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Regional block: Walking away from central to peripheral nerves and planes for local anaesthetic drug deposition

Regional blocks have been long used in anaesthesia practice. Following the evolution of regional anaesthesia in clinical practice, we may realise that we are moving away from use of central neuraxial blockade to peripheral nerve blockade and plane blocks. For a long time, the central neuraxial blocks have been considered as the gold standard. However, recently, the use of fascial planes/field blocks for local anaesthetic drug deposition has increased in clinical practice.^[1] This change may be related to avoidance of side effects related to the blocks, better understanding of regional blocks and availability of drugs and gadgets for nerve block. Most importantly, the introduction of ultrasound has revolutionised the techniques of regional anaesthesia.

Recent literature with regards to regional blocks includes the fascial plane blocks like erector spinae plane (ESP) block, quadratus lumborum (QL) block, serratus anterior plane (SAP) block, pectoral nerves block (Pecs block), transversus abdominis plane (TAP) block, rectus sheath block and adductor canal block etc., The reports on these blocks have shown promising results with regards to perioperative analgesia. This journal has published in the past various original articles and reports pertaining to these newer blocks and their comparisons with older blocks.^[2-14] This issue of the journal reports a randomised trial wherein COMBIPECS (combinations of Pecs 1 and Pecs 2) block has been studied for breast surgeries.^[15]

While moving away from central neuraxial blocks to more peripheral regional blocks, several pertinent issues that are not only related to provision of analgesia but also related to the side effects and some peculiar concerns specific to the individual block need to be kept in mind. Most of the studies related to fascial plane block are primarily related

to the analgesic effect as the primary outcome measure.^[2,4-15] The majority of the studies report that addition of these newer blocks decreases the requirement of analgesics (specifically opioid) during the perioperative period. The comparative study among individual blocks has reported variable results and the superiority of an individual block has not been determined conclusively. Each block appears to have some limitations with regard to specific surgery for which it has been used. Thus, further research is required to elucidate an optimal fascial plane block or a combination for an individual's surgery.

The few concerns that need further research would be the effect of fascial plane blocks on the procedure of surgery. The presence of local anaesthetic drug at the site of surgery (when drug spread is in the same plane as surgical site) leads to difficulty in use of electrocautery. This is primarily due to the presence of fluid at the site of electrocautery which increases tissue conductance and thus decreases the function of electrocautery. This has been reported earlier in a case wherein the difficulty was encountered during surgical resection due to the presence of local anaesthetic fluid along the tissue planes.^[16] This issue provides us the insight on the timing of blocks. The reported studies have administered blocks at different times, that is, prior to^[2,8,12] or after induction of anaesthesia^[3,4,7,15] or at the end of surgery. While studying the action of a local anaesthetic drug, providing sufficient time for the drugs to spread and get absorbed by the body is necessary. Giving blocks prior to anaesthesia would lead to more anxiety and discomfort to the patient.^[2,8,12] However, these factors have not been studied. While administering blocks after induction of anaesthesia would lead to fluid accumulation in planes and subsequent interference in surgical dissections, administering blocks at the end of surgery would

not provide the intraoperative beneficial effects of analgesia. Thus, further research is needed to optimise the timing of administering the blocks. In addition, the presence of fluids at the surgical site is sometimes mistaken for inflammatory lesions. Thus, needling for regional blocks could have concerns related to infection, tumor seedling by breaching the surgical plane and, at times, haematoma formation. These concerns need to be explored by further research.

The other concern relates to the volume of the local anaesthetic drugs and its impact on the muscles. It is well-known that moving away from the central nerves requires an increase in the volume of the anaesthetic drug for optimal anaesthesia and analgesia. This is primarily related to variable amount of connective tissue that needs to be penetrated by the local anaesthetic for its effect. It is known that spinal cord roots have less connective tissue but the amount of connective tissue increases as we move towards the peripheral nerves. This connective tissue barrier mandates the use of high volumes of drug for optimal analgesia. The use of ultrasound has brought down the drug volume as the exact location of drug delivery can be confirmed and the drug spread could also be visualised in real time. However, in fascial plane blocks, the drug needs to be deposited in a plane and thus mandates appropriate volume. Although ultrasound guides the appropriate spread of the drug in a particular plane, the most optimal volume of drug is yet to be defined for individual fascial plane blocks. Moreover, the direct impact of the local anaesthetic on muscles needs to be assessed for these fascial plane blocks. It has been reported that the local anaesthetics can cause myotoxicity depending upon the concentration of the drug and the period of use.^[17-19] Although the muscles regenerate, continuous infusion of local anaesthetics may affect the regeneration process. Because local anaesthetics are injected in planes without pressure measurement and hydrodissection is not done to identify the correct plane, myotoxicity may occur depending on the drug volume, pressure during drug injection or the direct effects of the chemicals.^[17] Although these risks factors are possible in administering fascial plane blocks, they have not been studied conclusively. In a systematic review for systemic concentration of local anaesthetics after TAP and rectus sheath block, the authors reported rapid systematic absorption of local anaesthetics after these blocks.^[20] Although majority of the fascial plane blocks do not use adrenaline, the review reported that the use of adrenaline reduces absorption. Therefore,

along with local muscle toxicity, the systemic effect of local anaesthetics with regard to fascial plane blocks also needs to be studied further.^[21]

There are few other concerns that warrant further assessment. Injection of drug in fascial plane may lead to adhesion and may interfere with surgical interventions in future. The newer fascial plane blocks have been reported primarily for analgesia^[2,4-15] and not as sole anaesthetics.^[3] The role of these blocks alone or in combination for effective anaesthesia needs further exploration. Moreover, persistent post-surgical pain is a concern. Thus, whether these newer blocks have any impact on mitigation of chronic pain needs further research. Recently these blocks have even been used for chronic pain management with variable efficacy but are reported as isolated cases. Therefore, more research needs to be explored in this arena as well.

To conclude, the newer regional blocks including fascial plane blocks appears to be promising for providing optimal analgesia during various surgical procedures. However, these blocks need to be studied further for their overall beneficial effects with regard to anaesthesia, analgesia, myotoxicity, systemic absorption and interaction with surgical outcomes.

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