International Journal of Surgery Case Reports 88 (2021) 106541

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.elsevier.com/locate/ijscr

Case report

Inadvertent life-threatening total spinal anesthesia following caudal block in a preschool child underwent urologic surgery: A rare case report

Amanuel Sisay [a,b,*,1], Betelihem Girma [a,1], Teklu Negusie [a,d,1], Sherif Abdi [a,e,1], Bayisa Horsa [a,c,1], Kinfe Ayele [a,f,1]

[a] Department of Anesthesia, College of Health Science, Addis Ababa University, Ethiopia
[b] Department of Anesthesia, College of Medicine and Health Science, Bahirdar University, Ethiopia
[c] Department of Anesthesia, College of Medicine and Health Science, Ambo University, Ethiopia
[d] Department of Anesthesia, College of Medicine and Health Science, Maddawalabu University, Ethiopia
[e] Department of Anesthesia, College of Medicine and Health Science, Dire Dawa University, Ethiopia
[f] Department of Anesthesia, College of Health Science, Aksum University, Ethiopia

ARTICLE INFO

Keywords:
Total spinal blockade
High neuraxial block: Caudal block
Pediatrics anesthesia: Case report

ABSTRACT

Introduction and importance: Caudal block is considered to be safe and provide optimal analgesia for pediatric patients undergoing sub-umbilical operations. It overcomes opioid-related side effects, particularly the dangers associated with respiratory depression in small children.

Case presentation: A 5-year-old male underwent uneventful hypospadias surgery under general endotracheal anesthesia. Caudal block planned to be administered postoperatively for postoperative analgesia then performed after palpation of sacral cornu with 8 ml of 0.25% bupivacaine. A few minutes later, the patient became apneic, heart rate, blood pressure, and oxygen saturation dropped abruptly—immediate resuscitation with ventilatory support, fluid bolus, and atropine administration. After a minute patients' vital signs returned to the normal range then 2 h later patient started to breathe spontaneously and consciousness is regained. After close follow-up for 24 h in the post-anesthesia care unit patient was discharged to the pediatric ward then discharged to home without any neurologic sequelae after 3 days.

Clinical discussion: Total spinal anesthesia in a very infrequent incident during central neuraxial blocks, especially in the pediatrics population where a caudal block is usually performed. Manifestation of this event can be detected by loss of consciousness, cessation of respiratory effort, hemodynamic instability, and dilated pupils. Delayed treatment can result in cardiopulmonary arrest.

Conclusion: Unanticipated total spinal anesthesia following central neuraxial blocks can potentially cause severe adverse consequences. Preventive modalities must be employed to avoid this incident. Early recognition and instant management should be instituted to avoid dangerous complications following the total spinal blockade.

1. Introduction

Caudal block or caudal epidural block is one of the central neuraxial blocks that provide anesthesia and analgesia by inserting a needle via the sacral hiatus and delivering local anesthetics to the epidural space, usually for children below eight years of age planned to have surgery below the umbilicus. Currently, caudal block is a standard of care for intraoperative and postoperative analgesia in pediatrics who underwent any infra-umbilical surgeries because of the high success rate and provide predictable analgesia. Unless early detected and managed, high level or total blockade is exceptionally uncommon but potentially life-threatening adverse event after caudal block. Inadvertent intravascular injection, local anesthetic systemic toxicity, and urinary retention are rare but possible complications of a caudal block. Common unwanted effects following caudal are pain at the site of puncture and back pain, which are not clinically relevant [1].

This case has been reported in line with SCARE 2020 criteria [2].

* Corresponding author at: College of Health Science, Addis Ababa University, Addis Ababa, P.O box: 9086, Ethiopia.
E-mail address: yelfgntamirat@gmail.com (A. Sisay).
[1] College of Health Science, Addis Ababa University, Addis Ababa, Ethiopia

https://doi.org/10.1016/j.ijscr.2021.106541
Received 16 September 2021; Received in revised form 25 October 2021; Accepted 27 October 2021
Available online 3 November 2021

2. Presentation of case

A 5 years old child presented to Tikur Anbessa Specialized Hospital after parents noticed abnormal urination pattern and urethral meatal opening diagnosed with mid penile hypospadias then planned to undergo tabularized incised plate (TIP) repair.

During a pre-anesthetic evaluation, it was noted that the patient has no current systemic infection, no known allergy, and no other congenital disease. Physical examination of airway, respiratory and cardiovascular systems were in the normal range. Laboratory results of complete blood count and covid-19 test were in the normal range. After the patient kept nothing per os for 6 h for solid food and 2 h for clear liquid fluid, brought to the operating room. All available monitors, pulse oximetry, electrocardiography, noninvasive blood pressure monitor were applied, and readings were 100 bpm, grossly normal ECG trace, and 100/65 mmHg, respectively. Atropine (0.01 mg/kg, 0.16mg), dexamethasone (0.15 mg/kg, 2.4 mg), and ceftriaxone (30 mg/kg, 480 mg) were given as premedication. After preoxygenation for 5 min with 100% oxygen, the patient was received morphine (0.05 mg/kg, 0.8 mg) and paracetamol rectal (40 mg/kg, 640 mg) for analgesia then induced with ketamine (2 mg/kg, 32 mg) and succinylcholine (2 mg/kg, 32 mg) for relaxation then intubated with a 4.5 mm internal diameter polyvinyl chloride endotracheal tube and surgery started. Isoflurane 1.5% MAC was used for maintenance for anesthesia intraoperatively and assisted ventilation while breathing spontaneously; Mapleson A circuit was used after the patient recovered from succinylcholine relaxation. The surgery was finished uneventfully after 90 min. The patient's vital signs were stable, noted by heart rate between 80 and 105 bpm, blood pressure 90–100/50–70 mmHg, and grossly normal ECG trace. The patient received 10 ml/kg/h of normal saline intraoperatively, was not cold to touch, and had minimal blood loss.

While the patient is awakening from anesthesia, positioned to a lateral decubitus and possible aseptic technique applied caudal block was performed using 21G 3.0 cm needle after sacral cornu was identified. After passing the sacrococcygeal ligament determined by a loss of resistance, the anesthetist aspirated for blood and cerebrospinal fluid, and was found to be negative; finally, 8 ml of 0.25% bupivacaine was injected. Soon after the injection of local anesthetics, the patient was repositioned to supine for extubation; we noticed that the patient had stopped spontaneous breathing, heart rate dropped to 48 bpm from 90 bpm, blood pressure dropped to 48/29 mmHg from 95/58 mmHg, oxygenation saturation dropped to 86% from 98%, profound relaxation of the muscle tone and decrement of consciousness level evidenced with being non-responsive to a painful stimulus which was active at the end of the surgery. We immediately started resuscitation by ventilating the patient with 100% oxygen, administering 0.3 mg atropine and 150 ml normal saline bolus. During resuscitation, we made a presumptive diagnosis for total spinal anesthesia following caudal block, and all patients' vital signs came back to normal range within a minute. After ruling out possible causes, including hypoglycemia (blood sugar level was 183 mg/dl), inadvertent muscle relaxant administration, and fluid deficit, we reached that total spinal anesthesia secondary to caudal block as the high likely diagnosis. During the eye examination, pupils were dilated, non-responsive to light, and had cycloplegia bilaterally, which further supports our diagnosis. Due to the lack of an intensive care unit bed, we put the patient on a mechanical ventilator (Aeonmed Gloryplus) in the operating room until the muscular tone and consciousness regained. After 2 h, the patient starts to breathe spontaneously, move legs and arms, pupils start to constrict and respond to light. We extubated the patient after a 30-minutes start of spontaneous breath, ensuring that the patient maintained all respiratory parameters by itself. We transferred to the post-anesthesia care unit for close follow-up. After 24 h, the patient was transferred to the pediatric ward and was discharged safely from the hospital after 3 days.

We assume the cause for total spinal after caudal in our patient is that the needle used was without a stylet that might falsely lead to a negative aspiration of cerebrospinal fluid. Another potential reason might be that despite there being no flow of cerebrospinal fluid in the needle, inadvertent dural puncture might be there but could not be identified.

3. Discussion

Safety concern regarding caudal block for pediatrics is well studied and found to be very safe for anesthesia and analgesia for pediatrics surgery demonstrated that the rate of complication is only 0.7/1000 caudal block. A high spinal or total spinal anesthesia/blockade is one of the infrequent complications of central neuraxial blocks that can result in death if not quickly recognized and treated with an estimated incidence of 0.63% - 0.8% after spinal anesthesia, but literature is insufficient for this event during a caudal block [3–7].

We found two case reports of a total spinal blockade in pediatrics after caudal block from the literature review. Both cases of the total spinal blockade were detected by cessation of respiratory movement, rapid fall in oxygen saturation, heart rate, and blood, totally paralyzed, unconscious, and bilateral non-reactive dilated pupils. Both cases were managed with immediate oxygen support, vasopressor, and atropine administration then admission to the intensive care unit for respiratory support until consciousness and full-body control were regained [8,9].

Clinicians' preference found to be dominant regarding the selection of the volume of local anesthetics for caudal block. The widely acceptable dose depends on the dermatome level to be blocked; 0.5 ml/kg to achieve the sacral dermatomes, 1 ml/kg to achieve the lumbar dermatomes, and 1.25 ml/kg to reach lower thoracic dermatomes. A local anesthetic dosage with the potential to produce local anesthetic toxicity is administered to 25% of patients having a caudal block, and younger children appear to be the most vulnerable to obtaining a hazardous dosage. *The European Society of Regional Anaesthesia and Pain Therapy/American Society of Regional Anesthesia and Pain Medicine* recommends using ropivacaine 0.2% (2 mg/ml) or levobupivacaine/bupivacaine 0.25% (2.5 mg/ml) is recommended for the performance of caudal blocks in children and should not exceed 2 mg/kg ropivacaine or 2.5 mg/kg bupivacaine or levobupivacaine for caudal block [10,11].

In terms of age, the pubertal growth spurt has been shown to include cranial migration of the spinal cord terminal from the L3 to the L1-L2 level in as little as 12 months. On the other hand, studies discovered that the dural sac ended lower than S2-S3 in 8% of individuals in a study group of children. In babies and toddlers, the lower location of the spinal cord and dura increases the risk of unintentional dural puncture. Lateral positioning with the neck, hips, and knees maximally flexed was linked with substantial cephalad displacement of the dural sac. Although needles without stylets are the primarily used for caudal block, they are associated with blockade during aspiration for cerebrospinal fluid and blood, which facilitates inadvertent injection of a local anesthetic to subarachnoid space and the bloodstream, respectively on top of that, those needles will also increase neurologic complications. Using Tuohy-type needle with stylet minimizes the risk of flow blockage of cerebrospinal fluid and blood by tissues. Despite landmark technique with loss of resistance used in almost all caudal block procedures, visualization of the needle using ultrasound is an advantageous method for successful epidural injection [4,12].

Marked blood pressure change after central neuraxial blocks is not common in the pediatrics age group compared to adults due to the under-development of systemic vascular resistance. Heart rate changes are also uncommon following caudal block, even with higher blocks as T6 level. As a result, hypotension should enhance the possibility of total spinal anesthesia and/or an intravascular injection resulting in local anesthetic toxicity. Sudden abrupt stopping of breathing or apnea, loss of consciousness, and pupillary signs of central nervous system depression are considered to be alarming signs of total spinal blockade following central neuraxial blocks. Treatment starts with early recognition and immediate intervention, including supportive airway and oxygen support management, vasopressor or inotrope administration,

and waiting until the local anesthetics are eliminated [13,14].

4. Conclusion

Even though it is very rare that total spinal anesthesia following caudal block can result in serious consequences, measures should be taken to minimize the risk of this adverse complication. Detection and symptomatic interventions are time-sensitive, and the pillars during the management of total spinal anesthesia, especially in pediatrics who has increased consumption of oxygen, cannot tolerate hypoxia even for a fraction of a minute as adults.

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

In our institution study of case reports are exempted from ethical approval in a circumstance that the patient give consent or the guarantee.

Informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Amanuel Sisay: Conceptualization, Validation, Data Curation, Writing - Original Draft, Writing - Review & Editing.

Betelihem Girma: Conceptualization, Data Curation, Writing - Review & Editing.

Teklu Negusie: Data Curation, Writing - Review & Editing.

Sherif Abdi: Data Curation, Writing - Review & Editing.

Bayisa Horsa: Data Curation, Writing - Review & Editing.

Kinfe Ayele: Data Curation, Writing - Review & Editing.

Research registration

1. Name of the registry: Researchregistry.com
2. Unique identifying number or registration ID: researchregistry7286
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): https://www.researchregistry.com/browse-the-registry#home/

Guarantor

Amanuel Sisay Endeshaw, corresponding author.

Declaration of competing interest

None.

Acknowledgment

We would like to thank the staff of Tikur Anbessa Hospital.

References

[1] M. Jöhr, T.M. Berger, Caudal blocks, Paediatr. Anaesth. 22 (1) (2011) 44–50.
[2] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, A. Thoma, et al., The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.
[3] C. Zhu, R. Wei, Y. Tong, J. Liu, Z. Song, S. Zhang, Analgesic efficacy and impact of caudal block on surgical complications of hypospadias repair: a systematic review and meta-analysis 44 (2) (2019) 259–267.
[4] P. Silvani, A. Camporesi, M. Agostino, I. Salvo, Caudal anesthesia in pediatrics: an update, Minerva Anestesiol. 72 (6) (2006) 453–459.
[5] S.G. Beyaz, O. Tokgöz, A. Tüfek, Caudal epidural block in children and infants: retrospective analysis of 2088 cases, Ann. Saudi Med. 31 (5) (2011) 494–497.
[6] T. López, F. Sánchez, J. Garzón, C. Muriel, Spinal anesthesia in pediatric patients, Minerva Anestesiol. 78 (1) (2012) 78.
[7] M.G. Senekal, The safe spinal anaesthetic: spinal anaesthesia is not without its complications and should only be performed for the correct indications, Continuing Med. Educ. 30 (6) (2012).
[8] G. Afshan, F. Khan, Total spinal anaesthesia following caudal block with bupivacaine and buprenorphine, Pediatr. Anesth. 6 (3) (1996) 239–242.
[9] J.F. Desparmet, Total spinal anesthesia after caudal anesthesia in an infant, Anesth. Analg. 70 (6) (1990) 665–667.
[10] S. Suresh, C. Ecoffey, A. Bosenberg, P.-A. Lonnqvist, G.S. De Oliveira, Casasola O. de Leon, et al., The European Society of regional anaesthesia and pain therapy/American Society of regional anesthesia and pain medicine recommendations on local anesthetics and adjuvants dosage in pediatric regional anesthesia, Reg. Anesth. Pain Med. 43 (2) (2018) 211–216.
[11] A.H. Taenzer, M. Hoyt, E.J. Krane, B.J. Walker, S. Flack, A. Bosenberg, et al., Variation between and within hospitals in single injection caudal local anesthetic dose: a report from the pediatric regional anesthesia network, Anesth. Analg. 130 (6) (2019) 1693–1701.
[12] M. Wiegele, P. Marhofer, P.-A. Lönnqvist, Caudal epidural blocks in paediatric patients: a review and practical considerations, Br. J. Anaesth. 122 (4) (2019) 509–517.
[13] Maria BDJ L Tielensand S Roberts Epidural anesthesia in children Available from: https://www.nysora.com/foundations-of-regional-anesthesia/sub-specialties/pediatric-anesthesia/pediatric-epidural-spinal-anesthesia-analgesia/.
[14] J. Butterworth, Physiology of spinal anesthesia: what are the implications for management? Reg. Anesth. Pain Med. 23 (4) (1998) 370–373.