LETTER TO THE EDITOR

Precision in practice: Exploring the impact of AI and machine learning on ultrasound guided regional anaesthesia

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Dear Madam, Ultrasound Guided Regional Anaesthesia (UGRA) is a commonly utilized practice in both elective and emergency situations during surgical procedures and for pain management. Its benefits include, being non-invasive, cost-effective, readily accessible, and providing the anaesthetist with clear visualization of essential anatomical landmarks, needle progression, and the spread of local anaesthetic. Ultrasonography has been shown to increase success rates for regional anaesthesia and decrease complications. One of the critical steps during UGRA is identifying relevant anatomical structures like nerves or vertebras. However, this aspect can be hindered by external influences such as variations in nerve structure and position, interference from noise, and positional instability.

Machine learning is a promising branch of artificial intelligence. It is used to conduct predictive tasks without programming instructions by creating algorithms. Extensive research has been conducted to evaluate the influence of machine learning on innovative anaesthesia methods. In 2023, Lopez et al. published a systematic review on how Artificial Intelligence could positively impact traditional anaesthesia practices.[1] Various studies included in the review employed different models to achieve variable targets during the induction of anaesthesia.

In one experiment, Alkhatib et al. used Convolutional neural network (CNN) based deep trackers to track the median and sciatic nerve with a surprising accuracy of 0.87.[2] Another study employed the same CNN model to locate and discriminate accurate images of sacrum, vertebral levels and intervertebral gaps during percutaneous spinal needle insertion.[3] Another study used a different AI model called SVM (support vector machine) classification, image processing, and template matching to locate lumbar level L3-L4 and the ideal puncture site for epidural anaesthesia in real-time. In this experiment, anaesthetists with minimal experience in ultrasonography were able to successfully determine needle puncture sites accurately.[4] All these studies utilizing AI models not only yielded beneficial results but also led to significant time savings.

Considering this, anaesthesiologists nationwide must integrate effective AI models to improve their clinical practice. This would minimize adverse outcomes in regional anaesthesia and ultimately enhance patient care and satisfaction.

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