Practicing pediatric regional anesthesia: Children are not small adults

Recently, there has been a rising trend in the use of regional anaesthesia in children.[1] The number of articles published in PubMed with the key words "pediatric," "regional," and "anesthesia" has doubled in the last 5 years and tripled in the last 10 years (personal search by the authors). The advantages of reducing the opioid use, faster recovery pathways, and the higher satisfaction scores in children and their parents have laid ground for clinicians to include regional anesthesia in the perioperative care of children. The increasing availability of ultrasound has improved the precision of peripheral nerve blocks (PNBs) in children, thus improving the success rates.[2]

Most regional techniques in children are extrapolated from those in adults. But children are not "small adults" and have many differences in the conduct of regional anesthesia compared to adults.[3] It is essential to explore these differences as we continue to evolve in our understanding of pediatric regional anesthesia and provide safer care to children. Research in children is challenging due to ethical considerations, limited ability of the child to communicate, and parents' anxiety and unwillingness to consent for study. But the clinical needs specific to children demands more literature in this area. The goalposts of journey in pediatric regional anesthesia should include being on the lookout for newer techniques based on specific needs in the pediatric population, comparison with or improvising on an existing adult technique, and continued evaluation of the efficacy and safety of established regional anesthesia techniques in children. The current issue includes three articles that exemplify the components of this journey.[4-6]

"Necessity is the mother of invention." Certain surgical procedures lack a gold standard regional anesthesia technique, driving anesthesiologists to look for better options. This is true with palatoplasty surgery and is evident from the numerous regional anesthesia techniques available for it, with none being perfect.[7] This issue features an article by Rajan *et al*.[4] with a similar concern in which the authors have explored the utility of sphenopalatine block for palatoplasty. Sphenopalatine block has been described in literature to attenuate the stress response to pin insertion before craniotomy, treat migraine and postdural puncture headache.[8-10] The authors Rajan *et al*.[4] explored the non-invasive mucosal application technique for perioperative analgesia in children undergoing palatoplasty. They found this technique effective in reducing the opioid use and emergence delirium. Though the technique appears simple, the correct placement of the applicator tip above the medial turbinate anterior to sphenopalatine ganglion is essential for the success of this block. This is easily possible in a child with wide cleft, but may need fiberoptic scope assessment in children with incomplete cleft palate or after previous cleft lip and palate repair for redo surgery. Further studies should evaluate whether this technique is superior to the existing regional anesthesia techniques or is just another addition to the armamentarium.

The techniques of most PNBs in children are adapted from adults due to the grossly similar anatomical locations of the peripheral nerves. However, certain differences in children like better visibility of structures in ultrasound, superficial targets, thinner fascia and sheaths, faster onset of blocks, and lower concentration of local anesthetic required can be advantageous.[3] The article by Ponde *et al*.[5] reflects this thought process. In this randomized, prospective pilot study, they have compared the efficacy of standard target site (posterior cord) for infraclavicular block with alternate target site (lateral cord) in 40 children. The authors found them to be equally efficacious possibly due to the thinner brachial plexus sheath in children that allows easy diffusibility of local anesthetic agent across the compartments. Based on this data, the lateral cord becomes a safer target for infraclavicular block in children as it avoids the risks of pleural injury associated with posterior cord target. Though these differences are subtle, they would definitely add to safety when evaluated at larger numbers.

Erector spinae plane block (ESPB) is a novel technique that has been recently reported to be safe, efficacious, and a potential "game changer" in perioperative pain management, ranging from thoracic to abdominal, pelvic, and limb surgeries.[11,12] Like PNBs, ESPBs require pediatric anatomy mastery to achieve adequate sensory blockade. Compared to adults, children's thinner and less-rigid muscles, fascia, and connective tissues must be considered. Hence, a linear pediatric probe, shorter needle, and lower volume of local anesthetic should be considered in conducting this plane block. It is also advisable to use saline for the hydrodissection step for all fascial plane blocks in children to allow sparing of the maximum allowable dose of local anesthetic.[12] Apart from lower pain scores and lower opioid use, a recent study by Pinar *et al*.[13] showed ESPB to consistently increase intra-abdominal tissue oxygenation (rSO_2) over time. This opens up yet another dimension to the role of ESPBs in abdominal procedures, which needs to be further studied. Though the literature on ESPB sounds promising, as it was described only recently

in 2016, more evidence is still required to solidify its role in pediatric pain treatment.

Continuous epidural analgesia is an established intra- and postoperative analgesia technique in adults and children. However, the challenges in maintenance of epidural catheters in the postoperative period vary. In this issue, Thomas *et al*.[6] have prospectively evaluated the efficacy of epidural analgesia in the postoperative period in 100 children. They found kinking of epidural catheter as the most common complication in 11% of their study population with a median age of 7 years as against 0.3% in adult literature.[14] This could possibly be due to higher mobility of skin and the smaller size of epidural catheters used in children compared to adults. It is interesting to note that the authors were able to salvage more than 80% of kinked epidural catheters by withdrawing them. Similar findings are noted in Pediatric Anesthesia Network (PRAN) data on the complications in pediatric regional anesthesia, which demonstrate the rate of catheter-related complications to be 4% and premature catheter removal rate due to all catheter-related complications to be 7.5%.[15] Another concern in children with continuous epidural analgesia is pericatheter leak despite correct catheter placement, which is also less frequently described in adults. Here, the discrepancy between the catheter size (24 G) and the epidural needle (20 G) used in children is larger compared to the epidural catheter size (20 G) and needle in adults (18 G). These also could be conservatively managed as reported by Thomas *et al*.[6] This study emphasizes the need to watch out for correctable factors like kink and leak for effective epidural analgesia postoperatively in children.

As we continue to rapidly progress in adapting more regional anesthesia techniques in children, literature on error traps is the need of the hour. It will enable us to fine-tune these techniques to continue improving the pain-free perioperative journey in children. We have "miles to go before we rest" to ensure them a safe sleep.

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References

1. Pinto N, Sawardekar A, Suresh S. Regional anesthesia: Options for the pediatric patient. Anesthesiol Clin 2020;38:559-75.
2. Guay J, Suresh S, Kopp S. The use of ultrasound guidance for perioperative neuraxial and peripheral nerve blocks in children. Cochrane Database Syst Rev 2019;2:CD011436. doi: 10.1002/14651858.CD011436.pub2.
3. Merella F, Canchi-Murali N, Mossetti V. General principles of regional anaesthesia in children. BJA Educ 2019;19:342-8.
4. Rajan S, Sasikumar NK, Rudrahitlu V, Mathew J, Barua K, Kumar L. Effects of bilateral transmucosal sphenopalatine ganglion block on intraoperative anesthetic requirements and recovery profile in children undergoing palatoplasty under general anesthesia. J Anaesthesiol Clin Pharmacol 2023;39:220-5.
5. Ponde VC, Puri KJ, Desai AP, Gursale AA, Zehra SU, Johari AN. Infraclavicular block in children: Is blocking lateral or posterior cord equally successful? J Anaesthesiol Clin Pharmacol 2023;39:181-8.
6. Thomas A, Bhasulamani SP, James D, Yadav B, Rai E. A cros-ssectional observation study to evaluate the efficacy and complications of epidural analgesia in paediatric population. J Anaesthesiol Clin Pharmacol 2023;39:189-94.
7. Reena, Bandyopadhyay KH, Paul A. Postoperative analgesia for cleft lip and palate repair in children. J Anaesthesiol Clin Pharmacol 2016;32:5-11.
8. Padhy N, Moningi S, Kulkarni D, Alugolu R, Inturi S, Ramachandran G. Sphenopalatine ganglion block: Intranasal transmucosal approach for anterior scalp blockade-A prospective randomized comparative study. J Anaesthesiol Clin Pharmacol 2020;36:207-12.
9. Mousa MA, Aria DJ, Mousa AA, Schaefer CM, Temkit MHH, Towbin RB. Sphenopalatine ganglion nerve block for the treatment of migraine headaches in the pediatric population. Pain Physician 2021;24:E111-6.
10. Nair AS, Rayani BK. Sphenopalatine ganglion block for relieving postdural puncture headache: Technique and mechanism of action of block with a narrative review of efficacy. Korean J Pain 2017;30:93-7.
11. Adhikary SD, Bernard S, Lopez H, Chin KJ. Erector spinae plane block versus retrolaminar block: A magnetic resonance imaging and anatomical study. Reg Anesth Pain Med 2018;43:756-62.
12. Monica L, Giulia R, Marco S, Fabio S, Alessandro V, Rosa L, Demetrio DP, Marco R. Erector spinae plane block in children: A narrative review. Korean J Anesthesiol 2022;75:473-86.
13. Pınar P, Yeşiltaş S, Türkay M, Karaaslan K, Türk A. Ultrasound-guided erector spinae plane block in patients undergoing pediatric abdominal surgery: A randomized study. Ain-Shams J Anesthesiol

2022;14:46. doi: 10.1186/s42077-022-00246-x.
14. Manassero A, Bossolasco M, Carrega M, Coletta G. Postoperative thoracic epidural analgesia: Adverse events from a single-center series of 3126 patients. Local Reg Anesth 2020;13:111-9.
15. Walker BJ, Long JB, Sathyamoorthy M, Birstler J, Wolf C, Bosenberg AT, *et al*. Complications in pediatric regional anesthesia: An analysis of more than 100,000 blocks from the pediatric regional anesthesia network. Anesthesiology 2018;129:721-32.

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