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Paediatric regional anaesthesia

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Paediatric regional anaesthesia is, today, a universally established method for providing pain control, but there is still a debate about the safety/efficacy of performing regional anaesthesia in children. There are certainly some 'obstacles' that must be recognised and overcome; these problems are unique to the paediatric population such as small dimensions, reduced renal and hepatic function due to immaturity in newborns and infants, and the requirement for an unconscious child to perform a block. In briefly considering each of these points it is seen that they are easily dealt with.

Small dimensions

The small size of children results in a greater failure rate and increased risk of injuring anatomically close structures. A good knowledge of paediatric anatomy allows performance of peripheral and central blocks with full knowledge where we are acting. A large survey of ADARPEF (the French Society of Paediatric Anaesthesia) assessed that paediatric regional anaesthesia is safe if performed by experts, with paediatric equipment (for example, needles and catheters of the correct gauge and size) and a more recent survey by the same Society confirms this safety with no sequelae and /or deaths from more than 33 000 blocks [1-4].

Immaturity

Relative immaturity in children is associated with a potential increase in plasma levels of circulating drugs due to reduced metabolism and clearance and a narrow therapeutic window. Scientific studies and research has led to the synthesis of two new local anaesthetics with a greater margin of safety (levobupivacaine and ropivacaine) as a result of their reduced affinity with the cardiovascular and nervous systems in comparison with racemic drugs such as bupivacaine.

Moreover, the addition of adjuvants like clonidine and ketamine contributes to a reduction of toxicity by decreasing the required local anaesthetic dose and also increasing analgesic property (synergism) [5-11].

Sedation before performing the anaesthetic block

The seemingly never ending debate about the need for an unconscious child in order to perform regional anaesthesia has now, at last, ended. It has been demonstrated that performing a block during anaesthesia is key to increasing safety as a result of the absence of pain, fear, agitation or shaking that can cause severe anatomical damage such as dural or vessel puncture and nerve injury [12].

Continuous epidural infusions

The benefits of continuous epidural infusions have been known from many years, and include improved patient outcome and money saving related to a reduction in ICU stay and in the total period of hospitalisation compared with patients treated with intravenous analgesia [13, 14]. The previously described first French survey found that with 1155 epidural catheter placements the only complication was caused by a mistake in positioning (the catheter was too long and the wrong size) [1]. The addition of adjuvants (such as clonidine, not morphine) to local anaesthetics can overcome opioid side-effects (nausea, emesis, urinary retention, respiratory depression and itching are independent of the route of opioid administration). In conclusion, continuous epidural analgesia remains as one of the main techniques for pain control in children.

Other new techniques

The recent availability of paediatric catheters for continuous peripheral nerve block permits a further application for regional anaesthesia in children, useful for surgical procedures or prolonged pain control for the upper and lower extremities [15-19].

The new century brought a new tool that can improve both the safety and the efficacy of the nerve blocks: the use of ultrasound for nerve detection [20-25]. This technique is extremely useful in children where a plexus or a nerve is generally very superficial and close to important structures. The possibility of seeing the nerves and the needle allows a more accurate and safer block with a reduction in the amount of drug used - as confirmed by the first papers on the paediatric use of ultrasound. The two biggest societies of regional anaesthesia, ESRA and ASRA, have published recommendations on the ultrasound guided paediatric regional anaesthesia, providing suggestions for its safe performance [26, 27].

Key Learning Points

- Children – in particular newborns and infants, are different from adults due to reduced drug clearance and anatomical variations.
- Sedation or anaesthesia is very often necessary before the performance of a block.
- Any block can be performed in children and some of them (such as caudal) are most commonly performed in children.
- Continuous central and peripheral infusions are used in children as well as adults.
- The use of ultrasound in detecting a plexus or a nerve is now available for children.
- Reviewing the published data, regional anaesthesia is a safe and effective technique in children.

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