

Occurrence of Total Spinal Anesthesia after Caudal Anesthesia in a Newborn Patient: A Case Report of a Challenging Complication

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ABSTRACT

A 2-month and 13-day-old boy underwent surgery for a right inguinal hernia. During the procedure, a caudal block was performed using 4 mL of 0.25% bupivacaine injected with an epinephrine-soaked syringe. Before the injection, we confirmed that there was no blood or cerebrospinal fluid present. However, shortly after the injection, the patient experienced respiratory apnea and a slow heart rate. The medical team provided respiratory and cardiac support and closely monitored the patient. After a day and a half, the patient was discharged with no further complications.

Introduction

Caudal anesthesia is one of the regional blocks that are performed by inserting a sterile needle through the skin towards sacrococcygeal ligament and then infusing local anesthetics into the epidural space. It suppresses pain and induces numbness. This procedure can help reduce pain and induce numbness. The patient can be positioned in the prone, lateral decubitus, or knee-chest position to perform this procedure [1-2].

One of the most common anesthesia strategies in pediatric surgery is the use of a regional anesthetic technique. This technique can be used alone to perform the operation or to control pain after the operation in addition to general anesthesia. This method is often used for surgical procedures below the navel such as inguinal hernia [3-4].

Case Report

The patient was a 2-month and 13-day-old boy who weighed 4 kg and visited the hospital due to swelling in the right femoral and groin area. The doctor ordered an ultrasound examination which revealed a 7.5mm wide sac hernia in his right groin, requiring surgery. During the pre-anesthesia evaluation, the patient's breath sounds were slightly hoarse but there was no wheezing, fever, cough, active systemic infection, or allergies. The patient underwent surgery on December 4, 2023, at the operating room department of the Zahra Mardani Azar Medical Education Center. Upon entering the operating room, the patient's vital signs were recorded as PR=125/minute, T=37.1°C, RR=42/minute, BP=80/45mmgh, and SPO2=97%. Additional findings from tests indicated Hgb= 9.1gr/dl, HCT= 30.1%, PLT= 768*103/ μ l. The surgical nurse placed the patient on the surgical bed and monitored vital signs before administering 0.2 mg of midazolam intravenously for premedication and sedation,

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as directed by the anesthetist. Pre-oxygenation was also performed with 100% oxygen for 3 minutes. Once the patient's condition was stabilized, they were positioned on their left side in the lateral position, and the sacral hiatus was identified in accordance with sterile instructions provided by the anesthesia team. A 23G needle was used to puncture the skin, enter the sacrococcygeal ligament, and reach the caudal space. Carry out a certain procedure, the air resistance loss technique was utilized. In order to ensure its accuracy, the anesthesiologist performed an aspiration to confirm the absence of blood and CSF. Afterward, a 4 cc of 0.25% bupivacaine solution was administered through a syringe dipped in epinephrine. Almost a minute after the injection, the patient was returned to a supine position and the anesthesia team observed that the patient was experiencing respiratory apnea. The SPO₂ levels dropped from 98% to significantly low levels and the patient displayed signs of hypoxia and cyanosis. Additionally, the patient was diagnosed with sinus bradycardia. The heart rate decreased from 145 beats per minute to less than 120 beats per minute and the patient's blood pressure dropped from 80/45 to 55/35. The patient was immediately ventilated with 100% oxygen using a mask and ambo bag. There was no spontaneous breathing observed. The anesthesia team promptly performed resuscitation measures. This included stabilizing the patient in a supine position, intubating with an uncuffed size 4 ETT, and providing respiratory support with 100% oxygen until the patient returned to spontaneous breathing. The team then prescribed 0.1 milligram of atropine intravenously to increase the heart rate from 100 to above. The anesthesia team analyzed the possible causes for the apnea during the resuscitation process. According to the anesthesiologist in charge of the resuscitation team, based on the events that occurred and the denial of unintended events such as injecting the wrong drug into the patient, the probable cause of apnea was the injection of midazolam or total spinal anesthesia. The second diagnosis is more meaningful because the patient's heart rate continued to decrease even after correction of oxygenation. Although spontaneous breathing resumed, the patient's heart rate remained below 120/min and there was no movement in their upper extremities. Once the anesthesia team completed resuscitation measures, the patient's vital signs immediately improved and stabilized, allowing the surgeon to proceed with the operation. During the surgical procedure, vital signs were continuously monitored, and the treatment fluid was saline, infused at a rate of 10 cc per kilogram per hour. No volatile anesthetics were used, and the surgery lasted for 45 minutes. The patient underwent herniotomy and circumcision. Strategic awake extubation was performed after the patient returned to spontaneous breathing and demonstrated signs of full consciousness, such as recovery of organ movements and muscle tone. The patient was then transferred to the recovery ward in an awake state with vital signs PR=158/minute, T=36.6°C,

RR=38/minute, BP=83/41mmgh, and SPO₂=98%, where their vital signs were monitored. After re-checking the level of consciousness, the reaction of the eyes to light, the movement of the limbs, the crying of the baby, and the stability of the vital signs, the patient was transferred to the neonatal ward as per the anesthesiologist's orders. The patient was hospitalized for up to 24 hours to monitor for apnea and the possibility of delayed respiratory apnea. The patient was discharged from the hospital one and a half days after the operation without any special complications.

Discussion

Caudal anesthesia is recommended for surgeries involving the lower part of the body, mainly below the navel. Some examples of such surgeries include inguinal hernia repair, urinary tract surgery, and orthopedic surgery of the pelvis and lower extremities. This type of anesthesia can be administered in a single or multiple doses using an epidural catheter, which allows for continuous and repeated administration of the local anesthetic [5-6]. During inguinal hernia repair surgery in infants, the anesthesia team's primary concern is the risk of respiratory apnea, especially in patients with a hematocrit level below 30%. This risk may also occur during the recovery period. For these patients, caudal anesthesia is the preferred method to minimize the risk of respiratory apnea [3]. However, caudal anesthesia has its own side effects, including intravenous injection, epidural abscess, and total spinal anesthesia. Although these complications are rare, they can occur. Nevertheless, research has shown that the overall complication rate for this method is approximately 2% for about 19,000 patients studied. These rare complications have not caused any permanent damage, and they should not discourage anesthesiologists from using caudal anesthesia in children [5]. Sisay et al published a case report similar to ours. In their report, a 5-year-old child was referred for urological surgery, and caudal anesthesia was used to relieve post-operative pain. After injection of 8 ml of 0.25% bupivacaine, the patient experienced respiratory apnea, followed by a decrease in heart rate. Thanks to the actions taken by the anesthesia team, including respiratory support and atropine injection, the patient was saved [1]. The risk of total spinal anesthesia is more frequent in infants than in adults, possibly because infants have their Dural sac located parallel to the 2nd and 3rd lumbar vertebra, which is lower than in the elderly. This increases the possibility of Dural perforation [6]. Currently, procedures such as caudal block are performed under ultrasound and fluoroscopy guidance to accurately diagnose the sacrococcygeal ligament and the caudal space, in order to reduce the incidence of such events [7-8].

Conclusion

In spite of the fact that caudal anesthesia is a safe method to perform procedures in children below the umbilical region. However, there is a possibility of an occurrence of total spinal anesthesia, which can be reduced by following proper working instructions, using modern equipment and ultrasound. It is important to note that the fear of such incidents should not discourage the use of caudal anesthesia. It's important to ensure that the anesthesia team is well-prepared in case of any adverse effects.

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