the back of the cell and maintain the structural integrity of the rear of the cell, hence the removal of FRY resulting in the tail-like phenotype.

Conclusion

Using a clear microfluidic chip we have been able to image and tract the movement of *Dictyostelium* cells in a confined space. It has been previously shown that the mechanisms of migration and the speed of the cell movement can change between a 2-dimensional and a 3 -dimensional environment. The advantage of using a microfluidic chip is that we can create different channel sizes to suit our requirements and thus control the amount of space the cell has to move in. This is relevant for many different types of cells for example tumour cells moving within the human body in metastasis or *Dictyostelium* moving in its natural environment in soil. FRY has not been show to alter the velocity of the cell once it has been knocked out but it has shown an interesting tail-like phenotype. FRY could be responsible for maintaining the integrity of the cytoskeleton at the rear of the cell and on removing the FRY gene this structural integrity at the back of the cell is lost. Removing the FRY gene has not directly affected the speed of cell migration in the 5x2 µm channels, but this could be due to the loss of FRY being compensated by other proteins involved in cell migration when the cell is migrating under these experimental conditions. Changing the assay used to analyse *Dictyostelium* migration, for instance by restricting the diameter of the channels further could give different results. Further research into this could discover the true role of the fry gene in *Dictyostelium*.

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The landmark technique remains a safe alternative to ultrasound guidance for performing a fascia iliacus block: A cadaveric study

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Keywords:

Regional block, Anaesthesia, Fascia ilacus, nerve block, Cadaveric study, Landmark technique

Introduction

Regional anaesthesia and nerve blocks are a vital part of modern anaesthesia. They can be used on their own, as part of a general anaesthetic or post-operatively as an adjunct to standard analgesia.

A commonly used nerve block is the fascia iliacus block.[3] This can be used in the emergency department as an effective form of pain relief for femoral fractures.

Classically the landmark technique was used, this involves infiltration of local anaesthetic in relation to fixed bony landmarks. However, with the advent of affordable portable ultrasound machines, ultrasound (USS) guided techniques have become more commonplace. This allows for more accurate placement of the block using a reduced volume of local anaesthetic.[1,2]

Usage of USS for regional blocks has been found to be safe and effective. USS guided regional blockade is provided almost solely by anaesthetists and anaesthetic trainees. Blocks performed by non-anaesthetic trainees (for example emergency medicine trainees in accident and emergency departments or orthopaedic trainees) are generally done using the landmark technique.[6,7] This technique can be used effectively by doctors who do not possess the necessary ultrasound skills. [7]

We used a cadaveric model to assess the safety and potential efficacy of the landmark technique for fascia iliacus nerve blocks.

Method

A single ninety year cadaver donated to the Laboratory of human anatomy of the University of Glasgow was used for the study. Local ethical approval was granted.

The cadaver was prepared and pre-dissected as described later. A single right sided fascia iliacus block was administered by an anaesthetist not directly affiliated with the project using the landmark technique. Blue india ink was used instead of an anaesthetic agent.

Preparation

The cadaver was prepared using standard embalming techniques and then dissected along fascial planes in the following manner.

A superficial skin incision was made on the right limb from the anterior superior iliac spine (ASIS) to the pubic tubercle, along the line of the inguinal ligament. A vertical incision was then made laterally along the line between the anterior and posterior surfaces of the thigh, finishing just above the knee joint. The lower end of the incision was then extended medially, finishing at the

medial border of the thigh. Starting laterally, a large skin flap was dissected and turned medially to hinge on the medial border of the thigh. Subcutaneous fat and fascia lata were then dissected together and turned medially as a second flap. This was then closed and sutured for the experimental part to begin. This was done so there would be minimal disruption of the tissues post infiltration of anaesthetic.

Infiltration

The block was introduced using the following landmarks. A line was drawn between the ASIS and pubic tubercle. This line was then divided into thirds and a 18 French Gauge spinal needle was introduced at ninety degrees perpendicularly at 2cm below the point at the junction between the lateral third and the medial third.

The anaesthetist felt for the first click followed by the loss of resistance as the point for instilling the block. When he was satisfied the tip was in the correct position 20ml of India ink mixed with 10% latex was used and left for 10 days to set.

Inspection

Subsequently the flap was re-opened to investigate the spread of the India Ink. The abdomen was also opened and carefully inspected for any sign of ink.

Photographs were taken using a Nikon Coolpix 955 digital camera. Images were viewed digitally using Jasc Paintshop Pro (Version 7.04) and stored as .jpeg images.

Part of the femoral nerve was excised with a small fragment of muscle en-block from the area where the Femoral nerve was crossing into the right iliac fossa The tissue was then routinely processed for histology.

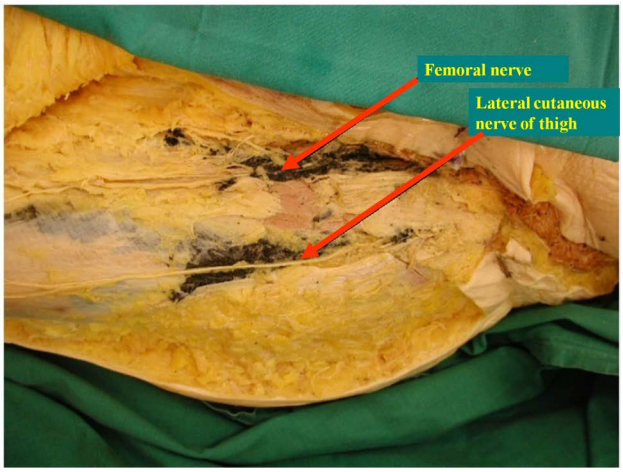

Figure 1: Dissection of thigh. Note the black discolouration in the plane

Results

Examination of the abdomen did not show any Ink into the abdominal cavity. Dissection of the thigh showed the ink travelling in columns cranially to caudally, covering the femoral and lateral cutaneous nerve of thigh (see figure 1). The ink was contained exclusively in this plane. No sign of vascular or nerve injury was noted at the time of inspection.

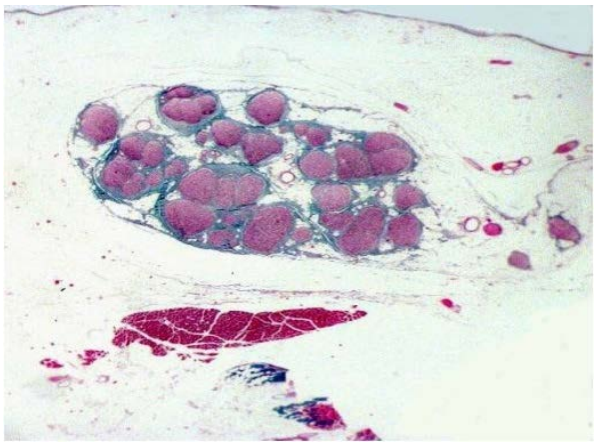

Figure 2: Histological specimen of thigh dissection. Femoral Nerve centre (pink), covered in ink

Histological examination showed satisfactory covering of the femoral nerve with the india ink as seen in figure 2. The femoral nerve which appears pink was immersed in dark ink at the microscopic level.

Discussion

There has only been one randomized control trial comparing ultrasound versus the landmark technique for fascia iliacus blocks[4] (non-cadeveric). This study found that there was increased sensory loss with the use of the ultrasound guided method.

However less technical equipment and ultrasound skill is required to use the landmark technique and can be used in the emergency setting as a preoperative adjunct to pain relief prior to surgery.

Our study shows that the landmark technique can be an effective alternative to using ultrasound guidance where this is not available and in experienced hands. We would advocate that persons performing fascia Iliacus blocks should become competent at using both ultrasound guidance and landmark techniques to use in instances where ultrasound facilities are not readily available.

While studies have used similar methods to ours to describe new methods of fascia iliacus blocks, [5] we have shown in our study is that this classical method is still safe and our method of evaluating the spread of the

block suggests that it is likely to be effective. A study with non-anaesthetic staff involved to perform the infiltration will be useful to further validate its role in the emergency setting.

Conclusion

While we do not recommend the landmark technique over the USS technique, we conclude that the landmark technique for performing a fascia iliacus block is safe in experienced hands. However repeating this study with non-anaesthetic staff would be useful to evaluate efficacy when performed by non-anaesthetic personnel.

Competing Interests: None declared.

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Doctors Academy Events in Bristol, UK: Anatomy of Trauma, Emergency Medicine and Operative Procedures

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Keywords:

Clinical anatomy, Surface anatomy, Emergency medicine, Operative surgery, Anatomy of clinical procedures

Introduction

In medical school, we are often inundated with a massive amount of information and we, as hard working medical students, bend over backwards to learn each and every minuscule detail. Often, however, we forget to take a step back and look at the bigger picture. On 11th May 2013, The Doctors Academy Group brought two of its exciting and innovative workshops to University of Bristol for the very first time to bridge this very gap that seems to exist amongst most medical students.

Doctors Academy is an internationally reputed non-profit educational organization that is known to conduct a wide variety of clinical events for both students and doctors in a local as well as international scale. We were first associated with Doctors Academy when we attended their National Medical Students Academic Winter conference in Cardiff. During our time there, we were captivated by the stimulating talks delivered by the speakers as well as the interactive workshops, which enabled us to use our clinical knowledge and apply it in "real-time" clinical scenarios. This motivated us to bring back our experiences to Bristol and share it with our colleagues here.

For its first event in Bristol, Doctors Academy agreed to provide the courses for free and took up all the expenses on its own. The courses that were organized in Bristol in collaboration with Doctor's Academy were structured as follows:

Clinical Anatomy as Applied to Trauma & Emergency Medicine (Morning Session;) Surgically Applied Anatomy in Important Operative Procedures (Afternoon Session)

Both the sessions were divided into four stations and students were grouped accordingly. Each station was timed for a period of 45 minutes and the students were rotated after each station was completed. The stations were: Head & Neck, Abdomen & Thorax, Upper Limb & Lower Limb. Each of these stations was conducted by surgeons who are experts in their respective fields. The main goal of each station was not to discuss the theory of anatomy in detail but to expose the importance and significance of surface anatomy in routine scenarios experienced by surgeons and doctors in hospitals. This was primarily achieved by handing the tools to the students themselves. They were asked to use their acquired knowledge of anatomy and illustrate surface anatomy by drawing on each other with guidance from the faculty.

The objectives of the two courses were outlined in a similar manner, however, the morning session emphasized more on trauma whilst the afternoon session focused on the day to day elective surgical procedures.

I. Head & Neck

From a procedure that every medical student should be capable of doing in the case of an emergency such as cricothyroidotomy to being able to do a cranial nerve examination, it was all covered in this station. Alongside, the surface anatomy of the thyroid gland was demonstrated and it was interesting to see how many medical students were unable to pin-point the precise location of it although they knew where it was exactly on the cadavers.

***Figure 1*:** *Illustrates a student drawing out the surface anatomy of the thyroid cartilage, cricoid cartilage and sternum.*

II. Abdomen & Thorax

Stab Wounds. Gunshots. Pneumothorax. This was definitely a station that was not to be missed! Alongside the detailed surface anatomy of the abdomen and thorax where students drew on each other vigorously, the trauma and numerous surgical procedures that occur routinely in the hospital setting was covered in this station.

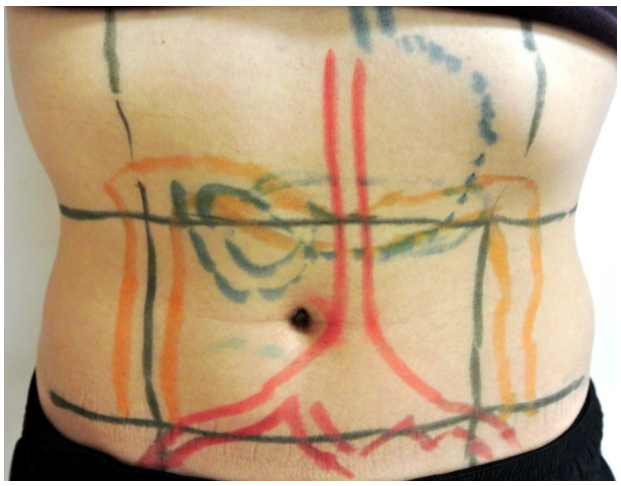

Figure 2a: *Surface anatomy illustrating the nine quadrants of the abdomen. It highlights the location of the abdominal aorta and other relevant abdominal organs.*

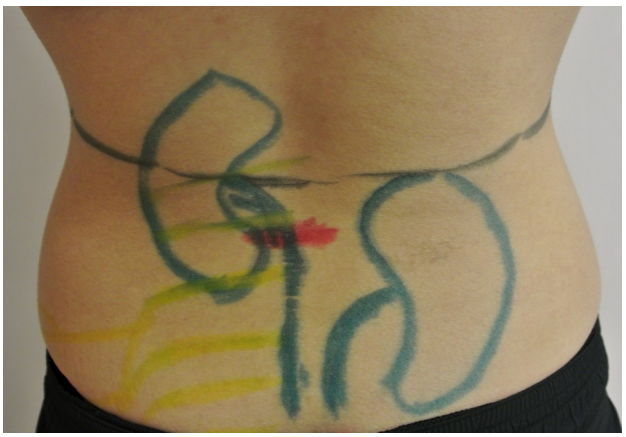

Figure 2b: *Surface anatomy of the kidney seen from the posterior side.*

III. Upper Limb

The brachial plexus as we know is every medical student's nightmare! However, after the event, a lot of us felt that we could remember it much better and this was definitely due to the fact that we drew it out on each other-an approach that we never undertook previously. Furthermore, common fractures of the upper limb was covered along with the treatment options.

Figure 3a: *Illustration of carpal bones of the hand.*

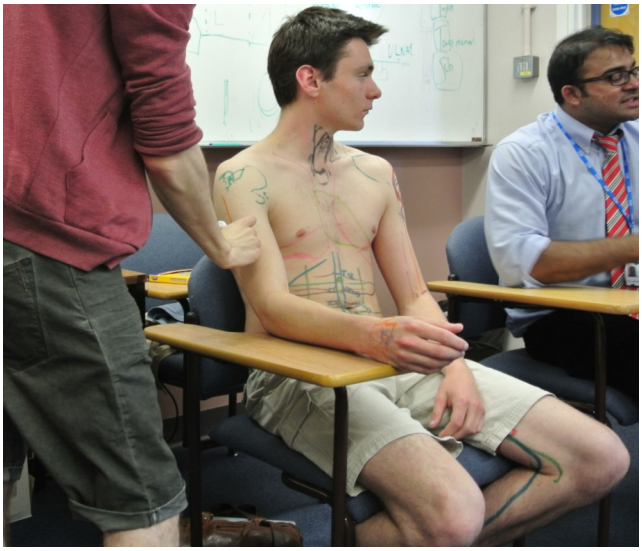

Figure 3b: *Surface anatomy in the upper arm*

IV. Lower Limb

During this session, it was revealed to us that the textbook version anatomy of the lower limb is quite different to the surface anatomy on real people. The courses of blood vessels and nerves are not exactly the same as that shown in textbooks! In this session, the other eye-openers were the different methods of

stabilization for limb fractures, i.e., casts, splints, intramedullary nailing, plates, and screws or K-wires as well as external fixators.

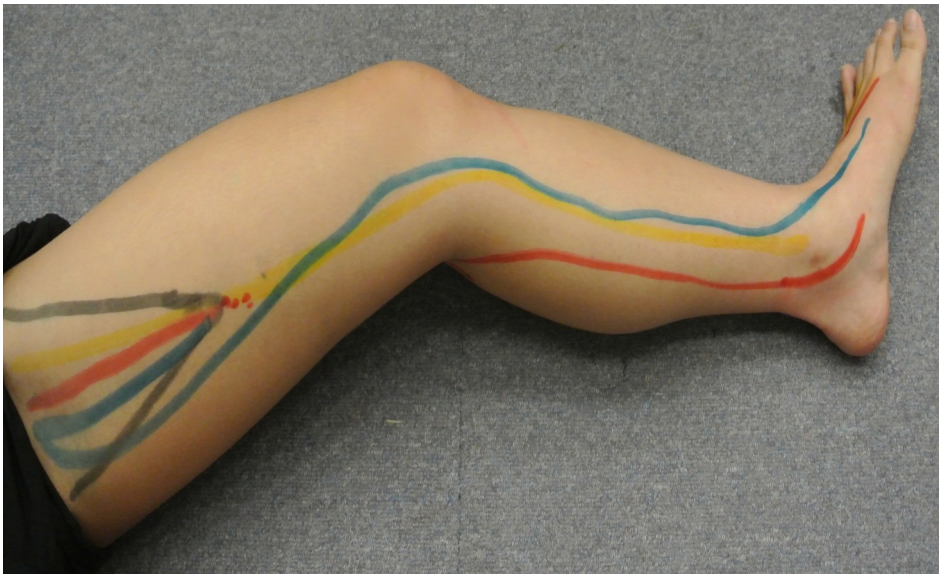

Figure 4a: *Surface anatomy of illustrating the femoral triangle, long saphenous vein and posterior tibial artery.*

After attending the events organized by Doctors Academy, we, as medical students, feel that this is an event not to be missed by medical students of any year! And this was proven by the feedback received where it was described as "one of the best revision sessions that I have ever attended".

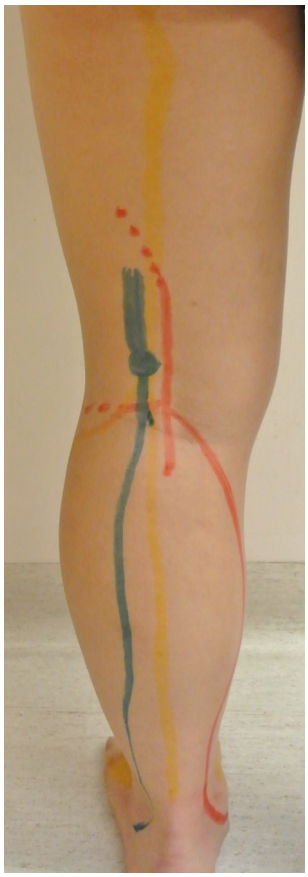

Figure 4b: *Surface anatomy illustrating the location of the popliteal artery and its main branches, as well as the short saphenous vein.*

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The diagnostic work-up of stable chest pain at a large university teaching hospital

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Keywords:

Chest pain, Angina, Coronary artery disease, Exercise tolerance test and Coronary angiogram

Background

Coronary artery disease (CAD) is the commonest cause of death in the UK: one in five men and one in seven women die from the disease.[1,2] The problem continues to rise with an increasing prevalence of obesity and physical inactivity.[3] The commonest clinical manifestation of CAD is chest pain, with 20%-40% of the population experiencing chest pain.[4]

The working definition of angina is a *"symptom of myocardial ischemia without necrosis that is recognized clinically by its character, location and precipitating factors".*[2,4] Patients suffering with chest pain experience a decreased quality of life, as they fear that it is a forerunner of a myocardial infarction.[4] In spite of the simplistic definition above, diagnosing angina is not easy, as chest pain is not unique to angina with musculoskeletal, gastrointestinal and psychiatric causes making up a large proportion of other causes of chest pain.[5,6,7,8] Therefore the clinical challenge is to accurately identify the patients with CAD in order to prevent adverse events but also to limit unnecessary investigations.

Aims

The aim of the audit was to compare the assessment of stable chest pain at the University Hospital Wales (UHW), Cardiff with the NICE guidelines.

NICE guidelines

The recently published guideline from NICE: Chest Pain of Recent Onset (2010)[2] describes a new model for the assessment of stable chest pain.

The guidlines state that anginal pain is:

1. Constricting discomfort in the front of the chest, or neck, shoulders, jaws or arms.
2. Precipitated by physical exertion.
3. Relieved by the rest or glyceryl trinitrate (GTN) with in five minutes.
   - Three of the features above are defined as atypical angina.
   - Two of the three features above are defined as atypical angina.
   - One or none of the features above is defined as non-anginal chest pain.

Using this categorisation, the patient can be grouped into a NICE risk group depending on the patient's type of chest pain, sex, age and other cardiovascular risk factors (Table 1).[2]

Percentage of people estimated to have coronary artery disease according to typicality of symptoms, age, sex and risk factors[2]

Age (years)	Non-anginal chest pain				Atypical angina				Typical angina			
	Men		Women		Men		Women		Men		Women	
	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi
35	3	35	1	19	8	59	2	39	30	88	10	78
45	9	47	2	22	21	70	5	43	51	92	20	79
55	23	59	4	25	45	79	10	47	80	95	38	82
65	49	69	9	29	71	86	20	51	93	97	56	84

For men older than 70 with atypical or typical symptoms, assume an estimate > 90%.
For women older than 70, assume an estimate of 61–90% EXCEPT women at high risk AND with typical symptoms where a risk of > 90% should be assumed.

Values are per cent of people at each mid-decade age with significant coronary artery disease (CAD).
Hi = High risk = diabetes, smoking and hyperlipidaemia (total cholesterol > 6.47 mmol/litre).
Lo = Low risk = none of these three.
The shaded area represents people with symptoms of non-anginal chest pain, who would not be investigated for stable angina routinely.
Note: These results are likely to overestimate CAD in primary care populations.
If there are resting ECG ST-T changes or Q waves, the likelihood of CAD is higher in each cell of the table.

Table 1: Percentage of people estimated to have coronary artery disease in relation to their symptoms and risk factors

Depending on their risk, the patient should be sent for further investigations (Table 2).[2]

Investigations according to NICE CAD category	
Risk of CAD	**Investigations recommended by NICE**
<10%	Alternative diagnosis/non cardiac
10-29%	Computed tomography calcium scoring (CS)
30-60%	Functional non-invasive imaging
61-90%	Invasive coronary angiogram (CA)
>90%	Treat as coronary artery disease

Table 2: NICE recommendations of investigations according to CAD risk

Method

Data was collected retrospectively from patients (n = 299 patients) who had coronary angiograms (CAs) during the period of 12/01/2010 - 09/09/2011. From this cohort only patients who met the criteria for the audit were included (n = 178) (Table 3).

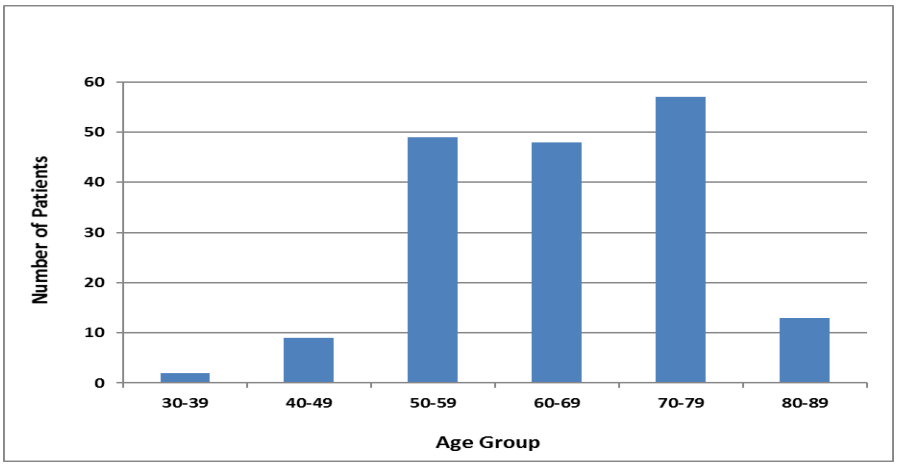
Inclusion criteria	Exclusion criteria
All patients presenting to cardiology outpatients department with: • New onset stable chest pain where angina is suspected • Patients with known angina who now have limiting symptoms	• Acute myocardial infarction • Known cardiomyopathy • Known or suspected valvular disease • Known or suspected arrhythmias • Percutaneous coronary intervention cases

Table 3: Inclusion and exclusion criterias for patients included in our study

Using clinic letters, every patient's clinical journey from their outpatient appointment to angiogram was recorded. Data was gathered from their outpatient appointment, including information about their history and cardiovascular risk factors. Data on the history included their description of chest pain, thereby classifying the pain into typical, atypical or non-anginal. The presence of risk factors were recorded; out of which three risk factors: smoking, diabetes and dyslipidaemia were deemed the most important, the presence of any one of them classifying a patient into a high-risk category. Using the NICE guidelines, an estimate of the percentage clinical risk was calculated for each patient (Table 1). Following CAD risk probability calculation, the subsequent chosen investigation by the clinician for each patient was compared with NICE recommendation as per guidance.

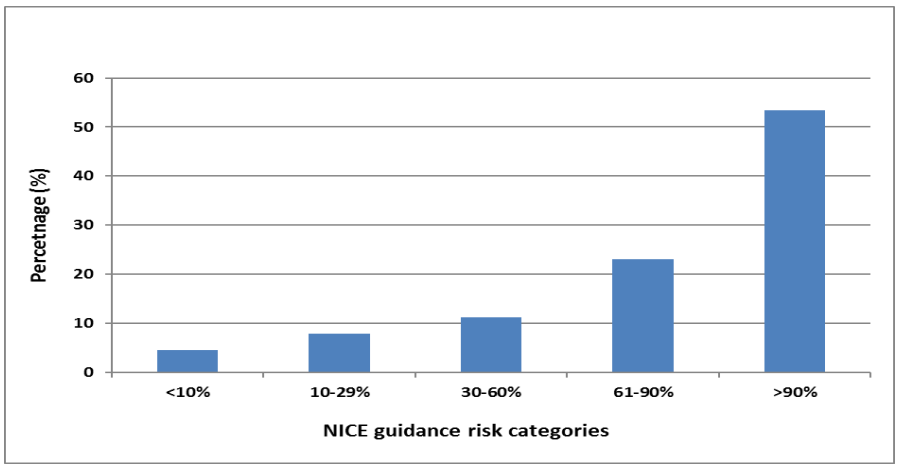
Results

In total 178 patients were included in the study. The age range of patients was 37-88 years (median 65) (Graph 1). More than half of the patients were male (61%).



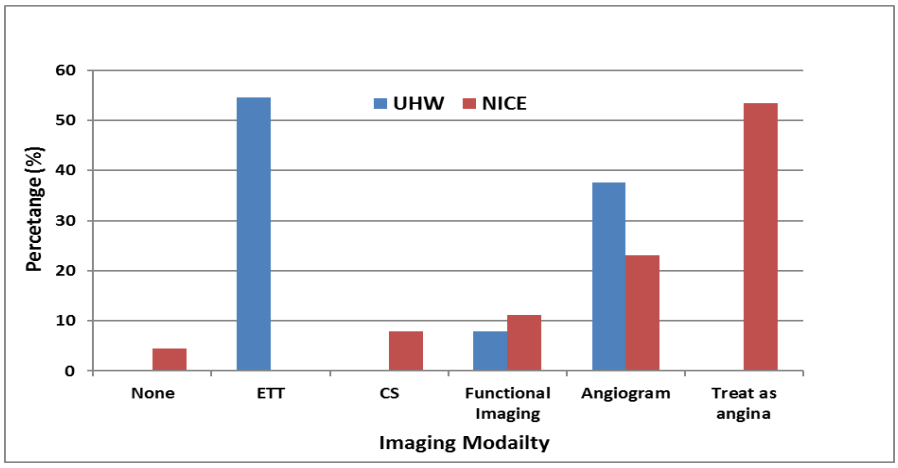
Graph 1: Age distribution of patients included in the study

According to NICE, the majority of patients fell into the >90% risk category, with less than 5% with a risk of less than 10% (Graph 2).



Graph 2: CAD risk stratification (in accordance to NICE risk categories) of patients in our study

At the UHW, 97 (54%) had exercise tolerance testing (ETT), 14 (8%) had functional testing (stress echocardiography and myocardial perfusion scanning) and 67 (38%) had coronary angiograms (Graph 3*)*. This shows a large deviation from the NICE guidelines which recommend that ETT should not be used at all for diagnosing chest pain. According to the NICE guidelines, 4% should have had no investigations done and treated as non cardiac chest pain, 8% should have had calcium scoring, 11% functional imaging, 23% coronary angiograms and 53% should have been treated as angina (Graph 3).



Graph 3: Comparison of investigations for CAD patients performed in UHW and that which is recommended by NICE

Discussion

CAD is a major cause of death, but if diagnosed early it is manageable. The problem lies in the correct diagnosis, which needs to be highly accurate and limit superfluous investigations.

As mentioned before, the study shows that there is a large deviance between the practice at the UHW and what NICE guidelines suggest in managing CAD. There are however obvious reasons for why this is the case at the UHW.

Calcium scoring which is recommended for patients with a risk of 10-29% is currently unavailable at the UHW and instead most patients with this risk category had ETT, which the UHW feel is the closest alternative. Patients with a risk of 30-60% are recommended functional tests by NICE though few had these; instead they had an ETT or proceeded directly to angiogram. The reasons for this are due to the lack of availability of functional tests such as myocardial perfusion scanning and stress echocardiograms which are used selectively. In the 60-90% risk bracket, the majority had ETT rather than proceeding directly to angiograms as recommended by NICE. ETT again seems to be primary modality of choice.

NICE have controversially excluded ETT as a diagnostic tool citing its lack of sensitivity and specificity.[2] This differs from practice at the UHW where ETT is used for both the diagnosis and prognostication of CAD, it was the primary investigation in 54% of patients. It is used primarily because it is cheap, quick and a positive result may prevent further investigations for a patient if a diagnosis is made.[9,10] NICE however recommends functional tests rather than ETT in the majority of these cases as their sensitivity and specificity is greater. They do have a point as a large proportion of the patients who had ETT at the UHW went on to have further imaging, and therefore showing its lack of sensitivity and specificity in making a diagnosis of CAD.

The results from this study suggest that if the UHW used the NICE guidelines, there would be a significant impact in the way CAD is managed. The majority (76%) of patients fall within the boundaries of 60-100% CAD risk and are therefore eligible for invasive investigation from the outset. These results suggest that implementation of the NICE guidelines will therefore result in an increased number of patients requiring highly specialised investigations and a much greater need for coronary angiograms. Angiograms are the gold-standard for diagnosing CAD and the majority of patients are likely to eventually need an angiogram to see the extent of severity of CAD, however they are expensive, invasive and often not available straight away except to high risk patients. If the NICE guidelines are followed, increased training, increased numbers of cardiologists and a larger number of angiograms suites will be required, all requiring a financial input.

Limitations of the study

- Clinician's skill at taking a history categorises chest pain into typical, atypical and non-anginal
- Study done in a limited geographical area, limited to one hospital
- Data collected retrospectively

Future recommendations

- Study including all patients investigated for chest pain (not just the patients who had angiograms)
- Larger sample size

Conclusion

Following NICE guidelines, there is no role for ETT in the assessment of chest pain with functional imaging and coronary angiograms the main investigations. The pragmatism of this is however questionable with ETT being relatively inexpensive and requiring little training to operate compared to functional imaging. If the NICE guidelines were followed it would require a dramatic change in how chest pain is being assessed and would need a huge investment in equipment and staff.

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How Does Addiction Occur?

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Keywords:

Addiction, Addition theoriesm, Dependence, Molecular neurobiology and Behavioural responses

Intoduction

Addiction imposes enormous social and economic burdens on the individuals, their families, and on society as a whole. Illicit drug addiction, accounts for approximately 2% of the total burden of disease in Europe, with estimates for tobacco and alcohol at around 12 and 10% respectively. The economic costs of alcohol addiction alone in the UK are estimated to exceed £25 billion per year [2] including health, crime-related costs and losses in productivity. For centuries people have tried to define addiction and understand its nature, in the hope of developing therapeutic solutions. Addiction has been described as a sin, crime, bad habit, moral weakness, disease and, most recently as a disease of the brain[3]. Many factors have been identified that prompt people to experiment with illicit substances, however, taking a drug is not synonymous with developing an addiction. The question of addiction specifically concerns the processes by which drug-taking in certain individuals, evolves into compulsive patterns of drug-seeking and drug-taking that takes place at the expense of most other activities, and is characterised by the inability to cease[4].

Throughout the years, the understanding of this phenomenon has changed dramatically. Addiction was originally described in the context of drugs causing physical dependence and withdrawal symptoms, i.e. heroin and alcohol. Later, it became clear that other substances, such as tobacco, which do not cause physical dependence, are still strongly addictive. This uncovered the existence of both physical and psychological components of addiction[5]. Thereafter, the concept of addiction kept evolving with its inherent association with drugs, i.e. *medicines or other substances which have a physiological effect when ingested or otherwise introduced into the body*[6]. It has become apparent that it is not only drugs that one can develop an addiction to. Stimuli and activities such as gambling, internet use, shopping and sex can become strong addictions.

Due to the vast variety of addictive substances and stimuli, the development of a universal theory of addiction, encompassing all of its 'faces' is extremely challenging. A successful theory should enable prediction of circumstances in which addiction is more likely to occur and give insights into how it can be prevented, controlled and treated. It might seek to predict whether a given substance or activity will be addictive, who will be at risk of developing an addiction if exposed to particular stimuli, or whether changes in social factors will lead to an increase in the prevalence of particular forms of dependence[7].

Discussion

In thinking about the problem of addiction and the models of addiction, it is important to bear in mind that many people experiment with potentially addictive substances or stimuli, but most do not get addicted. Indeed, the factors responsible for experimental or casual drug use may not be relevant to the problem of addiction as the drug-taking and drug-seeking behavior in the addict may involve factors that are qualitatively different from those that motivate the non-addict.

One of the earliest theories of addiction is the positive reinforcement model, which postulates that addicts are motivated by the euphoric or hedonic effect that the drug produces. However although the pleasure effect associated with drug taking may be one of the factors prompting the experiment with drugs, in the addict the association between the hedonic consequences of drug consumption and the

ability of drugs to motivate behaviour often become dissociated[4]. Firstly, drug-taking may increase dramatically over time as an addiction develops, but the pleasure induced by a given dose of a drug is not reported to increase. Secondly, it has been reported *that even a 50% decrease in the subjective effects of cocaine did not reduce it's use by addicts*[4]. Thirdly, it has been shown that people will work for low doses of morphine or cocaine that produce no subjective pleasure at all [4]. Finally, the positive reinforcement theory implies that the addiction liability is directly proportional to the drug's euphorigenic power, but then alcohol, which is a mood depressant, can cause addiction. The positive reinforcement model is strongly opposed by Khantzian[8], who clearly states that *patients do not take drugs for the pleasure*. Indeed, clients of the addiction services themselves often say they 'hate taking drugs, drinking or smoking' or even 'feel disgusted by it', but yet, cannot stop.

After the realisation that hedonic effects of the drugs could not explain the phenomenon of addiction, the focus shifted to the model of negative reinforcement, which postulates that addicts are driven by withdrawal avoidance. However, this model proved to have considerable limitations too. Firstly, drugs that do not produce strong withdrawal syndromes, such as psychostimulants, can be highly addictive. Conversely, some drugs that do produce tolerance and withdrawal, such as tricyclic antidepressants or anticholinergics, do not support compulsive patterns of use[4]. Furthermore, the fact that there are only two drugs which produce physical dependence and withdrawal symptoms, alcohol and heroin, shows significant limitations of the negative reinforcement model. Finally, the prolonged cessation of the physically addictive drugs and the decay of withdrawal symptoms are not synonymous with a cure and relapse to compulsive use, even long after recovery remains a major problem in addiction. Therefore, although there are circumstances when the desire to avoid withdrawal is undoubtedly a potent motive for drug use, the urge to alleviate withdrawal symptoms is neither necessary nor sufficient to account for compulsive drug-seeking and drug-taking behaviors or the problem of relapse.

In the search for a more comprehensive explanation of addiction, the psychological and neurobiological perspectives were combined resulting in the 'incentive-sensitisation' model. Its core paradigm is that potentially additive drugs share the ability to produce long-lasting adaptations in neural systems, which render the brain reward systems hypersensitive or 'sensitised' to drugs and drug-associated stimuli. When sensitised, the incentive salience process produces compulsive patterns of drug-seeking behaviour. Through associative learning the enhanced incentive value becomes focused specifically on drug-related stimuli, leading to increasingly more compulsive patterns of drug-seeking and drug-taking behaviour. The persistence of neural sensitisation is hypothesised to leave addicts susceptible to relapse even long after the discontinuation of drug use[4]. The involvement of the associative learning and conditioning in addiction has also been proposed by the 'cognitive schemata model' as well as the theory of 'addiction as an excessive appetite'[5].

The biochemical component of the 'incentive-sensitisation' model, i.e. the involvement of the brain reward system and the neuroadaptations produced by drug use have been further studied with the hope and objective of finding a neurobiological explanation of addiction. Betz and colleagues[9] suggested that a common mechanism might underlie addictions to otherwise apparently unrelated drugs and hypothesised that, as proposed by the 'incentive-sensitisation' theory, the neurotransmitter dopamine might play a central role in the molecular mechanism of at least some addictions. This is consistent with Ross and Peselow's[10] study which postulates that addiction occurs due to neurobiological changes to the natural reward and adaptive behaviour and proposes a common biochemical model of addiction. According to this model, drugs of abuse corrupt the motivational and learning neurocircuits and by doing so, alter how an addicted individual interacts with salient environment stimuli that come to predict reward, whether it be biologically orientated or drug conditioned stimuli. The mesolimbic dopaminergic pathway mediates the acute rewarding aspects of drug intake and conditioned learning associated with craving and relapse. Adaptations in the mesocortical and cortifugal glutamatergic pathway mediate the conscious aspects of drug intake, such as craving, loss of inhibitory control, and continued drug-acquisition behaviours at the expense of biologically relevant ones and despite catastrophic negative consequences. Several other mechanisms have also been identified as involved in the development of addiction [10]. These findings are in line with the conclusions reached by Hou and colleagues [11] in their study concerning imaging of the dopaminergic system in drug addiction. The neurobiological theory of addiction, if viable, offers potential for future pharmacological therapies for addiction.

The discovery that the addicted brain is different in its neurobiology from the non-addicted brain[9] gave the basis to the development of the theory that addiction is a disease. More precisely, it is viewed as a chronic disease of pathological learning with a relapsing remitting course. This claim has met with fierce

criticism. Foddy[12] argues that changes in brain structure and function are not enough to constitute a disease and that plasticity is a normal and largely beneficial characteristic of human brains. Indeed, in childhood, in the case of injury to the brain, the neuroplasticity allows for the function of the damaged parts to be taken over, to some extent, by others. Hence, one can argue that plasticity is simply an adaptation to changing circumstances, whether it be loss of a particular part of the brain, or chronic presence of a substance. Furthermore, Foddy[12] insists that there are important practical consequences to defining something as a disease. Among other things, people are normally not held morally or legally responsible for the symptoms of a disease, even when it is self-inflicted. Here, some inconsistencies are highlighted - addiction is officially regarded as a disease, yet, the official application of the disease label has not freed the addicts from moral or legal responsibility. Moreover, unlike many other diseased people, they are denied disability payments and protection against work-place discrimination. Finally, the disease label transforms drug-taking from an autonomous, responsible choice into an external phenomenon, something which happens to the addict against his or her will. This approach would indeed question the rationale behind currently used and effective psychotherapies, which promote individuals'choice and will to be free of addiction. Despite the contra arguments, the concept that addiction is a neurobiological disease is now the official position of both the National Institute on Drug Abuse (NIDA) and the World Health Organisation (WHO).

Despite it's wide evidence base, the biochemical model of addiction has been challenged. One of the major criticisms is the limitation to drugs and lack of consideration of addictive non-drug stimuli or activities such as gambling, internet use or shopping addiction[5]. However, Ross and Peselow subsequently showed possible neuropathway involvement in addictive activities. The opioidergic and serotonergic systems have been implicated in impulse control disorders such as pathological gambling, a discovery which could lead to the development of potential pharmacological therapies for addiction. Another criticism of the biochemical model of addiction is its neglect of the social component[5]. Similarly, Dingel and colleagues[13] argue that the main potential harms of focusing on biological etiology of addiction stem from a concept of addiction that is dissociated from social context. Focusing on genetic testing and brain scans may lead one to overemphasise pharmaceutical 'magic bullet cures' and underemphasise, and underfund, more traditional therapies and public heath prevention strategies that have proven to be effective. Genetic research on addiction may fundamentally change our conception of deviance and our identities and may thus transform our susceptibility to substance use into something isolated in our biology, not embedded in biosocial context. This point of view is supported by the effectiveness of currently used psychosocial therapies, such as e.g. cognitive behavioural therapy, intuitive recovery or meetings of alcoholics anonymous.

Furthermore, the importance of the biosocial context is stressed by the 'incentive-sensitisation' model, which clarifies that sensitisation is not an inevitable consequence of exposure to potentially addictive drugs. It is not a simple pharmacological phenomenon and both the expression and the induction of sensitisation can be powerfully modulated by non-pharmacological factors, including environmental and (presumably psychological) factors associated with drug administration. It was evident in animal studies, which showed that sensitisation occurred more readily when a drug was given in a novel environment rather than in the animal's home cage[4]. The same conclusion was reached by the observations outlined by Kalant[14] of American veterans of the Vietnam War who had returned to the United States as heroin addicts. A surprisingly high proportion of those who became abstinent during treatment remained abstinent since returning to their home environments. This is in striking contrast with the observations of addicts who had long been free of withdrawal symptoms and drug craving during their confinement in the hospitals, but relapsed abruptly on the return to the environments associated with their previous drug use. This phenomenon is often observed in patients recovering from drug addiction who admit that moving away from the environment previously associated with drug use greatly reduces their craving and chances of relapse. Moreover, interestingly, self-administration of the drug seems to play a crucial role in the development of addiction or lack of thereof after drug use. Physical dependence can be produced by large doses of an opioid analgesic administered therapeutically by a health care professional to a patient with severe pain; yet, such patients rarely become compulsive drug-seekers. The situation was different for wounded veterans of the American Civil War, who were issued syringes and morphine tablets for self-administration. Many of them did become victims of what was later known as a 'soldier's disease', i.e. became addicted[14]. Both groups described took the same drug for the same purpose of pain relief. The factor that was different for the group that developed compulsive drug-seeking behaviours was the self-administration of the drug. The fact that

sensitisation and gene expression are affected by environmental and contextual factors, as well as by the drugs that are self-administered, means that addiction cannot be conceptualised exclusively in terms of the interaction between the drugs and the biological constitution of an individual. Hence, the neurobiological model, despite providing valuable insight into the physiology of addiction which can yield helpful therapeutic solutions in the future, is in itself not sufficient to account for the development of addiction. A variety of elements of the environmental context must also be taken into account.

Another alternative explanation for addiction is the psychodynamic model. Similarly to the biochemical model, it describes addiction primarily as a disorder of self-control or self-regulation, but ascribed to social and environmental variables. According to Khantzian[8], individuals with addictions suffer because they cannot or do not regulate their emotions, self-esteem, relationships and their behaviour. Therefore, they self-medicate the distress and pain associated with self-regulation difficulties. Despite the possible temporary relief provided by short-term use of addictive substances, in the long run, the illicit substances erode the existing human capacity to cope, further increasing the person's vulnerability to addictions. This theory is supported by the effectiveness of psychological treatments which focus on addressing and modifying the above-mentioned vulnerabilities which the psychodynamic model identifies as precipitating and maintaining factors for addictive behaviour. Individual and group therapies guided by understanding and empathy, provide powerful antidotes to the alienation, dysphoria and anguish, which are part of substance use disorders.

As outlined, the biological and psychosocial approaches to addiction have numerous differences, yet, they share a common view that addiction is characterised by a compromised ability of self-control and compulsive behaviour. Interestingly, this central paradigm of addiction has been challenged by the philosophical perspective on addiction. Addictive behaviours have been defined as compulsive for several reasons. Firstly, addicts appear to act compulsively because of their insensitivity to the costs of their drug use. Secondly, they appear compulsive because they regret their drug use, but still fail to reduce it. Thirdly, they appear compulsive because they report experiencing strong desires which they feel unable to control. Finally, neuroscientists have claimed that addicts behave compulsively because their actions have identifiable neurological processes as their root cause. Foddy[12] argues that none of the reasons identified would be considered uncontroversial proof of compulsion within philosophical discourse. He states that neither regret, nor strong desire, nor imprudent choices, nor changes in brain biology can establish without further argumentation that addicts behave compulsively in the sense that these would diminish their responsibility for their choices. A philosophical mistake is made with important practical and scientific ramifications when the above reasons are taken to be sufficient proof that addicts lack control. Indeed, the question of control or lack of thereof in the context of addiction is of paramount importance. At the heart of this problem is the question whether we give to our strongest desires voluntarily or whether we have capacity for willpower which can fail in the face of a powerful urge, making these actions involuntary. Currently, there is a lot of controversy in this area. Various theories of addiction are based on the principle of impaired self-control and clients often admit they want to break their addiction, but cannot control themselves. Yet, the therapies used are centred on being in control and having strong will. Moreover, they are very effective and many clients recover proving they can be and are in control. This shows that much remains to be learned about the intricacies of self-control and its role in addiction.

The models described in this article provide valuable insight into the biological changes in the brain caused by addictive stimuli and ways in which these alterations further enhance appetitive behaviour as well the psychosocial mechanisms that fuel addiction and relapse. Nonetheless, a question remains unanswered of why the great majority of people who experiment with potentially addictive substances and activities do not become dependent whereas some individuals do. The search for an answer to this important question has directed both, biologically and psychosocially orientated research, towards identifying potential factors that can increase a person's vulnerability or risk of developing an addiction. Based on the observation that addiction often runs in families, it has been hypothesised that inherited biological neuroadaptations could be responsible for the increased susceptibility of some individuals to develop an addiction. Ersch and colleagues[15] recently investigated whether the prefrontal deficits measured in cocaine-dependent individuals are induced by chronic cocaine use or whether they are pre-existing, heritable traits. To approach this problem, cocaine-dependent individuals were compared with their drug naïve first-degree relatives and with unrelated drug-naïve volunteers by measuring impaired inhibitory control, a well-known phenotype among the cocaine addicts. Interestingly, equivalent behavioural impairments in inhibitory control as well as reduction in the prefrontal and striatal volume were found in the cocaine-dependent group and their biological siblings with no history of drug abuse, compared with unrelated relatives. The model of preexisting biological predisposition and vulnerability to addiction was further investigated and confirmed in

subsequent animal studies. Different strains or genetically modified mice showed marked distinction in drug use and relapse and the 'impulsive' animals more readily acquired and intensively self-administered cocaine.

These studies suggest that heritable traits in the form of brain structure and consequent impulsivity are crucial to understanding risk and resilience in addiction. However, the fact that the genetically susceptible siblings of the investigated cocaine addicts did not develop addictions suggests that genes alone cannot account for addictions and other factors, such as the environment and social circumstances must play a role. These factors and their potential to increase one's vulnerability to addictions were discussed by Khantzian[8] as part of the psychodynamic model. He pointed out that the ability of humans to self-regulate their emotions, self-esteem, relationships and behavior was governed less by instincts and more by coping skills and capacities acquired from the caretaking environment, suggesting that inadequacy of the conditions that one grows up in can affect their susceptibility to addictions. This is where the psychodynamic model overlaps with attachment theory of addiction implying that individuals suffering from attachment difficulties in childhood may not have acquired adequate self-regulation mechanisms from their home environment, which can make them more vulnerable to developing an addiction[16]. These findings strongly suggest that the power of addiction resides in the interaction of the drug with the internal terrain (the biological and psychosocial context) of the person who uses it. This highlights the complexity and multidimensionality of addiction and, hence, the need for a multidisciplinary approach in uncovering its nature.

Conclusion

It is concluded that addiction is an extremely complex phenomenon involving an interaction between an addictive substance or activity and an individual user, including their biological and psychosocial habitus. Molecular neurobiology studies have given valuable insight into the neuronal mechanisms and adaptive changes occurring in addiction as well as genetic predisposition to developing addiction. Moreover, behavioural responses such as conditioning have been implicated. There is also abundant evidence that psychological and social factors, such as self-regulation or attachment capacity, play a role in both predisposition to as well as development of addiction. However, none of the theories alone can fully account for the process of addiction. This suggests that understanding of this phenomenon in its entirety requires appropriate integrative multidisciplinary approaches of study, involving neurobiology, pharmacology, psychology, philosophy and sociology working towards a common goal.

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Winner of the 'World University Anatomy Challenge 2013'

5th International Medical Summer School, It's fun to learn

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Winner of the 'Doctors Academy World University Anatomy Challenge 2013'

Mr Debmoy Ghatak

I can summarize my overall experience of the Future Excellence International Medical Summer School in one word: GREAT!

Let's start from the very beginning shall we... I was in my 1st year in Medical College, Kolkata. I discovered from a senior student that there was a National Anatomy Quiz approaching. Anatomy had been my favourite subject so far and I had become the senior prosector of our Anatomy Department. I joined up for the quiz and sat for the screening test. The results on the next day revealed I was through to the next round. From onwards I managed to overcome the hurdles of the quarter-finals, semi-finals and eventually the final...to be crowned the champion of the National Anatomy Challenge.

Doctors Academy was one of the organisers of KARMIC 2013 (Kolkata Annual Research and International Medical Congress) and the National Anatomy Challenge was a part of this event. As the winner of this competition I was given direct entry into the World Anatomy Challenge being held as part of the Doctors Academy's 5th FEIMSS event at the University of Manchester, UK. I was really very excited to get the invitation letter!

However, it was no easy task organizing my trip to Manchester. Neither Doctors Academy or the Indian Medical Student's Association (IMSA), (another collaborator of KARMIC), could provide a travel bursary. I approached my College, Ex-students' Association, Department Of Higher Studies, Department of Health and Family Welfare, my university (West Bengal University of Health Sciences), the Chief Minister and even the Governor of our State but none of them gave me sponsorship for my trip. Finally, after a great deal of effort (especially near the time of my examination), I got my visa, flight tickets were confirmed, and my accomodation arranged. The Boeing 767 of Qatar airways took off from the Kolkata International Airport in the early hours of 11th August taking us first to Doha, and then to our final destination: Manchester.

In Manchester my accommodation was in the Grosvenor Halls of Residence, in the University Campus, whilst my parents stayed in a local hotel. In the Grosvenor residence lobby I first met all the students from different countries who had come to attend the FEIMSS.

The next day, we got our registration and then the introduction. We got to know about the educational schedule for the day and the social events for the evenings. Then seven renowned surgeons from different

specialities told us about a week of their lives; there was a cardiothoracic surgeon, a neurosurgeon, a plastic surgeon, a general surgeon, an ENT surgeon and an orthopaedic surgeon . Each surgeon provided us with an insight into their respective specialty – I enjoyed the talk from the cardiothoracic surgeon because it is my dream to be a heart transplant surgeon.

The next three days were awesome. We attended the lectures, workshops and the social events which were organized for FEIMSS delegates. In the lectures we learnt about the recent developments in the fields of cardiothoracic surgery particularly about the new procedures and techniques. We became accustomed to the abbreviations LVAD, ECMO, TAVI, PCI, CRT, CABG, MID-CAB, TE-CABG and many more things, and what they stand for. But the workshops were the most enjoyable as we got to know how to assess acutely unwell hospitalised patient, how to perform cardiopulmonary resuscitation (CPR), how to insert a chest drain, how to suture, how to tie a perfect surgeon's knot, many other basic surgical skills....and not to forget the laparoscopy session!

During the lunch breaks I would sit with my new friends and spoke about the methods of medical education in the countries that we are from, what the syllabus in each year includes and what is the pattern of learning. We also discussed where we intend to study in future and what things drive us to be a good surgeon and a good doctor. We exchanged our ideas about our future plans, our dreams and I thoroughly enjoyed these times socialising and sharing ideas.

Finally the moment that I had been waiting for arrived: World Anatomy Challenge happened which is what I'd come all this distance for. The primary elimination round was the last event on 15th August. It was a set of 40 questions shown on a slide show that we had to answer in 20 minutes in a paper. The results of screening were released the next day... and from 260 participants in the summer school, 32 students got selected, and I was overjoyed to discover that I was one of them.

The Quarter Final of World Anatomy Challenge then took place with the 32 students being divided in 4 groups of 8, each for 4 consecutive heats. I was in the first heat and I got selected with another student for the Semi-Final (of 8 students). All the questions were read out and then we had to answer by pressing the buzzer – this meant we only had a fraction of a second to think and buzz. It was a true test of nerves particularly if someone got a question wrong! In the Final there were 4 students remaining – they were all brilliant and this was my biggest test. I was unable to answer the a first few questions and when I glanced at the score board, I was running a little behind the others. I told myself "you have still got a chance so don't give up, you can do it and you will have to, come on……." I nailed the next few questions, went up the score board and finally secured enough marks to go ahead; from there I didn't have to look back. And finally the score board said "TOP SCORE – DEBMOY G". Everyone in that lecture theatre gave me a standing ovation, I couldn't have done it without their support and best wishes. Words fall short to explain that feeling. Thank you to all my friends out there.

Then there was the prize giving session where I got a replica of a shield on which my name will be inscribed as a winner of World Anatomy Challenge 2013 and a prize cheque, to top off the day.

In the end, all my success is a credit to my mom and dad, who are the polestars of my life. Without their support it couldn't have been possible. They brought me to this world, they gave me all the amenities, they nurtured my skills and they raised me to be a good child, a good person in society and a good doctor for the future.

I also want to thank Doctors' Academy for giving me the chance to compete with students on such an international stage and to allow me to join the 5th International Medical Summer School. I will remember this Summer School not only for the things that I've learned, not for the things that I have done but also for the happy memories that I have taken back home with me and that I shall no doubt cherish for the rest of my life.

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Interview with Professor Laurence Kirmayer:
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"We human beings are, after all, cultural beings..."
Professor Laurence Kirmayer

Professor Laurence Kirmayer

I remember having a stimulating conversation with a good friend of mine, a professor of political economy who is also a consultant for the United Nations on violent radicalisation. After having travelled all over the world in his quest to fathom the political and economic determinants of extreme behaviour, he concluded that *'most of these people were just in the wrong place at the wrong time…'* All of us have been, no doubt, the victim of circumstance in one way or another (albeit the consequences perhaps are not so grave for some as they are for others). One could equally, however, argue that being in the *right* place at the *right* time would qualify as a good working definition of luck ('luck is when preparation meets opportunity' is a quote that I chanced upon and one that resonates with me). And so here I am, braving the elements in Montreal, Canada (it is -30 degrees centigrade over here and the streets are laden with snow which reaches as high as my knees in certain areas) after having met Professor Kirmayer fortuitously in a World Psychiatry Association event in the heartland of the world, the Holy Land itself. Professor Kirmayer cordially and graciously extended an invitation to present in Canada, an invitation I just couldn't refuse. I cannot help but feel how very fortunate I am to be in his presence (Professor Kirmayer exudes serenity) and to have this opportunity to interview a world authority on cultural psychiatry. Indeed, McGill University is where cultural psychiatry all began…

Ahmed Hankir (AH): Thank you for accepting my invitation to interview you for the World Journal of Medical Education and Research (WJMER). My first question is this, 'Who is Laurence Kirmayer?'
Laurence Kirmayer (LK): Well, professionally, I am James McGill Professor and Director of the Division of Social and Transcultural Psychiatry at McGill University. My work straddles both academic and clinical areas of psychiatry as I am also a staff psychiatrist at the Department of Psychiatry of the Jewish General Hospital, and a Senior Investigator at the Lady Davis Institute for Medical Research, Montreal, Canada.

AH: Could you signpost your trajectory hitherto?
LK: My educational and training background was originally in physics and mathematics and then psychology as an undergraduate at McGill University. During my undergraduate years, I began in physiological psychology but became increasingly interested in cognitive and social psychology. In my final year of medical school, also at McGill, I had the good fortune to take a seminar in ethnopsychiatry (which was essentially on work at the intersection of anthropology and psychiatry) with the medical anthropologist, Margaret Lock. This opened up a vista that was extremely exciting.

After medical school, I completed my residency in psychiatry at the University of California Davis in Sacramento, California. I was fortunate enough to meet Byron and Mary-Jo Good who were also central in a renewed engagement between medical anthropology and psychiatry initiated by the work of psychiatrist/ anthropologist Arthur Kleinman. In Sacramento, we started a reading group in culture, personality and psychopathology. This gave me a chance to explore the relevance of psychological anthropology to clinical questions during my training. We also had a chance to take part in a consultation program that worked collaboratively with local healers from different traditions.

After three years in Sacramento, I returned to Montreal for a research fellowship in 1981, and that is when I became aware that McGill had a long and illustrious tradition in what was then called *transcultural psychiatry*. I began working as a consultant in consultation-liaison psychiatry with medical patients at the Jewish General Hospital (one of the teaching hospitals affiliated with McGill) and it was clear in that work that cultural background has a powerful impact on everyone's experience of illness, and not only on psychiatric illness.

AH: What was the focus of your research activities?
LK: Initially, I focused on the problem of somatization, because it was clear that in general hospital and primary care settings much of mental illness is manifested mainly as physical symptoms i.e. ache, fatigue and other 'medically unexplained symptoms' (MUS)). My interest was in understanding how culture shaped the expression of distress and the impact this had on the recognition and treatment of common mental disorders in primary care. My clinical work in consultation-liaison and emergency psychiatry underscore the importance of physical symptoms of emotional distress across diverse cultural groups.

Over the years, I have continued to study somatization and other modes of expressing distress to understand how people think about illness and communicate their distress to others. The key questions that I wanted to answer were, 'What kinds of knowledge do people have about illness?' and 'How do their perspectives interact with healthcare systems and the other social contexts they must navigate?'

AH: Was there an experience in particular that was the most memorable in influencing your research?
LK: I had many personal and clinical experiences that convinced me of the importance of understanding the patients' point of view. One that comes to mind was an experience of my own "attributional style." One day, I was on the floor playing with my infant daughter, and I vividly recall feeling so tired that I found it hard to get up from the floor. At the time, I interpreted this fatigue as a sign of depression - though my mood was fine. I saw my family doctor who diagnosed me with asthma (which I had never had before). So it seems I was engaged in *psychologising*, rather than somatising! Because I am a psychologically oriented practitioner, it was easy for me to devise a psychological explanation for my experience of fatigue. This really drove home the point that the ways we explain symptoms depend on personality, past experience and social context. It is important, however, to say that the division between psychological symptoms and physical symptoms can be quite arbitrary. Illness affects us as whole organisms - involving our bodies, thoughts and feelings. What we focus on - and what we feel we should conceal - is influenced by culture. Indeed, the cultural shaping of illness experience is relevant to doctors across all specialties. My own clinical work in liaison psychiatry focussed on aspects of psychiatry, psychology and social sciences that are very applicable to general medical care. The psychosocial aspects of care are often recognized in dealing with common conditions like Fibromyalgia Syndrome in rheumatology or Irritable Bowel Syndrome in gastroenterology. But understanding the personal and social context of illness is essential not only for categories of medically unexplained symptoms or functional syndromes which are a large part of practice in every medical specialty but for every health

problem. We human beings are, after all, *cultural beings*. The way that we learn to see the world shapes every aspect of experience, including the ways we perceive and cope with illness and disease.

AH: What is the distinction between 'social' and 'culture'?

LK: Although there have been debates in the social sciences and psychiatry about the distinction and their relative importance, the constructs of the social and the cultural cannot be sharply distinguished - they are intimately intertwined. People who want to emphasise the importance of economics and power tend to fall into the social camp; those who focus on the role of values, knowledge and discourse, would fall into the cultural camp. But it is important to appreciate how the two are inter-dependent. Who you are - the social position you occupy and the structural forces you experience - changes if you go to a different cultural environment. Cultural values are used to justify and maintain social structural arrangements including the inequalities that make people vulnerable or sick. Even the scientific basis of medicine has a cultural element. Although we try to refine our medical practice through scientific empiricism, at any given time it is shaped by cultural ideas and practices.

AH: What is the difference between 'Eastern' and 'Western' psychiatry?

LK: The distinction between "East" and "West" is always a bit of a caricature. In fact, it usually involves people of "the West" (i.e. Europe and North America) projecting their notions onto "the East" (most of the world!) in a way that results in a kind of mirror image. The notion of the person in the West tends to be very individualistic, while in many other cultures people tend to think of themselves in more communal, familial or collectivistic terms. For example, the normal path of development in the West is for young people to become autonomous, to leave their families and set up a new household. However, in much of the world, people live their whole lives in the orbit of extended family. This is not a lack of development but a different path governed by different norms and values. Cultural psychiatry is interested in looking at these developmental trajectories more critically and more open-mindedly. Take for instance the fact that in psychiatric nosology (DSM-IV) there is a dependent personality disorder but no independent personality disorder. If you juxtapose different ways of life, we learn a lot about normal development and pathology from cultural variation. This cultural diversity is important to appreciate, not only in the context of a globalising world, but equally from a basic science point of view. Understanding culture would guide us not only to more appropriate care for the patients we see, but also toward more accurate theories of neurodevelopment in health and illness. There is an emerging field of cultural neuroscience examining this variation. I find this extremely interesting because, like many who are attracted to psychiatry, I am looking for ways to integrate all the different levels and facets of human experience. In psychiatry, there has long been an emphasis on the biopsychosocial approach, which points toward a truly holistic and person-centred approach to medicine.

AH: What is the current state of play of cultural psychiatry?

LK: Cultural psychiatry has focused on health disparities - both globally and locally, in terms of the needs of immigrants, refugees and ethnocultural minorities. At the same time, it has continued to advocate for an integrative approach to care that challenges mainstream psychiatry. In recent decades, there has been a striking *biologisation* of psychiatry, especially in the U.S., with the assumption that neuroscience is going to give us the core understanding of the aetiology and treatment of illness and disease. To a large extent that has become the dominant view and the perspectives of social science and psychology have been downplayed. But I would argue that human biology is cultural biology. The brain is the organ of culture - and we use our brains to acquire and adapt through cultural inventions like reading, mathematics and other complex social practices. Many of the problems we see in psychiatry may reflect not structural abnormalities in the brain but the consequences of learning (programming the brain) and the unhealthy environments and social relationships people must negotiate.

Take for instance panic attacks. The psychiatrist-anthropologist Devon Hinton has described a series of culture specific panic attacks that occur in Southeast patients. For example, some of the patients from Cambodia he works with may interpret the dizziness they feel on standing due to orthostatic hypotension as evidence they are about to have a stroke and then have a panic attack. A particular symptom interpretation, based on specific cultural notions of the body, leads to a vicious circle of physical symptoms, catastrophizing thoughts, anxiety, and more physical symptoms. This particular vicious circle might not occur for someone who does not have the same system of cultural ideas. On the other hand, in Anglo-American cultures a middle aged man who gets chest tightness may worry that he is having a heart attack and this too sometimes gives rise to panic attacks.

A lot of anthropological research has made it clear that the interpretation of symptoms like chest pain or discomfort differs across the cultures. The salient models come to us from popular medical knowledge, past

experience and mass media. In Turkey, chest tightness may be attributed to grief. So you can start to appreciate the major role that culture plays in all of this. We have to be open and interested in different cultures, as physicians who hope to help others. At the same time, we must be mindful of the very powerful stereotypes that lead us to over-generalize and not see the individual who is in front of us. This is the attitude of what some have called "cultural humility" – the recognition that there are many different perspectives and we need to take the time to understand the patients point of view.

AH: What are some of the advances we can look for from cultural psychiatry?

LK: A major step in recent years has been the effort to clarify how to collect and organize information about culture and context in mental health. DSM-5 (the recent revision of the diagnostic system of the American Psychiatric Association) introduces a Cultural Formulation Interview. This is a basic approach to exploring the social and cultural context and meaning of illness. It should be part of the toolkit of every physician.

When I was a medical student one of the challenges in medicine was learning how to address sexuality. Some effort went into teaching us how to take a sexual history and becoming comfortable addressing issue of sexual dysfunction, sexual orientation and related aspects of identity and experience. Nowadays, I think one of the areas that has become especially challenging is addressing religion and spirituality. This is largely because of the geopolitical situation that has saturated us with images and stereotypes of "the Other" usually depicted as someone of very different religious or cultural background. Just as with addressing sexuality, a lot depends on our ability to develop a certain maturity, openness and ability to empathize with others to understand and address their concerns.

Cultural psychiatry also has the potential to help us rethink the notion of health and healing in medical care. In the 1970s, Miriam Siegler and Humphrey Osmond (the person who coined the word psychedelic) wrote a book about Aesculapian authority, the kind of authority that doctors or healers are given in society. In addition to the technical aspects of biomedicine based in biology, we need to understand where our social authority and psychological influence comes from. Although we seek to ground our practice in scientific evidence, in most cultures, healers draw their power and authority from some connection to religion or spirituality. Perhaps the most elementary system of medicine is shamanism. For the shaman there was no medical schools, no diploma to warrant his expertise. Instead, the shaman's authority stems from his or her own experience of illness—what Jung called the archetype of the "wounded-healer". There is some basic emotional logic behind this notion of authority. This is why we have self-help groups and this primordial level still lies underneath all of what we do in biomedicine. So, as a physician, coming to terms with one's own vulnerability, and using it to help understand the predicaments of our patients can provide an important path to empathy and a way to mobilize their own capacities to heal.

All medical intervention has psychological and social dimensions that contribute to the effectiveness of healing. The healer has to be open to the healer in the patient. It is not the healer who has the absolute the power. We need to encourage the patient to be active rather than passive. This view of the cultural and psychological dynamics of healing gives us another way to look at our medical institutions and ways of practice. It encourages us treat patients with great respect and appreciate many of the indignities they endure. Hopefully, it will lead us to re-examine our larger culture. By thinking through the conditions for psychological healing and wellness, physicians can contribute to making our medical institutions more hospitable and effective. The recognition of cultural diversity in health care is one key dimension of this hospitality and duty to care. It is also a way to contribute to building pluralistic societies that are inclusive. But this will require changes in our own attitudes toward others, to move beyond stereotypes, and understand others on their own terms. In fact, we must be advocates and agents of cultural change in the broader society, if we want things to get better for our patients.

AH: Professor Kirmayer, thank you once again for accepting my invitation to interview you.

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An Introduction to Emergency Medicine

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Emergency medicine, A&E, Career pathway in A&E, Training programme in A&E and Emergency physician

Introducing Emergency Medicine

Emergency medicine is a specialty which encompasses both medicine and surgery, in an acute setting. It exposes physicians to a multitude of presentations varying from trivial medical problems to trauma situations. The two main roles of emergency physicians are to firstly triage patients into those that need immediate care and those that do not. Then, they must fully resuscitate and stabilize any acutely unwell patient to allow transfer of the patient to another area of the hospital, where further care can be provided. Any emergency medicine doctor has to be able to deal with any type of acute presentation, medical, psychiatric or surgical, and so has skill set that ranges basic procedural skills such as inserting a cannula to more complex skills like inserting a chest drain.

Life as an emergency medicine physician

A typical day as an emergency physician can start at any time of day, as there needs to be staff in the department at all times. Shifts vary from 8-12 hours long and can be day, twilight or night shifts. As doctors working in emergency medicine work busy shifts, they have strict rules about rest periods during and in between shifts. This is to ensure that doctors working in emergency medicine are safe to practice when on duty and are not overworked.

Working in emergency medicine means that as a physician you have to be prepared for whatever walks through the doors, which can include major incidents and trauma. Due to the high workload and change of patients, doctors in emergency medicine need to be able to work under pressure and deal with an ever changing situation.

The benefits of working in emergency medicine include the opportunity to do practical procedures, such as suturing and intubation. Emergency medicine also allows you to work within a highly specialized multi-disciplinary team, especially for trauma patients or resuscitation situations. In these cases it is essential that the emergency physicians work and coordinate the assets of each specialty involved e.g. orthopaedics, radiology, to providing the optimal care to a patient. The emergency medicine physician is the one who leads the team as they are the experts in the emergency scenario.

There are many opportunities for teaching within this environment although it can be difficult to carry out or attend unless scheduled, as it is frequently too busy. Research is not a priority in every emergency department, but there is opportunity for research, especially when it comes to resuscitation protocols, for example therapeutic hypothermia as a method of improving survival rate after cardiac arrest.

Working in such a busy environment does not mean that administrative work is cut to a minimum. Senior emergency medicine physicians are allocated specific time for administrative work for keeping their department organized and prepared for every eventuality.

Although emergency medicine is a stressful job, work-life balance is now much more achievable due to the strict adherence to the within Europe. Many emergency doctors can easily find a job abroad as there is a great demand around the world, providing opportunities for travel and new experiences.

There is also the possibility of pursuing further learning in a sub-specialty related to emergency medicine, such as anaesthetics, orthopeadics and radiology as these skills will clearly be an asset on the 'shop floor'.

There are minimal opportunities for private work in emergency medicine as this sector is hospital based and unable to provide out of hours care in a private clinical setting.

Training

Applying for emergency medicine involves enrolling in acute common care stem post-foundation programme at CT1 level. To enroll in this programme the application process involves portfolio check and clinical interview which rank the applicant against the person specifications. This programme includes a year of acute and emergency medicine plus a year of anaesthetics and intensive care medicine and another year in their chosen specialty at application, in which the trainee the trainee shows that they are competent to continue higher specialty training at ST4 level. This usually has training in sub-specialties such as paediatric emergency care. Before applying for specialty training applicants need to have completed College of Emergency Medicine examination (MCEM) and at specialty training level, trainees need to complete fellowship (FCEM) examination to be able to obtain certificate of completion of training (CCT) to become a consultant. In addition to this, training in sub-specialties such as pre-hospital care should be considered early on in training as they are considered an asset.

Emergency medicine is one of the less competitive specialties within a hospital setting. For 2013, competition ratios at CT1 level were 2.6:1 with a total of 534 applications and 203 posts nationwide. At ST3 level competition ratio in 2012 was 0.5:1 with 106 applications and 198 posts nationwide. This difference in competition ratios at CT and ST levels is explained by some CT trainees switching to other specialties through the Acute Common Care Stem, due to the shifts and because emergency medicine is a relatively new specialty. Due to the high demand for emergency physicians and increasing demands, in 2014 training for emergency medicine has been offered as run-through training over 7 years from ST1 to ST7 thus eliminating the need to re-apply for specialty training at ST4 level.

The Future

Acute medicine is taking over much of the workload of the emergency department but there is still a need for the initial assessment and treatment of patients coming in the door. The future of the emergency department will rely on new and innovative treatments that can be available for resuscitation of patients, to reduce morbidity and mortality from the actual cause of admission. Current examples include Focused Assessment utilizing Ultrasound for Trauma (FAST) patients within the emergency department. Another important development for emergency medicine is the improvement in equipment, for example defibrillators are much more portable nowadays. There will be a move to ensure emergency medicine and resuscitation need to begin at the site where paramedics make contact with the patient and then continued in hospital.

Ultimately, emergency medicine is a challenging and rewarding job. It requires trainees to be committed to acute medicine and resuscitation of patients, and lifelong learning in acute scenarios and the unpredictable nature of their presentation upon arrival in the department.

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A Career in Military Medicine

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Introducing Military Medicine

Military doctors practice medicine within the Armed Forces. Medical Officers (MOs) go wherever the military are deployed, providing medical care when it is required, to both service personnel and civilians. The armed services in the UK are the British Army, Royal Air Force and Royal Navy.

A successful MO must be organised, able to respond quickly and safely when under pressure, and be flexible and able to adapt to service needs. The military offers a broad range of working environments, daily challenges and the opportunity to practice medicine in some of the harshest environments on earth, whether it is a jungle or desert, a submarine or airplane, following a natural disaster where humanitarian aid is needed, or in a war zone. Military medicine places you in situations you would not get exposed to within the NHS. You may be the only doctor for hundreds of miles and may have to adapt to the conditions and lack of access to all the equipment usually required to treat the patient.

The Victoria Cross is the highest award for gallantry in the call of duty. Only three people have ever been awarded the Victoria Cross twice, and two were doctors. Noel Chavasse and Arthur Martin-Leake both served with the Royal Army Medical Corps during the 2nd Boer War and World War 1.

Interaction with Other Specialities

Most of the secondary and tertiary healthcare for the armed services is provided jointly so there is plenty of interaction with colleagues from the other Armed Forces. Military doctors usually work in Military Defence Hospital Units (MDHU's) alongside their NHS counterparts, treating both military and NHS patients. MDHU's are based at NHS hospitals around the country, Injured service personnel can require further prolonged rehabilitation once back in the UK, after acute treatment. There is a multidisciplinary team of physiotherapists, surgeons, occupational health staff, and dieticians etc, all working together to return the servicemen to full duties, if possible. The military has numerous regional rehabilitation units; the main unit is Headley Court in Epsom, where complex rehabilitation takes place.

Emergency vs. Elective Work

Whilst deployed as a MO, emergency work and General Practice and will be at the forefront of what you do, providing immediate and general healthcare to wounded or sick personnel. When not deployed, elective work may be undertaken on military personnel and civilians. On a mission, MOs are on-call 24/7 ready to respond to any crises that may develop and may have to deal with any medical situation that arises, for example a crew member could be unwell or injured on a Royal Navy Submarine which very rarely surfaces when deployed.

Finance

Cadetships for medical students are arranged by each armed service. These are worth roughly 14K, 16K and 18k for the clinical years, as well as costs for pay tuition fees, in return for 6 years service ("short commission") from the date of full GMC registration. While on a cadetship you will hold a junior officer rank and be expected to join the university unit for your armed service. There will be weekly training nights plus weekend exercises, to learn about the service, its role, and to prepare you for military life.

Pay in the early years after qualification tends to be higher, on average, than an equivalent civilian doctors pay (on reaching full GMC registration - £52,225). Salaries rise by roughly 2.5K each year regardless of rank, so the NHS may begin to pay more when reaching senior levels. The military does provide subsidised accommodation and food.

Sub- Specialities

Some specialities are unavailable to military doctors due to service requirements. These include Geriatrics, Paediatrics, Obstetrics and Gynaecology, and Oncology. However, there is plenty of scope for undertaking training in the following specialist fields: Radiology, Aviation, Hyperbaric, Occupational and the more traditional trauma-based specialities of Emergency Medicine, Orthopaedics, Anaesthetics, and General Surgery. Rehabilitation, Plastic surgery, Ophthalmology and Reconstructive medicine are also growing fields in Military medicine.

Opportunities, Challenges, Thrills

Advantages of Military Medicine include working alongside people who share the same ethos and values as yourself, and experiencing work in different environments and locations. Also, being a doctor and in the armed services often affords great respect by both the public and other doctors.

However, there are challenges to being a military doctor:

a. You can be away from home for extended periods of time, often with little contact with family and friends.
b. The general duties period, 2-3 years in General Practice serving with a particular regiment, unit, ship, submarine etc, means that military doctors end up 2-3 years behind their NHS counterparts, i.e. it will take longer to reach a consultant post.
c. When on deployment it can be stressful and tiring, as you are basically on call 24/7 in what may be cramped conditions.
d. Some specialties are not available to military doctors, reflecting the needs of the service.
e. As an officer in the armed forces it is important to note that the service always comes first regardless of your position, and leave can be withdrawn at any time.
f. Due to improvements in body armour and medical care, personnel are surviving with ever more complex problems. This can be extremely challenging when dealing with young people who may be unable to perform as they once did.

Application Process

In order to become a military doctor, you have to pass the normal armed services officer selection process. This comprises of: numerical and verbal reasoning tests; fitness tests; interviews, and a weekend of tests with your desired armed service. This can be done while at university to become a cadet, or once qualified, if you are considering a direct entry. Your Foundation years will take place at one of the MDHUs, either Plymouth, Portsmouth, Northallerton, Frimley Park (Surrey), and Peterborough. The Royal College of Defence Medicine is based in Birmingham, where you can also work. Because the MDHUs are spread out around the country, the Defence Postgraduate Medical Deanery (DPMD) was set up in 1996 to coordinate applications to the MDHUs. While in your final year as a medical student you will apply to the DPMD for the 6 hospitals mentioned. No interview is needed.

On completion of your Foundation Programme, you will go to RAF Cranwell, BRNC Dartmouth or RMA Sandhurst for your officer training. Postgraduate specialist training is undertaken with the NHS along the same pathways as civilian doctors. The forces do take a number of direct-entry medical graduates. This varies year to year and it is best to check with your local careers office. If you do not want to go full time in the services, there is plenty of scope to join up as a reservist. With this you will train alongside your regular counterparts for a few weeks each year and can be deployed operationally every few years. It is certainly very worthwhile considering if you are unable to commit full time.

Recent Advancements

Advances in Military Medicine include the use of telemedicine (employing information and communication equipment to deliver health care from a distance) and robotics. Military Medicine often influences civilian trauma management too, such as the restructuring of ABC management to CABC. This is for Catastrophic hemorrhage, and subsequent resuscitation with equal dose of blood products.

Injuries unique to Military Medicine include shrapnel and maxillofacial injuries. There is now a suction device for shrapnel wounds which uses topical negative pressure to be applied, to help remove bacteria and reduce inflammation. Internal fixation of maxillofacial injuries with mini titanium plates rather than cumbersome external ones, has allowed better post-operative recovery.

Due to the variety of injuries sustained new techniques are being developed all the time especially involving reconstructive surgery: In 2006 Pte. Neil McCallion had his wrist bones remodeled from 3 of his ribs and muscles from his right torso, after a 17-hour operation he can now perform most daily activities. Another case involved

Pte. Andrew Garthwaite who was severely injured in 2010; his 'bionic' arm will allow him to regain some sensory feedback.

Camp Bastion, the main British base in Afghanistan, hosts the busiest trauma department in the world and brings together the expertise of North Atlantic Treaty Organization (NATO) doctors from around the world, working together to perform life- saving surgery. It is now thought that roughly 90% of battlefield injured personnel will survive mainly due to the practices employed at Bastion. For example, every seriously injured patient undergoes a full body scan while being admitted. There are also new 'one hand' tourniquets, which can be used by anyone, and the helicopter-based Medical Emergency Response Team, MERT, which allows early critical care management and rapid evacuation of field casualties to Camp Bastion for further treatment.

In conclusion, Military Medicine is a challenging yet highly rewarding approach to medical practice. Doctors need to be willing to serve their country at immediate notice and maintain training to ensure they can deal with any scenario as it arises. It allows working with patients in numerous environments, from both benign to trauma situations, and the acquisition of a unique set of skills and totally different life experiences.

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CONTINUED MEDICAL EDUCATION

Section I: Multiple 'True' or 'False' Questions

Question 1:
Regarding the organisation of the nervous system:

Options

1. The grey and white matter are based on the distribution of neuronal cell bodies and myelinated axons
2. There is a common pathway for pain and vibration sensation
3. There are specific areas in both motor and sensory cortices representing each part of the body
4. The left hemisphere deals with language functions in the majority of right-handed individuals
5. The area involved in the formation of new memory is located within the frontal lobe

Explanation: The macroscopic appearance of the grey matter is due to the large number of cell bodies and that of white matter is due to the high fat content of the myelinated axons. Within the brain, the grey matter is located peripherally whilst the white matter is located centrally (with additional collections of grey matter interspersed, the basal ganglia). However, within the spinal cord the grey matter is organised centrally with surrounding white matter forming the tracts. The dorsal columns of the spinal cord carry fine touch, proprioception and vibration modalities. The spinothalamic pathway carries the modalities for temperature, pain and gross (crude) touch. The primary motor and sensory cortices have a topographical representation of the body, with the leg medially within the central sulcus and the arm and face laterally. The sizes of these areas are related to the precision of sensation or movement of the particular body part (e.g., the hand has a far larger area of representation than the feet). Most individuals are said to be left hemisphere dominant, meaning that within their left hemisphere are the cortical areas dealing with speech, reading, writing and calculation. Thus 90% of those who are right-handed are left hemisphere dominant. The area thought to be involved in the formation of new memories is the hippocampus, which is located within the medial temporal lobe.

Question 2:
Regarding treatment of Parkinson's Disease:

Options

1. Dopamine cannot cross the blood brain barrier
2. Levo-dopa is an amino acid which is converted to dopamine by decarboxylation
3. Levo-dopa has a half-life of around 12 hours
4.Anti-muscarinic drugs are used in the treatment of Parkinson's disease
5. Levo-dopa can cause nausea through stimulation of an area in the floor of the fourth ventricle.

Explanation: Dopamine cannot cross the blood brain barrier. Levo-dopa is an amino acid that is actively transported across the blood brain barrier and metabolised within neurones in the substantia nigra into dopamine. Levo-dopa can cross the blood brain barrier and is converted within the brain to dopamine. Levo-dopa has a short half life of around 2 hours. In the early stages of Parkinson's disease, levo-dopa is stored within neurones but as the disease progresses and neuronal degeneration continues, the levels fluctuate, creating problematic dyskinesias. Although less effective than dopamine related drugs, anti-muscarinic drugs are used in the treatment of Parkinson's disease (they are particularly helpful in treating tremor). Other drugs used in the treatment of Parkinson's disease include dopamine agonists (such as pramipexole), monoamine oxidase B inhibitors (such as selegiline), stimulators of dopamine release (such as amantadine) and catechol-O-methyltransferase inhibitors (such as entacapone). Levo-dopa stimulates the chemoreceptor trigger zone in the fourth ventricle causing nausea and vomiting. An anti-emetic such as domperidone can prevent this occurrence.

Answers: (1) T F T T F (2) T T F T T

CONTINUED MEDICAL EDUCATION

Section II: Single Best Answer Questions

Question 3:
Which among the following statements regarding skeletal muscle physiology is correct?

Options

A. The numbers of fibres supplied by a single motor neurone is dependent on the embryological development of that muscle
B. Hypertrophy of a muscle involves increase in the number of actin and myosin filaments within the muscle fibres
C. The 'H' zone within sarcomeres contains actin filaments
D. The 'I' bands contain myosin fibres
E. Release of calcium ions is responsible for the exposure of the active sites of myosin filaments

Explanation: The numbers of fibres supplied by a single motor neurone is dependent on the dexterity of the muscle; muscles requiring fine movements have fewer fibres supplied by each neurone. Hypertrophy is induced by contraction of a muscle at maximal force and involves increase in the number of actin and myosin fibres. The 'H' zone within sarcomeres (the area between two Z lines within a myofibril) contains myosin fibres. The 'I' band contains actin fibres, which overlap with myosin fibres during contraction (thus shortening the 'I' band during contraction). Release of calcium ions is responsible for the exposure of the active sites of actin filaments (NOT myosin filaments) that allows the myosin heads to bind at the onset of contraction.

Question 4:
Which among the following statements regarding testing for Human Immunodeficiency is correct?

Options

A. A child under 14 years of age cannot have a HIV test unless consented by either of the parent
B. In adults, if the test is positive, they are legally obliged to inform their partner of their status
C. The most common test for HIV tests for antibodies against HIV
D. Standard ELISA test has a false positive rate of rate of approximately 20%
E. Will be positive within 24-48 hours of exposure

Explanation: If the patient is deemed Gillick competent, even if they are 14 years of age, they can consent to medical tests or interventions (although Gillick competence is commonly applied to contraception, it can apply to any medical field). Competence means that the patient is able to understand the nature, purpose, benefits, risks and alternatives to an intervention, including no intervention, believes and retains the information long enough to reach a conclusion, and be able to make that conclusion free of external pressure. Patients are not legally obliged to inform anyone else (including their partner) of their HIV status unless they intentionally put others at risk. Thus, patients may need to disclose their status to their partners if they continue to have sexual intercourse despite having the knowledge and the understanding of the modes of HIV transmission. Likewise, failure to inform medical insurance companies of a positive status when opening new policies may nullify the policy in the future. The most common test for HIV tests for antibodies against HIV. Other substances which can be tested for include p24 antigen, which detects the p24 protein on the surface of the HIV and PCR for the viral RNA. The false positive rate of standard ELISA test for HIV antibodies has a far lower false positive rate. There is a window period after exposure before which antibodies against HIV are raised. This varies up to three months and so a test taken before this period is of dubious value if negative.

Answers: (1) B (2) C

CONTINUED MEDICAL EDUCATION

Section III: Extended Matching Questions

Question 5:
Groin lumps

Options:
A. Undescended testis (cryptorchidism)
B. Hydrocoele of spermatic cord
C. Inguinal hernia
D. Femoral hernia
E. Lymph node
F. Saphena varix
G. Femoral artery aneurysm
H. False aneursym
I. Neuroma of femoral nerve
J. Psoas abscess

Questions:
1. A 36-year old Asian immigrant presents to the Emergency Department with a tender, fluctuant mass in his left femoral triangle. He gives a history of night sweats, weight loss and a painful left hip. On examination, there is pain on passive extension of the left hip.

2. A 78-year old woman attends the Emergency Department with drowsiness and confusion. Her husband reports a 12-hour history of vomiting and abdominal pain. On examination, she is clearly dehydrated, her abdomen is distended and she has obstructed bowel sounds. More detailed assessment reveals a small painful swelling in her right groin crease.

3. A 22-year old man presents with a swelling over his medial right thigh. On examination, the swelling is slightly tender & pulsatile but the patient feels well otherwise. He admits to injecting heroin into the area earlier in the day.

Explanations:
1. Although this mass could be attributed to lymphadenopathy, its fluctuant nature and the presence of ipsilateral hip pain point to a diagnosis of psoas abscess. Psoas abscesses develop either from infection of unknown origin or as a consequence of infection spreading from an adjacent organ (usually bowel or urinary tract). Treatment is now usually (at least initially) by percutaneous drainage under ultrasound or CT guidance, with antibiotic treatment of the infecting organism. In this instance, the abscess has probably originated from a tuberculous spine.

2. The woman has signs of small-bowel obstruction secondary to a strangulated femoral hernia. A small complicated hernia in the groin crease in an elderly female with no prior history of a reducible lump is much more likely to be a femoral hernia than an inguinal hernia (although inguinal hernias are approximately ten times more common in general). Although not mentioned in the question, do note that inguinal hernias (especially if direct) are typically above and medial to the pubic tubercle (i.e. the site of the superficial inguinal ring) while femoral hernias are below and lateral to the pubic tubercle.

3. A false aneurysm (or pseudoaneurysm) is one that does not involve the vessel wall but still communicates with the lumen (i.e. unlike a true aneurysm, which is an abnormal dilatation of a blood vessel and involves all three layers of its wall – namely the intima, media & adventitia). It represents an accumulation of blood (haematoma) that is held in proximity to the vessel by the surrounding connective tissue. False aneurysms may follow traumatic damage to an artery, such as in femoral artery cannulation for angiography of after incorrect placement of needles by intravenous drug users. False aneurysms of the femoral artery present as expansile, pulsatile masses in the groin with a history of trauma to the region. Small pseudoaneurysms will clot spontaneously, whereas large ones usually require surgical intervention.

Answers: 1 – J, 2 – D, 3 – H

CONTINUED MEDICAL EDUCATION

Question 6:
Upper gastrointestinal haemorrhage

Options:
A. Aorto-enteric fistula
B. Carcinoma of the stomach
C. Carcinoma of the oesophagus
D. Epistaxis
E. Haemoptysis
F. Mallory-Weiss tear
G. Oesophageal varices
H. Oesophageal or gastric erosions
I. Peptic ulceration
J. Vascular malformation

Questions:
1. A 55-year-old man is brought into the emergency department after vomiting a large amount of fresh blood. On examination, he appears drowsy with a heart rate of 120 /min and blood pressure of 92/50 mmHg. An urgent full blood count shows haemoglobin 6.9 g/dL, platelets 160 x 109 /L, MCV 106 fL and INR 2.3.

2. A 27-year-old man presents to his GP with three episodes of vomiting containing altered blood. He has recently started a stressful job and has not had time to have regular meals. He also mentions a 6-month history of upper abdominal pain, which is relieved by eating and for which he self-medicates with ibuprofen.

3. A 70-year-old man presents to Casualty after vomiting small amounts of fresh blood. Examination reveals a pulse of 138 /min and blood pressure of 68/42 mmHg. Per rectal examination reveals melaena and fresh blood. Apart from an abdominal aortic aneurysm repair last year, he denies any medical history.

Explanations:
1. This man is vomiting large amounts of fresh blood. This clinical presentation, together with the raised MCV and deranged clotting, suggest liver disease secondary to excess alcohol consumption. Oesophageal varices result from portal hypertension, which in this case is likely to be due to a cirrhotic liver (the commonest cause). Portal hypertension results in the formation of collateral vessels between the portal and systemic circulations as follows: between the left gastric and oesophageal veins (i.e. oesophageal varices), from the obliterated umbilical vein to the superior and inferior epigastric vessels (i.e. caput medusa), between the superior and inferior rectal veins (i.e. anal canal varices), & also in the retroperitoneum. Other features of portal hypertension are splenomegaly and ascites. The management of variceal bleeding is by immediate fluid and blood resuscitation followed by an urgent endoscopy to control the bleeding.

2. This patient's history of epigastric pain relieved by eating is classic of duodenal ulceration. Peptic ulcer can be either acute or chronic. The commonest causes of acute peptic ulcers are Helicobacter pylori infection (80% of cases) and NSAID use. NSAIDs cause peptic ulceration by inhibiting the synthesis of prostaglandins that usually protect the gastric mucosa from acid attack. Other cases of acute peptic ulceration include operations, steroid use and stress. Cushing's ulcers arise following head injury (from increased vagal stimulation resulting in increased acid secretion). Curling's ulcers arise secondary to severe burns (from sloughing off of the gastric mucosa due to hypovolaemia). Eighty percent of chronic peptic ulcers occur in the duodenum, mostly on the anterior wall of the first part of the duodenum.

3. An aorto-enteric fistula is a rare but recognized complication of abdominal aortic aneurysm repairs, and should be considered in any such patients who presents with gastrointestinal bleeding. Blood loss is massive, as it gushes straight from the aorta into the intestine. Patients present with upper and lower GI haemorrhage and rapid collapse – if they are not taken to theatre immediately, mortality is almost inevitable.

Answers: 1 – G, 2 – I, 3 – A

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Feedback

Excellent. Lecturers all turned up, excellent opportunities to ask questions & interact. Fantastic emphasis put on research and careers. Something that is not really taught in the curriculum. Overall fantastic job. Social events were good. Well done.

- Emma Joanne Badger
Year 3 Medical Student
The University Of Birmingham

Overall I felt that the course was very well organised. All the speakers were friendly and approachable

- Nadia Hussain
Year 5 Medical Student
University Of Leicester

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