Ultrasound Guided Regional Anaesthesia Training Programme in University of Malaya

Report by Dr Beh Zhi Yuen

INTRODUCTION

Regional anaesthesia - peripheral nerve block (PNB) - is a vital skill for an anaesthesiologist and ultrasound-guided techniques have enhanced the skill and improved patient safety.[1] With the current trend of implementing enhanced recovery after surgery (ERAS) pathway for various surgical procedures[2,3,4] and opioid crisis[5] in the developed countries, regional anaesthesia will continue to gain interest and become the centre of multimodal analgesia protocol.

Prior to this, ultrasound guided regional anaesthesia (UGRA) training in University Malaya Medical Centre (UMMC) was conducted on a per case basis without a dedicated team, block room and limited supervision. Trainees usually learned UGRA by their own initiatives - attend workshops, read textbooks or online materials and hands-on practice on patients with limited supervision. There were no database to capture the practice and follow up on patients who received PNB.

We launched a training programme for UGRA since mid 2018 as part of the quality improvement initiative. There has been several published quality improvement papers on UGRA practice, training and teaching.[6,7,8] These papers showed improvement in clinical services and participants skills following project implementation. Our UGRA training framework is based on the abovementioned papers and programme creator's vast experiences from several European meetings and fellowship training in Singapore. We present the annual report and framework recommendation to set up such training programme.

FRAMEWORK

This was a quality improvement project in which the training module was implemented using the Plan-Do-Study-Act (PDSA) framework. It received approval from the Medical Research and Ethics Committee (MREC) UMMC [MREC ID NO: 201963-7484].

Regional Block Corner

We began this project by setting up a regional block corner in a dedicated area in the operating theatre. This regional corner would be a centralised location for trainees to learn UGRA, to perform them under supervision and in less pressured environment thus resulting in fewer failed blocks and minimise avoidable complication.[7,8,9]

This corner should decrease regional anaesthesia related delay, non-operative time, which might improve productivity, efficiency and thus increase surgeon acceptance. It would be handled by a "block team" which administers regional anaesthetics and then follow up patients postoperatively, adding continuity of care and possibly improving the quality of analgesic management and patient satisfaction. By setting up a regional corner, it allows ultrasound machine to remain in a single location and avoid being continuously moved among operating rooms, possibly increasing the life span of this expensive equipment. The corner would be equipped with regional anaesthesia related tools, guidelines, media and documents to facilitate the teaching and work process.[6] Patient information leaflet in three main languages (English, Bahasa Melayu and Mandarin) were printed and a web-based online database registry using Redcap were created to capture the practice of PNB in the institution.

Added values - regional corner became a dedicated area to perform blocks for patients who suffer from acute and chronic pain in the ward, not amenable to standard pharmacological agents.

Limitations - some institution has no space to set up a regional corner; a qualified personnel is required to run the regional service and supervise the trainees; likewise supporting staff like nurses are important to assist in the block preparation and performance.

Regional Anaesthesia and Acute Pain Medicine (RAPM) Posting

Trainees were assigned to undergo one month regional anaesthesia and acute pain medicine (RAPM) posting. They got to perform blocks under supervision, learned fundamentals and follow up patients who received blocks. All trainees had to attend a UGRA workshop before start their posting. The trainees would be evaluated during the posting for their knowledge and technical skills using the validated assessment form. They also had to sit for end of posting exams using standardized question bank (30 questions in 30 minutes - single best answer format). The questions covered fundamental knowledge about UGRA including the ultrasound physics, applied anatomy, technical description and complications.

Learning UGRA has three major components: understanding the equipment, knowledge of sonographic anatomy, and technical skills associated with needle

placement.[10] The aim of this posting is to learn the above and be competent with the basic regional anaesthesia (to become better than before at the end of the posting). Trainees will learn the technical components (anatomical and procedural) with the non-technical skills (e.g. patient engagement, preparation, safety checks and judgment) to achieve competence in UGRA.

They will have supervised practical session and receive the current updates, merits and demerits of the approaches, type of local anaesthetics and concentration during the sessions. Brief/debrief/feedback will be given in between the block activities. Some of the trainees may need to undergo evaluation of needling skills on simulation and meat-based models prior to being allowed to perform on patient. Therefore it is compulsory for them to undergo UGRA cadaveric workshop before joining the posting. Patient safety comes first.

Didactic learning material on ultrasound physics, sonographic techniques, and relevant anatomy will be delivered during the rotation posting through lectures, media, discussion and hands-on sessions with structured syllabus. Journal discussions were arranged and trainees will have end-of-posting assessment as mentioned above which include MCQ and performance appraisal using the Systematic Training and Assessment of Technical Skills (STATS framework) plus Delphi method.[11,12] The details of the workflow system for the RAPM posting will be available in the journal article.

Added values - RAPM posting became a formal training rotation for trainees to learn UGRA under structured syllabus with supervision in our institution. Regional anaesthesia posting has been a recognised rotation posting in the postgraduate anaesthesia training programme in many countries. For example, the anaesthesia trainees in Singapore have two months of rotation posting during the 2nd and 3rd year of training.[15,16] The RA team also expanded its service to manage acute and chronic pain outside theatre such as providing regional analgesia for patients with multiple rib fractures in intensive care units and those suitable for interventional pain procedure for chronic pain problems such as ultrasound guided stellate ganglion block for complex regional pain syndrome.

Figure 1: A patient received erector spinae plane block (ESP) with catheter technique as analgesic adjunct for multiple rib fractures with lung contusion requiring non-invasive ventilation support and close monitoring in intensive care unit.

Limitations - manpower status may interrupt the consistency of service provision and limit the service expansion especially during exam season.

UGRA Cadaveric Workshop

As mentioned in the earlier segment, it is a prerequisite for trainees to attend UGRA workshop before starting their RAPM posting. The uniqueness of our workshops is that it incorporated cadaveric session in conjunction with the University Malaya silent mentor programme (donated fresh cadaver bodies for medical training and research). The silent mentor programme is held regularly about four times a year.

The aims of having these regular workshops are:

- to impart knowledge and fundamentals of UGRA to the participants on how to perform UGRA safely and competently with main focus on essential basic regional blocks,
- assess trainees motor skills (probe manipulation and needling skills) on the cadavers before they begin their RAPM posting, an extra measure to promote patient safety,
- assess trainee knowledge and information retention after the didactic lessons
- provide opportunities for trainees to practice needling on the cadavers

This workshop is a two-day programme and reading materials would be shared online with the participants a week prior to the workshop.

Day 1: The first half of the day was essential lectures on UGRA - fundamentals and conduct, upper limb blocks, lower limb blocks, truncal blocks, managing complications such as local anaesthetic systemic toxicity (LAST) and nerve injury. During the regional block lectures, we found that a brief live-demo by the speaker or co-facilitator at the end of the lecture would enhance understanding and re-emphasize the essential points of the blocks. The second half of the day was hands-on session using volunteer models (there are usually six stations: two stations for upper limb blocks - above and below clavicle, two stations for lower limb blocks - anterior and posterior, and two stations for truncal blocks - thoracic and abdominal). Participants would be assessed

using formal assessment tool during the hands-on session to encourage active learning, to evaluate knowledge retention and to guide them obtaining ideal sono-anatomy for each type of block with probe manipulation.

Day 2: Cavaderic session and real live-demo by expert in the operating theatre. Participants were rotated between the anatomy lab and operating theatre. They had at least two hours of cadaveric session and one hour of real live-demo in the operating theatre.

Ultrasound needle visualization is a fundamental skill required for competency in UGRA, especially in-plane needling technique (the most common approach). This skill requires a level of dexterity to achieve precise alignment of the needle and ultrasound beam. For many practitioners, acquiring this skill is a challenge, requiring practice and repetition.[16,17] Cadaver model is the best simulator for participants to practice and acquire needling skill in a stress free environment (without the fear of harming patient and pressure of OT turnover time). Unlike other simulators such as inanimate models (gel phantom) or meat based animal models (chicken, beef), cadavers provide the most realistic model - comparable to live subjects.[17,18] However cadaveric model has its major limitation - inability to use nerve stimulator, lack of vascular anatomy and some models were too cachexic, which impaired probe placement, needling and sonoimaging.[18] Nevertheless, cadaveric model is the best model to practice truncal blocks and deep advanced blocks. Not all institutions have the facilities to provide cadaveric sessions, and it is expensive with limited participation seats to preserve workshop quality.

Innovation and Technology

We continue to innovate our programme content. We tried having pre and post workshop quiz during the in-house workshop by using interactive real time voting app (Mentimeter) and online game system (Kahoot). However the workshop schedule was too tight therefore it prohibited further exploration of the abovementioned method.

We often faced manpower constraint to run the RA corner and supervise the trainees. The lecturer in charge also has to run other operating theatre lists and cover other academic duties. Our ultrasound machines were relatively old and the hospital has no plan or budget to purchase a high end machine specially for regional team use. Unlike other country healthcare system or local private practice, patients do not pay for the PNB service including its disposable items. To overcome the above shortcomings, we used the cheapest needle designed for PNB - a stimulating non echogenic needle because we performed high volume of cases using PNB. Trainees had to adhere to

Figure 2: Photo collages of several in-house UGRA workshops since April 2018. Lecture contents were standardized and delivered by regular speakers (UM lecturers). We had the help of facilitators from Special Interest Group Regional Anaesthesia (SIGRA) during hands-on volunteer models and cadaveric sessions; several methods were tried including on-site assessment

the main principle of achieving precise alignment of the needle and ultrasound beam before advancing the needle to prevent any avoidable needling complication. We only used disposable dressing set yellow plastic as probe cover for single shot PNB to save cost. To enhance trainees understanding on anatomy and UGRA, we subscribed some app using 3D anatomy model. All patients shall receive sedation analgesia during block performance to provide comfort and a pleasant experience.[19] This is particularly essential for those surgical cases using PNB as sole anaesthetic technique. The drug choices and doses were titrated clinically according to patient comorbidities and frailty. We also provided headphones for patients to feel comfortable and relax with light sedation analgesia during surgery.[20]

Due to limited funding and long waiting time to purchase the simulators produced by NYSORA [NYSORA Simulators™], we self-manufactured the simulators using 3D printing machine. We wanted to provide trainees with more opportunity for needling practice during RAPM posting. The prototype had been tested during in-house workshop and still undergoing refinement.

CONCLUSION

This project underpins a novel effort to provide a comprehensive UGRA training for anaesthesia residents in Malaysia. There is plenty of room to improve and it requires team effort, funding and dedication from various stakeholders.

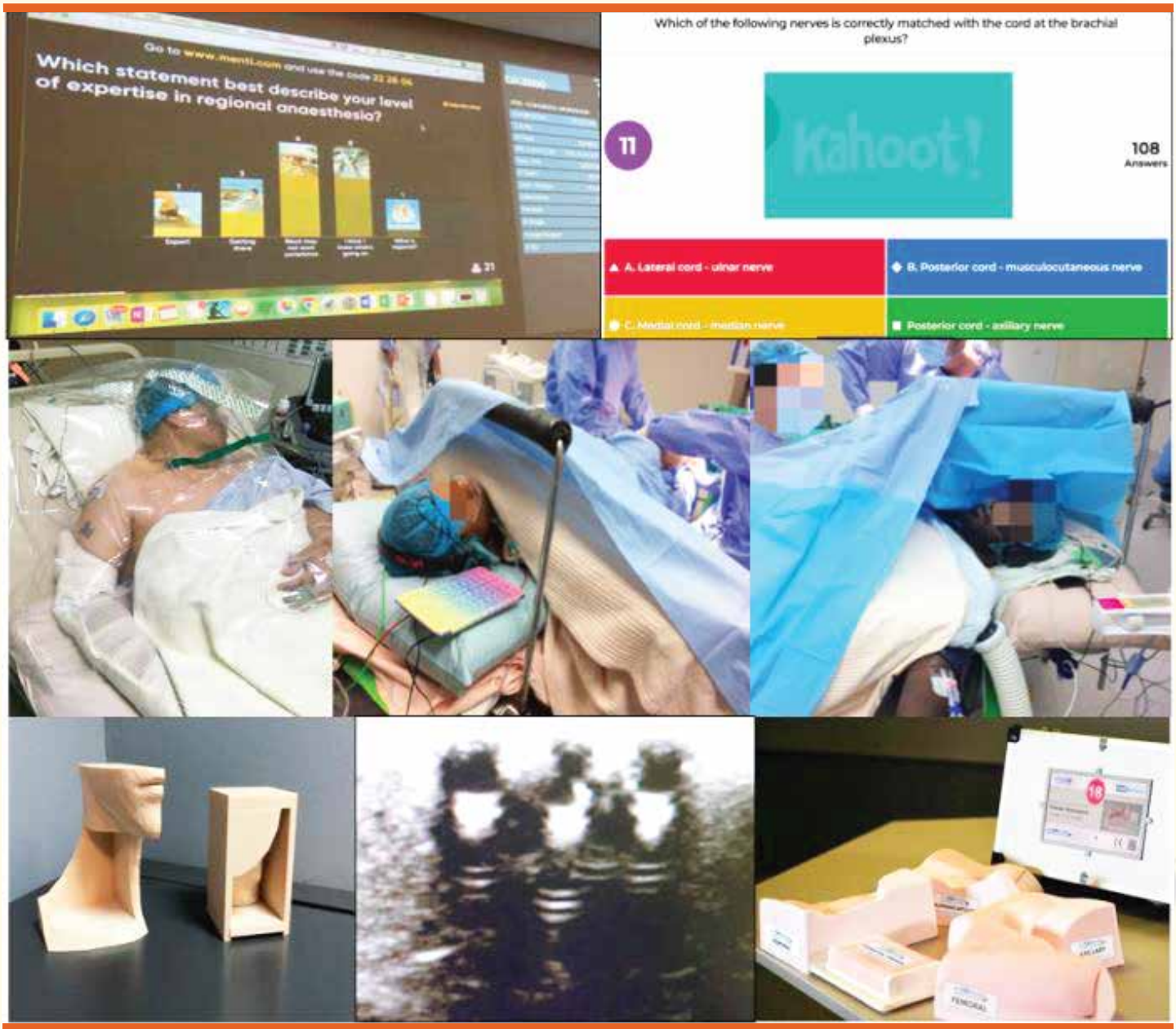

Figure 3: Photo collages of several innovation made such as trial of using online interactive voting system and games like Mentimeter & Kahoot during in-house UGRA workshops, trial of transparent sterile drape, provision of music therapy plus sedation analgesia for patients using PNB as sole anaesthetic technique. Self-manufacture simulators – the prototype is created for trainees to practice needling during RAPM posting.

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