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Transverse abdominis plane block in neonates: is it a good alternative to caudal anesthesia for postoperative analgesia following abdominal surgery?

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Sir—We report the case of a 3.6 kg full-term infant with imperforate anus and VACTERL syndrome (vertebral anomolies, cardiac, tracheoesophageal fistula, renal anomolies, and limb abnormalities) for colostomy placement on day 2 of life. Because of vertebral anomolies associated with the syndrome and the inability to perform a caudal block, we decided to proceed with a transverse abdominis process (TAP) block for postoperative analgesia following a left-sided colostomy placement.

After induction of general anesthesia, and endotracheal tube placement, a left sided lower abdominal wall was prepped in a sterile fashion and TAP block was performed under ultrasound guidance with a linear 2.5 mm probe (L-25; Sonosite, Bothell, WA, USA) with 0.5 ml of 0.25% bupivicaine with epinephrine 1 : 200 000.

The patient was extubated shortly after the end of the case in the NICU and required no further analgesic medications for the ensuing 24 h. We present this case as a possible alternative for postoperative analgesia in infants when a caudal block may be contraindicated. Although TAP blocks have been described in adults (1), this is to our knowledge the first description of its use in the neonates for postoperative analgesia.

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Spinal anesthesia for the premature infant: is this really the answer to avoiding postoperative apnea?

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Sir—Improved survival amongst infants born prematurely has led to increasing numbers of high-risk anesthetics being provided for surgical and diagnostic procedures on these infants. In our institution, though *Apnea-Monitoring Guidelines for Infants* were drawn up in 1990 and then re-examined in 1995, after their implementation; the incidence of postoperative cardio-respiratory events was not known.

Following review ethics board approval, we performed a retrospective study of consecutive infants who underwent inguinal herniorrhapies. Between January 1999 and August 2004; a total of 1831 inguinal hernia repairs were performed and 217 of these patients were infants (age <1 year). Out of these, 133 infants were born at <37 weeks gestational age (GA) and at the time of surgery were <60 weeks postconceptual age (PCA). Two independent anesthesiologists reviewed the medical records of these patients: medical history, intra-operative data including anesthetic details and postoperative course. Clinically significant 'apnea' (monitored and documented by the Nurse) was defined as a respiratory pause of 15 s or longer, 'bradycardia' as heart rate of <80 beats per minute and 'desaturations' as SpO_2 <90%.

Of the 133 infants undergoing hernia surgery, 14 had postoperative apnea (Figure 1).

Spinal anesthesia was intended in 78 infants and was successful as the sole anesthetic in 63 infants. Four of these 63 infants (6.3%) developed postoperative apnea and only one developed a significant bradycardia. Three of the episodes occurred after discharge from recovery room and all responded to stimulation. In the nine infants with insufficient spinal anesthesia, further supplementation was required- mask ventilation with nitrous oxide (two infants), intravenous ketamine (two infants) and tracheal intubation with volatile anesthetics (five infants). Four of these nine infants (44.4%) developed postoperative apnea and two required mechanical ventilation for up to 48 h postoperatively, having failed extubation in the operating room.

In six infants of the 78 from the intended spinal group, the anesthesiologist failed to identify the sub-arachinoid space despite multiple attempts and proceeded to a general anesthesia for the procedure.

General (volatile based) anesthesia with tracheal intubation and controlled ventilation was chosen primarily in 54 infants. If we include the six infants in who spinal could not be performed, a total of 60 patients received 'general anesthesia' for their procedure. Of these 60 infants, six (10%) developed postoperative apnea; and all but one

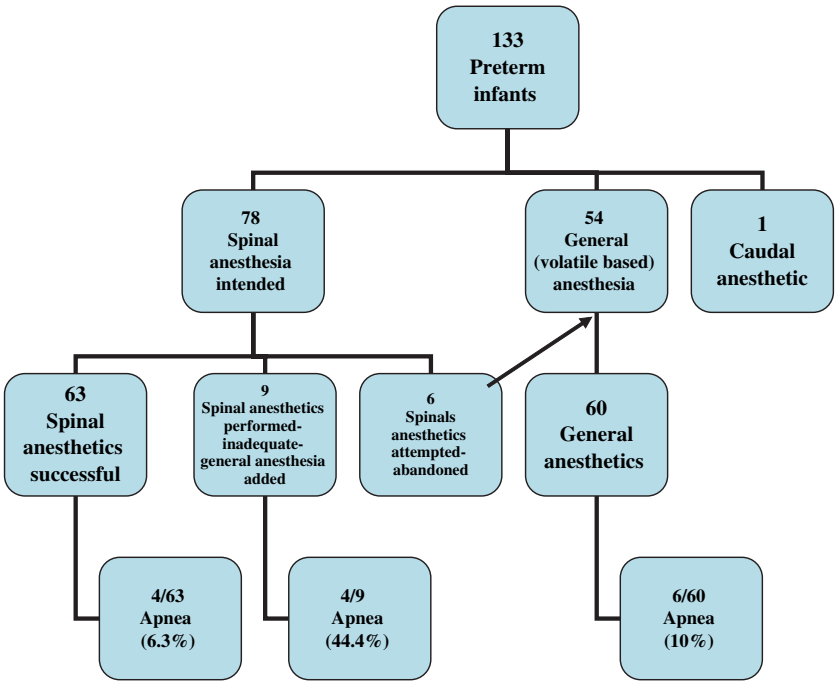

Figure 1
Summary of Anesthetic Management of the Study Group of 133 preterm infants and incidence of postoperative apnea.

responded either to stimulation alone or oxygen by mask. One infant required tracheal intubation and remained mechanically ventilated for 38 h. This infant's postoperative hemoglobin was 67 $g \cdot dl^{-1}$ and this may have been a contributory factor. One infant of the study population of 133 received a caudal block as the sole anesthetic (0.25% bupivacaine, 2.5 $mg \cdot kg^{-1}$) and remained without any intra or postoperative problems.

This study reports an overall 10.5% incidence (14/133) for postoperative apnea with lower incidence in the spinal group (6.3%) when compared to the general anesthesia group (10%). These differences did not achieve statistical significance. The infants in the *apnea group* (vs nonapnea group) did however have lower GA (mean 29.45 weeks SD = 5.27 weeks vs 31.84 weeks SD = 3.33 weeks), PCA (40.01 weeks SD = 5.33 weeks vs 43.31 weeks SD = 5.27 weeks) and were smaller by weight (3.27 kg SD = 1.32 kg vs. 4.11 kg SD = 1.35 kg) at the time of surgery. These differences were statistically significant with $P < 0.05$. Infants in the *apnea group* had an increased prevalence of preoperative respiratory complications (apnea, Bronchopulmonary dysplasia and or respiratory distress syndrome. These infants were also more likely to have higher American Society of Anesthesiology physical status class. However, the lack of standardization in these definitions probably precludes their confirmation as risk factors for the postoperative apnea. These and some other risk factors have been previously identified by other investigators (1–3).

Spinal anesthesia is known to be technically difficult in an awake infant, with significant failure rate and having short duration of action that may need to be either supplemented or eventual conversion to 'general anesthesia' (4). In our opinion, even with considerable experience and an adequate spinal block; an unhappy, vigorous or crying infant and surgical variables may influence not only the outcomes but eventually the preference of anesthetic technique in any institution. We have reported an overall failure rate of 19.2% (15/78) for these spinals, similar to that elsewhere (3). This study also highlights the fact that the 'failed spinal anesthesia group' is at significant risk for developing postoperative apnea. The sedative effect of neuraxial blockade has been implicated in acting synergistically with any supplemental pharmacological sedation (5). Even though the numbers in this group in our study was small, it is still alarming that over 44% of these infants developed postoperative apnea.

Although some investigators have suggested that in these high risk preterm infants postoperative outcomes may be independent of the anesthetic technique, this is still a matter of debate (4). While the economic implications of admitting all former preterm infants to an intensive care unit are striking, the anesthesiologist is often left without clear guidelines as to which anesthetic technique is most appropriate, how long and where these infants need to be monitored. We have implemented an intermediate level of monitoring through our *Guidelines* and this study also serves to provide continued quality assurance.

In our opinion, to determine the level and duration of postoperative monitoring required after hernia surgery in infants the preoperative risk factors should be taken in to account *in conjunction* with the anesthetic technique.

Preterm infants receiving spinal anesthetics with sedation or supplemental anesthetics should probably receive the highest level of monitoring as those with significant preoperative risk factors. Our data suggests that for the premature infant, spinal anesthesia is not always the answer to avoiding postoperative apnea.

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Be vigilant during use of intrathecal clonidine in former preterm infants

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Sir—We read with interest the article by Aouad *et al.* regarding respiratory failure following high spinal anesthesia with bupivacaine and clonidine in a former preterm infant (1). The respiratory pattern described by the author also mimics upper respiratory obstruction which could be attributed to excessive sedation with clonidine used (2). Author had not mentioned regarding any improvement in oxygen saturation with airway maintenance and oxygen supplementation. Probably this maneuver would have sufficed in maintaining ventilatory pattern and thus oxygen saturation. The abdominal excursions as described may be because of obstructed breathing as well. Moreover, the presence of full motor recovery after SAB within 90 min arise suspicion of high spinal and points towards respiratory obstruction for desaturation.

The authors attributed the increase in heart rate intraoperatively to wearing off the block effect but the initial decrease in heart rate can also be attributed to the effect of clonidine itself (3,4). The authors attributed to high spinal because of supine position but supine position in infants prevents cephalad spread of intrathecal drugs because of the presence of large occiput and support used under neck and back during supine position. Moreover Vila *et al.* concluded from his study that the maximum block height was comparable in preterm infants who were administered spinal anesthesia in lateral or sitting position (5).

Though the author mentions that the addition of clonidine does not increase the extent of sensory or motor block but on the contrary, in a review article by James *et al.* this effect has been well described (3). The increase in extent of block due lower CSF pressure as mentioned by the authors in this child has not been conclusively documented (6).

We conclude that keeping in mind the effects of intrathecal clonidine, specially in preterm infants, mandates great vigilance after spinal block.

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Pediatric sedation

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Sir—We would like to weigh in on the recent commentaries concerning pediatric sedation that have arisen since the