Networking session

### HOW DO WE DEFINE SUCCESS IN REGIONAL ANESTHESIA (RA)?

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A successful RA block is the accomplishment of providing a satisfactory central neuraxial, peripheral nerve or plane block using local anesthetic solutions to enable the surgeon/obstetrician to perform certain operations on patients in a safe (devoid of complications), efficient (how easily or quickly placement is performed) and effective (pain free) way with a positive outcome.

These blocks are typically performed by well-trained anesthesiologists who have expertise in the field. They need to know all necessary safeguards to avoid potential negative consequences of a loco-regional block, i.e., toxicity and high/total spinal anesthesia, as a complication of an epidural puncture.

The use of ultrasound guidance for inserting peripheral nerve blocks has become the standard practice, as it allows for more accurate needle placement. Blind-insertion techniques should become more the exception. Proper training, adherence to hygienic standards, and the availability of necessary equipment and drugs are crucial for performing RA blocks safely in a monitored environment supported by nursing staff.

Complications associated with RA blocks can arise, including toxicity or high/total spinal anesthesia as a result of epi- dural puncture. Anesthesiologists need to be prepared and take necessary precautions and have resuscitation equipment and drugs readily available. In case of local anesthetic overdose or toxicity, the immediate availability of 20% intralipid can be crucial for treatment. RA has its specific complications often related to its reliance based on subjective feelings (loss-of-resistance to air as in epidurals), e.g., postdural puncture headache, where others may have neurological complications (peripheral blocks puncturing nerves). Even supervisors can not see what is happening at the other end of the needle and never can be sure whether the true loss-of-resistance is being felt. Training RA techniques in simulation circumstances is essential.

Like other areas of healthcare, anesthesiologists should also strive for environmentally sustainable practices. The healthcare industry as a whole contributes between 4 and 5% of the global greenhouse gas emissions. While RA techniques themselves are environmentally friendly, the administration of extra oxygen during the procedure can contribute to carbon dioxide production. Anesthesiologists should be mindful of minimizing unnecessary oxygen use and adopting eco-friendly practices wherever possible.

Overall, the goal is to achieve successful RA blocks that provide pain relief, allow for efficient surgical procedures, and prioritize patient safety while also considering environmental sustainability and minimizing potential complications.

### TRACKING MOTION DEVICES IN ANESTHESIA PROCEDURES

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1. Tracking motion devices in anesthesia procedures

1.1 Introduction

Hand motion analysis through specific devices has been successfully used for years in the surgical field. (1) More recently, they have been used in anesthesia as assessment tools for procedural skills.

1.2 Motion-Tracking Technology

Motion-tracking devices may be divided into two forms: optical and nonoptical.

- Optical systems typically use high-speed cameras to detect either infrared light reflection or emission, from which three-dimensional positional data can be extracted and postprocessed.

- Nonoptical systems typically rely on one of three methods of data acquisition to determine orientation and movement: electromagnetic, mechanical, and inertial mechanisms.

- Two main different devices using electromagnetic fields have been described in the anesthesia literature:

1. The Imperial College Surgical Assessment Device (ICSD) is a device that tracks operator’s hand-motion. It uses an electromagnetic tracking system (Isotrak II; Polhemus Inc., Colchester, VT, USA) consisting of an electromagnetic field generator and sensors placed on the back of the operator’s hands. Three dexterity scores can be measured: total distance travelled by each hand, number of movements, and total time.

2. The HMA hardware consisted of a DriveBay electromagnetic field generator and control box (Ascension, VT, USA), one reference sensor, and two hand sensors (Model 800, 7.9 mm, 6-DOF). Three-dimensional position data from the electromagnetic sensors are registered using an open-source software. Metrics used to evaluate motion efficiency are the same: total time of procedure, total path length (distance travelled) and number of translational motions. Both systems collect the x, y, z Cartesian coordinate information from each sensor at a determined resolution and frequency. Most reports of ICSD use an accuracy of 1 mm at 20 Hz. On the other hand, DriveBay device reports an accuracy of 1.4 mm at 50 Hz.

Finally, the use of this motion device in the evaluation of motor skills allows obtaining quantitative data complementing previous validated visual scales. Having as many instruments as possible for evaluating motor skills could improve the learning process. In the future, if we want to set up metrics or cutoff scores to be achieved with motor skills training, a previous standardization of both parameters to be used and calibration thresholds should be established for each setting.

2. Value of Motion Metrics

The ICSD has demonstrated construct validity in many surgical procedures, including open, laparoscopic, and microsurgery. Additionally, in the anesthesia field, its construct and concurrent validity has been established in labor epidural placement, spinal anesthesia, ultrasound-guided supraclavicular block, and jugular CVC placement.
REFERENCES

8. McGraw R, Chaplin T, McKaigney C, Rang L, Jaeger M, Davison C, Altermatt FR, Hold C, McNab C, Davison C. The DriveBay device was validated because motion parameters discriminate between expert and novices and correlates to a previously published modified GRS.
9. Limitations to Motion-Tracking Technology:

Three dexterity scores can be measured: total distance travelled by each hand, number of movements, and total time. The number of hand movements is determined based on a calibration process of translational and rotational velocity thresholds. Therefore, the number of movements registered is highly dependent upon the thresholds the researchers have pre-defined. Clearly, evidence supports that tracking motion devices are valid assessment tools for procedural skills. Nevertheless, given those technical calibration processes, careful interpretation should be taken in consideration while extrapolating this type of data.

5. Potential applications of motion tracking.

Today motion analysis could be used for providing objective feedback in training, debriefing after procedures, and evaluating clinical competence.

Nowadays these types of sensors are not used regularly in the operating room, as a guidance to perform peripheral nerve blocks.

But is there the possibility of motion analysis application for performance assessment of clinical procedures on actual patients?

Is there space for this technology (motion sensors and artificial intelligence) to find subtle patterns, biomechanical traces, and kinetic characteristics of expert performance, to guide the performance of peripheral nerve blocks?

Previous investigations have used the expert performance approach, described by Ericsson, to evaluate patterns as indicators of performance, as characteristics of an expert execution in contrast with de performance of an inexperienced operator.

In the surgical field there is a lot of information generated around the use of artificial intelligence to evaluate performance of gesture in surgical procedures: a systematic review published in 2022 collects at least 66 articles on the topic, identifying the most used methodologies, current limitations, and future challenges.

Another innovative idea is needle tip tracking. Käsite reported that needle tip tracking did not reduce procedural time for out-of-plane ultrasound-guided lumbar plexus block but did reduce the number of hand movements and path lengths.

Gender influences on teamwork performance in the fields of anaesthesia and pain medicine, but also in scientific societies can be complex and multifaceted. While it is important to recognize that individual variations exist within genders, research has shown that gender play a role in team dynamics and performance in these fields. A variety of factors that need to be considered have been identified across the literature.

Stereotypes and Bias: Gender stereotypes and biases can affect team dynamics and performance. Stereotypes about gender roles and abilities may influence how team members perceive and evaluate each other’s contributions. For example, unconscious biases may lead to women being perceived as less competent or authoritative, which can impact their ability to effectively contribute to team decisions and leadership roles.

Communication Styles: Men and women may have different communication styles, which can impact teamwork. Research suggests that women tend to use more collaborative and inclusive communication styles, while men may adopt more assertive and direct approaches. These differences can affect how individuals interact, contribute ideas, and make decisions within a team setting.

Leadership Opportunities: Gender disparities in leadership positions can affect teamwork dynamics. Scientific societies, anaesthesia departments and academic communities may have a higher proportion of male leaders, leading to potential imbalances in decision-making power and the allocation of resources. This can influence team dynamics and hinder equal participation and collaboration among team members.

Implicit Biases and Perception of Expertise: Implicit biases can influence the perception of expertise and competence in team members. These biases may lead to women’s contributions being undervalued or overlooked, even when they possess the necessary skills and knowledge. This can hinder team