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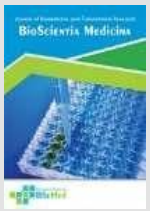

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Clonidine as an Adjuvant for Caudal Analgesia in Pediatric Patients Undergoing Infraumbilical Surgery: A Case Report

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A B S T R A C T

Background: Caudal block is a popular regional anesthetic procedure used in pediatric patients because it is easy and provides a significant analgesic effect, especially infraumbilical surgeries. Clonidine, an alpha 2 agonist, was previously used for antihypertensives but has recently been found to have analgesic properties, which have been demonstrated in several studies. A number of mechanisms have described how clonidine can exert an adjuvant effect on local anesthetic drugs. **Case presentation:** A 6-month-old toddler girl with a planned operation posterior sagittal anorectoplasty. The patient underwent a caudal block with a regimen of 0.25% bupivacaine + 8 mcg clonidine in 10 ml of 0.9% NaCl. Postoperative patient care was carried out in the usual ward with the analgesic regimen of paracetamol syrup 80 mg every 6 hours and ibuprofen syrup 80 mg every 8 hours. **Conclusion:** Clonidine, as an adjuvant for the caudal block, has greater benefits than its side effects in pediatric patients undergoing surgery, especially in areas infraumbilical.

1. Introduction

Pain is the body's defense mechanism against stimuli that can cause injury. Postoperative pain is unavoidable and is one of the most dreaded complications of the surgical process. The surgical process increases sympathetic tone and the release of endogenous catecholamines that cause pain, so it can create agitation, anxiety, increased heart rate, respiratory rate, and systemic arterial pressure in children. Postoperative pain management is a fundamentally important thing to reduce organic, functional, and psychological damage. As a strategy for prophylaxis of postoperative pain in children, caudal blocks are commonly performed because of their technical convenience and the benefits that outweigh the risks.[1-4]

The caudal block is a popular regional anesthetic procedure used in pediatric patients because it is easy and provides significant analgesia, especially in infra umbilical operations. By using techniques of landmarks and insertion blind, the success rate reaches >96% in pediatric patients. Drugs commonly used in this technique include bupivacaine, levobupivacaine, and ropivacaine. However, the duration of action of these drugs is short, and there is concern about infection if repeated or by continuous infusion. Therefore, adjuvant drugs are needed for local anesthetic drugs in order to optimize the duration

of action of these drugs. Several drugs that can be used, such as opioids, dexmedetomidine, epinephrine, midazolam, ketamine, and neostigmine, have been used as adjuvants for caudal block, but with various benefits and disadvantages.[5,6]

Clonidine, an alpha 2 agonist, was previously used for antihypertensives but has recently been found to have analgesic properties, which have been demonstrated in several studies. A number of mechanisms have been described for how clonidine can produce such effects adjuvant on local anesthetics. Clonidine inhibits the release of substance P and nociceptive neurons generated by noxious stimulation. This drug can also cross the brain barrier, which directly suppresses spinal neurons and interacts with alpha 2 adrenoceptors, resulting in sedation, analgesia, and sympotic in the spinal and supraspinal areas, where there is inhibition of neuronal transmission in peripheral nerve fibers A and C through slow retrograde axonal transport. In addition, clonidine causes vasoconstriction through interaction with alpha 2 adrenoceptors in peripheral vascular smooth muscle, thereby inhibiting the absorption and elimination of local anesthetics.[7] This study aimed to discuss clonidine as an adjuvant for caudal block in pediatric patients undergoing infraumbilical surgery.

2. Case Presentation

A 6-month-old toddler girl is accompanied by her parents' posterior sagittal anorectoplasty. Initially, the patient complained of not having an anal canal. This complaint was realized by the patient's parents after 2 days postpartum. The patient had no complaints of nausea, vomiting, or flatulence. The patient was then taken to the hospital for examination and treatment of colostomy. Currently, the patient still appears calm, with no complaints of nausea, vomiting, or flatulence. The patient's current bowel movements via colostomy with a liquid consistency accompanied by pulp, yellow in color. Bowel movements via pampers. There was no history of cough, runny nose, fever, or shortness of breath in the last 2 weeks. There was no history of drug and food allergies. There was no history of asthma, heart defects, or blueness of the mouth and fingertips. Previous surgery history: September 2021 / Sumba Hospital / Colostomy / GA / NICU care for 4 days. Birth history: The patient is the second child, born normally at the Public Health Center, with a body weight of 3200 grams and a body length of 53 cm. When the patient was said to be born, he immediately cried, and there was no blueness at birth, anus (+)

From the physical examination, the patient's weight was 7.7 kg, and body length was 66 cm. The patient's axillary temperature is 36.6^{0}C, pulse 105-109 times per minute regular, respiratory rate 32-36 times per minute thoracoabdominal, oxygen saturation 97-98% room water, with FLACC 0/10. Patients with activity tonus reflex (ATR) are good. No retractions, rhonchi, or wheezing. Heart sounds 1 and 2 sounded single, regular, with no murmurs and nothing gallop. Abdomen feels supple, normal bowel sounds, attached colostomy well maintained, good function with a production of 5-8 cc/24 hours yellowish. The patient urinates spontaneously using a diaper urine output as much as 1.4 cc/kgBB/hour. Neck flexion and deflection good, Mallampati difficult to evaluate, oral mucosa moist and not bluish, skin turgor good, acral warm, fingernails not bluish, visible yellow on the patient's body but not visible on the patient's hands and feet, capillary refill time (CRT) <2 seconds. Vertebral defects (-), anal atresia (+), cardiac defects (-), Tracheo-oesophageal fistula (-), renal anomalies (-), and limb abnormalities (-).

A complete blood count showed a leukocyte count of 10.83 x 10^3/µL (6.0 - 14.0); hemoglobin 12.30 g/dL (12.0 - 16.0); hematocrit 37.30 % (36.0 - 49.0); platelets 505.00 x 10^3/µL (140 – 440). The hemostasis indicator shows PPT 11.2 seconds (10.8 - 14.4); APTT 31.0 seconds (24 - 36); INR 0.98 0 (0.9 - 1.1). Examination of liver function showed SGOT 145.90 U/L (5.00 - 34.00); SGPT 29.00 U/L (11.00 - 34.00). Examination of kidney function showed a BUN rate of 4.2 mg/dL (8.00 - 23.00); Creatinine 0.46 mg/dL (0.57 - 1.11). Electrolyte examination showed a K number of 4.6 mmol/L (3.50 - 5.10); Na 141 mmol/L (136 - 145);

Cl 108.4 mmol/L (94 - 110). From the distal lopography examination, it is impressive that the atresia ani is high (according to the Krickenbeck classification of high-type ARMs) without fistulas; Susp. disused microcolon in part of the transverse colon to the sigmoid colon accompanied by dilation of the sigmoid colon and rectum.

Consent for surgery and anesthesia was obtained from the family. Installation of intravenous access was ensured smoothly. STATICS (scope, tube, airway, tape, introducer, connector, suction) pediatric, ETT 2.5 - 3.0 - 3.5, anesthetic drugs, emergency drugs, infusion fluid warmers and carpet warmer, plastic wrap, $EtCO_2$, thermistor probe temperature sensor, precordial stethoscope, block and caudal sets, and pediatric fluid and dose calculations were prepared. The patient has 1 peripheral infusion line installed on the left hand.

The patient was given premedication with 0.5 mg midazolam and 5 mg ketamine. After the drug worked, the patient was taken to the operating room and positioned supine. Induction of anesthesia was performed with sevoflurane and O_2 given so that the patient is hypnotized, and fentanyl 20 mcg. Then intubation was performed with ETT number 3, followed by confirmation of the location of the ETT and symmetrical bilateral auscultation (no air entering the stomach). After confirming the location of the ETT, proceed with ETT fixation. The patient was then positioned sims, and a caudal block was performed with a regimen of 0.25% bupivacaine + 8 mcg clonidine in 10 ml of 0.9% NaCl. Maintenance of anesthesia was carried out by administering O_2, compressed air, and sevoflurane.

During the surgical procedure, the hemodynamic fluctuations experienced by the patient are as follows: HR 93-103 beats per minute; RR 30-32 times per minute; SpO_2 97-99%, no additional analgesic drug administration. The surgical procedure lasted 2 hours 8 minutes. Postoperative patient care was carried out in the usual ward with the analgesic regimen of paracetamol syrup 80 mg every 6 hours and ibuprofen syrup 80 mg every 8 hours. We evaluated postoperative pain in the first 24 hours, and the patient did not need it rescue for pain management.

3. Discussion

In this case, we performed a caudal block with bupivacaine and clonidine regimen, where clonidine was successful in prolonging the action of local anesthetic drugs from the duration of surgery to 24 hours postoperatively. The patient did not require additional analgesia during or postoperatively. The dose of clonidine used for epidurals ranges from 1-5 mcg/kg. We used clonidine at a dose of 1 mcg/kg because studies have shown that increasing the dose from 1 mcg/kg to 2 mcg/kg does not enhance the analgetic efficacy of clonidine and may increase respiratory depression, bradycardia, and hypotension with increasing doses.[8-12]

Based on the study by Agarwal et al., it was concluded that adding clonidine 1 mcg/kg to bupivacaine 0.25% 1 ml/kg is a good alternative to bupivacaine 0.25% 1 ml/kg plain for postoperative analgesia in pediatric patients undergoing infra-umbilical surgery. Clonidine, as an adjuvant, prolongs the total duration of analgesia, better the quality of analgesia, and slows the time to analgesia rescue the first time after 8 hours with stable hemodynamics.[13-15] Chhaule et al. conducted a study comparing two different doses of clonidine for adjuvant on the caudal block. From their observations, adding clonidine 1 mcg/kg to bupivacaine for caudal block prolonged the duration of postoperative analgesia (370.75$\pm$45.39 minutes) when compared to a dose of clonidine 0.5 mcg/kg (190.25$\pm$57.40 minutes). The clonidine group at a dose of 1 mcg/kg also showed lower pulse, systemic blood pressure, respiratory rate, and pain scores for more than 6 hours postoperatively compared to the clonidine 0.5 mcg/kg group. Clonidine doses of 1 mcg/kg may be the lowest clinically significant and effective dose adjuvant on the caudal block for postoperative analgesia.[2]

Bonisson et al. conducted a prospective study comparing clonidine with three different doses, namely 1 mcg/kg, 2 mcg/kg, and 3 mcg/kg. Durante

operation, there is no difference regarding mean arterial pressure (MAP), pulse, concentration end-tidal sevoflurane, and time emergence. Postoperative morphine consumption and pain scores did not differ significantly between the groups, but the group on the 3 mcg/kg clonidine dose had a lower pulse and higher levels of sedation than the other groups.[3] In a meta-analysis performed by Wang et al., clonidine reduced preganglionic parasympathetic electrical activity and decreased sympathetic excitability, leading to bradycardia. However, medicine adjuvant other drugs commonly used for caudal block also have side effects, such as dexmedetomidine-induced hemodynamic instability, gastrointestinal dysmotility, opioid-induced nausea, vomiting, pruritus, and respiratory depression, and ketamine-induced neuronal apoptosis. Wang et al. concluded that clonidine has the same efficacy as an adjuvant for caudal block in pediatric surgery, with fewer complications.[6] However, in the study by Kumar et al., adjuvant clonidine at a dose of 1 mcg/kg for bupivacaine caudal did not prolong the analgesia effect when compared with bupivacaine alone in pediatric patients undergoing laparoscopic surgery, and it was concluded that local anesthesia with clonidine had no effect on pain during laparoscopic surgery.[5]

4. Conclusion

Clonidine can prolong the action of local anesthetic drugs, which are useful intraoperatively and postoperatively, with fewer complications. In addition, clonidine also has a sedative effect which is useful during the emergence process. We conclude that clonidine as an adjuvant for the caudal block has greater benefits than side effects in pediatric patients undergoing surgery, especially in the infraumbilical area.

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