

Case Report**The Successful Awake Caudal Anesthesia for Bilateral Inguinal Hernia Repair in Triple Premature Infants: Case report and Review of Literature**Mahin seyedhejazi¹, Tohid Karami^{2*}, Afshin Iranpour³, Haleh Farzin²¹Department of anesthesiology, Full professor of pediatric anesthesiology, Pediatrics teaching Hospital, Tabriz University of medical sciences, Iran²Department of anesthesiology, Pediatrics teaching Hospital, Tabriz University of medical sciences, Iran³Department of anesthesiology, Al Zahra Hospital, Dubai**Corresponding Author:** Tohid Karami, E-mail: karami.tohid@gmail.com**ARTICLE INFO***Article history*

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Introduction: Inguinal hernia is a more frequent problem in male infants with an increased incidence in twin ones. Prematurity is considered as a risk factor. During open surgery of hernia under general anesthesia, there is a high incidence of apnea especially in the preterm infants. Caudal anesthesia could be a more effective approach for induction of anesthesia and analgesia. **Case presentation:** Here, we presented three two-months-old infants (3.5-3.9 kg) for inguinal hernia repair, simultaneously who were born at 35 weeks' gestational age. They were undergone bilateral inguinal hernia repair with single shot awake caudal anaesthesia. **Conclusion:** Although herniorrhaphy is a common procedure in preterm infants, the induction of simultaneous caudal anesthesia for this procedure is rare event. On the other hand, the complications of anesthetic techniques such as apnea are important. Indeed, triple infants with based same genetic background didn't show any undesirable events after anaesthesia.

INTRODUCTION

The repair of inguinal hernia has been remained as the most common procedure in pediatric surgery. The incidence of inguinal hernia varies from 0.8% to 4.4%. Approximately 11.5% of children have a positive family history. The incidence increases in twins and reaches to 10.6% in males and 4.1% in female twins [1]. It has direct association with prematurity, it means the estimated incidence in premature infants is 10% to 30% versus 3% to 5% in term newborns [2]. The caudal anesthesia is a common procedure in pediatric anesthesia due to its excellent safety, partially acceptable and easy method, administration as an adjuvant method to general anesthesia and providing postoperative analgesia. The awake caudal anesthesia results in better patient's safety and reducing of general anesthesia-induced potential long-term neurotoxic effects in young children. However, regional anesthesia is associated with advantages in newborns such as prevention of respiratory failure and rapid recovery rate [3]. The awake caudal block for repair of hernia play import-

ant role in preterm infants because of good success rate, fast recovery rate and lower requirements of analgesics in postoperative period [4]. Here, we describe awake caudal epidural anesthesia in a premature neonates undergoing bilateral inguinal herniorrhaphy. Based on previous randomized controlled trials, we could not provide valid evidences about caudal epidural anesthesia or spinal versus general anesthesia effects on incidence of post-operative apnea(-PA), bradycardia or declining of oxygen saturation in awake premature neonates undergoing inguinal herniorrhaphy under awaked regional anesthesia. The regional Anesthesia could reduce PA in preterm infants [5].

CLINICAL CASE REPORT

We present three two-months-old siblings undergoing surgery for inguinal hernia repair by successful awake caudal block. Their weight were 3500, 3600 and 3900 grams, respectively. They had prematurity history at 35 weeks, gestational age and delivered by caesarean section. They were

Author	Age	Gender	Year of publication	Type	Clinical Finding
Lisa J Jones [6]	Preterm infants at less than 37 week's gestation under inguinal herniorrhaphy before 60 week's post menstrual age	Male / Female	2015	Meta-analysis	The effect of, rapidly acting, quickly metabolized general anesthetic drugs with regard to the risk of postoperative apnea and neurotoxicity has not so far been established in randomized trials. There is potential complications from postoperative apnea and direct brain toxicity from anaesthetic drugs superimposed upon pre existing altered brain development in preterm infants . This necessitate the examination of neurodevelopmental outcomes in the context of large randomised controlled trials of general, compared with regional, anesthesia, in former preterm infants undergoing for inguinal hernia repair .
Claudia M. Mueller [3]	28 week's	Male/ Female	2017	27/3	Continuous caudal infusion of chloroprocaine is a safe and effective way to maintain adequate analgesia for elective surgeries in infants. This approach obviates the use of general anesthetic drugs and reduces recovery time and risk of neurotoxicity.
Khaled Mousa Abo El-Enein [7]	1-5 years	Male / Female	2018	63cases (21)	Caudal epidural anesthesia has a longer duration of analgesia compared with spinal anesthesia. intrathecal bupivacaine plus dexmedetomidine prolongs the duration of analgesia and decreases the total analgesic consumption.
Jean-Christophe BouchutM.D [8]	39 weeks of postconceptual age	Male	2001	1	A male 39 postconceptual weeks old infant, was administered a caudal anesthesia by 5 mg/kg lidocaine , 2.5 mg/kg bupivacaine and 1.25 µg/kg clonidine without sedation for bilateral inguinal hernia repair, which had early postoperative apnea . Except for gestational age, the patient had no apparent risk factors for postoperative apnea. The infant was under monitoring up to 24 hours in a neonatal intensive care unit, with no other apnea recording.
Claudia Fellmann [9]	3week	male	2002	1case	Awake regional anaesthesia for inguinal hernia repair in former preterm infants is suggested to avoid life threatening respiratory complications known to occur after general anesthesia. Caudal epidural anesthesia is becoming a more popular technique and to prolong duration of anesthesia and reduce postoperative analgesics consumption , clonidine has been added into local anesthetic solution . they report a former preterm infant, who had two awake caudal anaesthetics for herniotomy within 3 weeks. The first was uneventful with bupivacaine 0.25% at 35 weeks post conceptual age. but at 38 weeks, the baby suffered from intra and postoperative apneas after inadvertent administration of bupivacaine 0.125% plus clonidine.
Seyedhejazi	Below three months	Male / female	2015	90	Double blind clinical trial,90 neonate & infant less than 3months & less than 5 kg,ASA I-II ,evaluated in 3 groups,1-caudal block with bupivacaine 0.25%, 1ml/kg 2- caudal block with bupivacaine 0.25%, 1ml/kg & 0.1mg/kg iv midazolam 3- caudal block with bupivacaine 0.25%1ml/kg&0.1mg/kg iv midazolam & 0.3mg/kg iv ketamine In this study adding IV midazolam and /or ketamine increase success rate
Seyedhejazi	2-13 week	Male / female	2008	30	The patients given single dose caudal block without IV drugs for lower abdominal surgeries. Hemodynamic changes,analgesia and apnea were evaluated up to 24 h.in this study patient surgeries were done successfully with out any complication .

candidate for bilateral inguinal hernia repair. In past medical history, twin of them had icterus. There was no symptoms and signs of pathologic events in preoperative visit. After obtaining informed consent of parents, finally we chose awake caudal anaesthesia technique. In operation room, the basic monitoring include following options: body temperature, electrocardiogram, non-invasive blood pressure, saturation of arterial oxygenation. Then, they received mild sedation with 0.3 mg IV midazolam and few drops of oral dextrose 50%. In lateral decubitus position, after preparation and drape of sacro-coccygeal space, caudal block was performed by 22-gauge needle by 3.5 ml, 3.6ml and 3.9 ml of bupivacaine 0.25% and 1/200000epinephrine. We precisely monitored patients during surgery. At the end of surgery, patients admitted to post anaesthesia care unite and discharged to ward after complete recovery. Oral feeding was started just after entrance to ward.

DISCUSSION

It is most obviously that the approach to inguinal hernia is considered as routine event but the simultaneous procedure on three siblings by awake caudal anaesthesia is a rare occurrence that siblings.

A retrospective chart review of all patients at a single institution who underwent elective surgery with continuous caudal epidural block was performed. From thirty patients (27 males, three females): 28 patients underwent inguinal hernia repairs. Caudal anaesthesia was performed via continuous infusion of 3% 2-chloroprocaine through an indwelling catheter.(3)

The important point of our article is that the patient had not received any anesthetic drug for induction or maintenance of anaesthesia & analgesia and they had only received mild sedation by small dose of midazolam. The key point is that awake caudal was successful in all of three infant without any complications. There are few paper in literature about awake caudal that author had study all of them.

The following databases and resources were searched: the Cochrane Central Register of Controlled Trials (CENTRAL, *The Cochrane Library*, 2015, Issue 2), MEDLINE (December 2002 to 25 February 2015), EMBASE (December 2002 to 25 February 2015), controlled-trials.com and clinicaltrials.gov, reference lists of published trials and abstracts published in Pediatric Research and Pediatric Anaesthesia (6)

Sixty-three patients were included in a clinical trial from April 2015 to September 2016 and were divided into three groups of 21 each: patients in group I were given intrathecal bupivacaine only at a dose of 0.4 mg/kg bupivacaine 0.5%; patients in group II were given intrathecal bupivacaine plus dexmedetomidine at a dose of 0.4 mg/kg bupivacaine 0.5% with 0.25 µg dexmedetomidine for every 1 mg bupivacaine; and patients in group III were given caudal bupivacaine 0.5% at a dose of 3 mg/kg. Our primary outcome measures were duration of analgesia (time from the block to first dose of analgesia or observed pain score ≥ 12) and frequency of analgesic consumption, whereas the secondary outcome measures were onset of block (time from performing block

until recording sensory loss using the pin prick method and motor loss, which was recorded using the modified Bromage scale), level of block, effects on hemodynamics, and occurrence of complications.(7)

In present case report, we gave an example of triple premature infants who were at 5-6 week's gestational age (i.e. 43 week's GA). Indeed, the incidence rate of apnea decrease as inverse correlation with increasing age and birth weight. Therefore, AOP effects are observed in 7% of infants with GA 35-84 weeks. On the other hand, the prevalence of AOP is higher in first degree relatives, it means the possible role of genetic susceptibility (e.g. 87% vs 62% for dizygotic twins of the same sex GA < 36 weeks), especially lay in male infants (Picone), Gharavi et al evaluated apnea in 100 infants with postconceptional age < 60 week undergoing herniorrhaphy and reported 20.7% case of postoperative apnea (18% in infants with GA of 35.64±2.73 weeks). These infants received anaesthesia by sevoflurane, remifentanyl, atracurium and 60% N₂O (Gharvi). The Geze et al suggested awake caudal anaesthesia due to avoidance anaesthetic undesirable effects after surgery (Geze). It is estimated the incidence of inguinal hernia as 10-30% of premature infants (khan), and then we could figure up the herniorrhaphy is common procedure in preterm infants based on GA. Therefore, we presented triple former premature infants undergoing surgery by awake caudal anaesthesia by bupivacaine 0.25%. The monitored value inter- and post-operative didn't demonstrate apnea in these babies. It's most obvious that the regional method are preferred to general anaesthetic approaches even though in former preterm infants due to safety of regional anaesthetic.

CONCLUSION

The premature infants have particularly high incidence of inguinal hernias. In these infants, caudal epidural anaesthesia have been successfully used to avoid general anaesthesia and airway management devices. Awake caudal block had been used successfully in our patients because they were in high risk of apnea after general anaesthesia due to their prematurity.

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We obtained informed consent of parents.

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THE CONFLICT OF INTEREST

The authors declared they had no conflicts of interest.

REFERENCES

1. Coran, A.G., et al., *Pediatric Surgery E-Book*. Vol. 2. 2012: Elsevier Health Sciences.
2. Holcomb, G.W., J.D. Murphy, and D.J. Ostlie, *Ashcraft's Pediatric Surgery E-Book*. 2014: Elsevier Health Sciences.

3. Mueller, C.M., et al., *Regional block via continuous caudal infusion as sole anesthetic for inguinal hernia repair in conscious neonates*. *Pediatric surgery international*, 2017. 33(3): p. 341-345.
4. Seyedhejazi, M., et al., *Success rates and complications of awake caudal versus spinal block in preterm infants undergoing inguinal hernia repair: A prospective study*. *Saudi journal of anaesthesia*, 2015. 9(4): p. 348.
5. Craven, P.D., et al., *Regional (spinal, epidural, caudal) versus general anaesthesia in preterm infants undergoing inguinal herniorrhaphy in early infancy*. The Cochrane Library, 2003.
6. Jones, L.J., et al., *Regional (spinal, epidural, caudal) versus general anaesthesia in preterm infants undergoing inguinal herniorrhaphy in early infancy*. Cochrane database of systematic reviews, 2015(6).
7. El-Enein, K.M.A., et al., *Comparison between intrathecal bupivacaine, intrathecal bupivacaine plus dexmedetomidine, and caudal anesthesia with bupivacaine in pediatric patients*. *Menoufia Medical Journal*, 2018. 31(4): p. 1200.
8. Bouchut JC, Dubois R, Godard J. Clonidine in preterm-infant caudal anesthesia may be responsible for postoperative apnea. *Reg Anesth Pain Med*. 2001 Jan-Feb;26(1):83-5.
9. Fellmann C, Gerber AC, Weiss M. Apnoea in a former preterm infant after caudal bupivacaine with clonidine for inguinal herniorrhaphy. *Paediatr Anaesth*. 2002 Sep;12(7):637-40.