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TWISTED SPINE, FAILING HEART — CAUDAL EPIDURAL ANAESTHESIA AS A RESCUE IN SEVERE KYPHOSCOLIOSIS

Anaesthesiology

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ABSTRACT

Background: The process of administering anaesthesia becomes difficult when dealing with patients who have both severe spinal deformities and major heart problems. The distorted anatomical structures found in kyphoscoliosis make it hard to use lumbar neuraxial techniques while the patient's unstable heart function heightens the dangers of undergoing full general anaesthesia. The use of regional techniques provides a safer alternative in these specific situations. Although caudal epidural anaesthesia serves as a standard paediatric anaesthetic method, it is rarely preferred as the main anaesthesia approach in adults. **Case Presentation:** We report a 40-year-old male with severe kyphoscoliosis and dilated cardiomyopathy (ejection fraction 30%) scheduled for below-knee amputation for peripheral arterial disease with foot gangrene. The initial plan was to perform lumbar spinal anaesthesia on the patient. Owing to the patient's distorted spinal structure and difficulty in locating spinal landmarks, spinal anaesthesia was a failure despite multiple attempts. General anaesthesia was not opted as the patient had both poor cardiac function and lung problems caused by his kyphoscoliosis. The team found that peripheral nerve blocks carried multiple injection requirements which created a chance of failing to achieve complete anaesthesia. Hence caudal epidural anaesthesia was opted as an emergency solution. Adequate sensory blockage was successfully achieved which allowed the surgery to continue without any problems while the patient's hemodynamic status remained constant. The patient also received successful postoperative pain relief after surgery. **Conclusion**: The case demonstrates that caudal epidural anaesthesia serves as an effective rescue method for patients who experience severe kyphoscoliosis with cardiac dysfunction because it provides a safe solution when standard lumbar neuraxial methods do not work while eliminating the dangers linked to general anaesthesia.

KEYWORDS

Caudal epidural anaesthesia, Failed spinal anaesthesia, Dilated cardiomyopathy, Kyphoscoliosis, Rescue anaesthesia

INTRODUCTION :

The process of delivering safe anaesthesia to patients who have severe spinal deformities and serious cardiac issues presents an ongoing challenge to anaesthesiologists. Regional anaesthesia is preferred for such high-risk patients who require lower limb surgeries as it minimizes the typical risks that occur with general anaesthesia. The presence of kyphoscoliosis creates special challenges which include complications that involve both technical and physiological aspects. The combination of distorted vertebral anatomy together with narrowed interspinous spaces and difficulties in patient positioning creates problems for standard lumbar neuraxial procedures which include spinal and epidural anaesthesia(1). Kyphoscoliosis presents anatomical difficulties which combine with physiological changes that include restrictive lung disease and decreased pulmonary reserve and cardiopulmonary function impairment. These factors increase the perioperative risk multi-fold when general anaesthesia is opted. The presence of secondary cardiac diseases such as dilated cardiomyopathy makes anaesthesia challenging because it raises the risk of patients experiencing hypotension and myocardial depression and need for extra ventilatory assistance after surgery. We must choose an anaesthetic technique that maintains hemodynamic stability while providing sufficient surgical anaesthesia to treat these specific patients(2). Caudal epidural anaesthesia, although widely used in paediatric practice, is less commonly employed in adults for major lower limb procedures. This offers various benefits which include simple access and gradual onset and stable hemodynamics. It serves as an effective replacement when lumbar neuraxial methods prove too difficult to execute or fail to work(3). We have successfully performed caudal epidural anaesthesia on a patient planned for emergency below knee amputation who had severe kyphoscoliosis and cardiac dysfunction after multiple failures of spinal attempts.

Case Report:

A 40-year-old male presented with severe pain and blackish discoloration of the right foot for two weeks. A diagnosis of peripheral arterial disease with foot gangrene was made and was planned for emergency below-knee amputation procedure. The patient is a known case of Dilated Cardiomyopathy with 30% ejection fraction together with hypertension and Kyphoscoliosis (Figure 1) with decreased exercise ability and breathing difficulties during physical activity.

Preoperative evaluation showed a pulse rate of 92 beats per minute and blood pressure of 100/60 mmHg and oxygen saturation of 95% on room air. The airway examination revealed sufficient mouth opening while chest wall expansion showed limitations. The spine assessment showed extreme thoracolumbar curvature which made it hard to identify spinal landmarks. The laboratory investigations showed haemoglobin levels of 10.6 g/dL with a normal coagulation profile and serum creatinine measurement at 1.4 mg/dL. The echocardiography examination demonstrated dilated cardiomyopathy which showed global hypokinesia and an ejection fraction of 30%.

Regional anaesthesia was the preferred choice as the patient has extreme cardiac dysfunction together with restrictive lung disease from kyphoscoliosis. A subarachnoid block was attempted multiple times but it failed because the lumbar anatomy showed distortion and lumbar landmarks were hard to find which led to failed attempts at both L3–L4 and L4–L5 interspace procedures. We considered general anaesthesia as a high-risk option because the patient had poor cardiac reserve and suffered from restrictive lung disease. We also considered peripheral nerve blocks to be less suitable because the below-knee amputation procedure needed multiple nerve blocks which would extend the duration of the procedure while increasing the chance of incomplete anaesthesia. We decided to perform a caudal epidural block as an emergency response technique. The patient was put in prone position and standard ASA monitors were attached. Under strict aseptic precautions under ultrasonographic guidance, the sacral hiatus was identified (Figure 2). An 18-gauge Tuohy epidural needle was advanced into the caudal epidural space through the sacral hiatus, and correct positioning was verified through radio opaque contrast distribution (Figure 3). A test dose was given after negative aspiration of blood or cerebrospinal fluid with 2 percent lignocaine. Then a single-shot block was administered with an injection of 18 mL of 0.25% bupivacaine with 20 mcg fentanyl.

The patient developed complete sensory loss from T12 within 15 to 20 minutes, which resulted in suitable surgical conditions. The patient maintained stable hemodynamic parameters throughout the procedure, and showed no signs of hypotension or bradycardia. The patient was provided supplemental oxygen through a face mask after administering Inj. Midazolam 1mg iv.

A successful below-knee amputation was performed and the surgery lasted 70 minutes. The patient achieved effective pain relief for 8 to 10 hours after surgery, which was evaluated using the visual analog scale (VAS). The patient was provided intravenous paracetamol as rescue pain relief after the patient reported increasing pain levels. We found no adverse reaction or postoperative complications that resulted from the caudal epidural block. After ensuring hemodynamic stability, the patient was shifted from post anaesthesia care unit to post operative ward.

We successfully used this as a rescue method for a patient with severe kyphoscoliosis and dilated cardiomyopathy. This case demonstrates how fluoroscopy guided caudal epidural anaesthesia can be successfully applied through an epidural Tuohy needle in situations of failed lumbar neuraxial blocks.

Figure 1

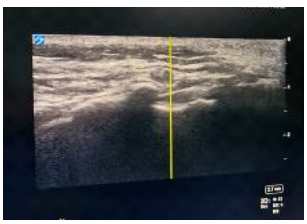

Figure 2

Figure 3

DISCUSSION :

The process of administering anaesthesia to patients who have severe spinal deformities and serious cardiac ailments proves difficult. The condition of kyphoscoliosis results in spinal anatomical changes which prevent the execution of lumbar neuraxial procedures. The patient required multiple attempts to establish spinal anaesthesia which ended in failure because the interspinous spaces were too narrow and his anatomical landmarks were not enough to guide the procedure. The procedure required multiple attempts which created a greater possibility of traumatic puncture and hematoma development and increased risk of patient discomfort, which demonstrated the need for other methods to achieve the desired outcome(4).

Patients with dilated cardiomyopathy face dangerous complications during general anaesthesia. The use of induction agents together with positive pressure ventilation creates hypotension and bradycardia(5). Patients who have restrictive lung disease from kyphoscoliosis face a higher risk of developing breathing problems after their surgical procedures. The decision to use regional anaesthesia instead of general anaesthesia proved to be the best choice because it delivered effective surgical anaesthesia while keeping both cardiac and respiratory functions stable.

The surgical procedure of below-knee amputation requires blockade of several nerves which include the sciatic and femoral nerves, and they may need to add the obturator or lateral femoral cutaneous nerves. Hence nerve blocks was less preferred in this cases as it requires more time to complete the procedure, and it increases the chance of producing insufficient blockade(6). The caudal epidural anaesthesia is commonly used in paediatric population and less explored in adult patients. The method establishes gradual sensory and motor blockades ensures stable hemodynamic functions and also the technique delivers effective anaesthesia during surgery with extended pain relief after the procedure.

Technique : The process of ultrasound guidance enables real-time identification of the sacral hiatus and sacrococcygeal ligament and epidural space which leads to better accuracy and decreases the risk of vascular or subcutaneous injection errors(7). The fluoroscopy method provides essential assistance in identifying the spread of drugs for adult patients who have abnormal spinal structures whereas their condition needs special diagnosis(8). The patient can be positioned in prone with mild sedation and oxygen supplementation. Tuohy needle is used to perform an epidural procedure under USG guidance. Later, lateral or anteroposterior views can be used under fluoroscopic guidance to identify the sacral hiatus and radio opaque contrast dye injected to confirm the location of the tip of the Tuohy needle and distribution drug. 0.25% bupivacaine with 20 mcg fentanyl produced sufficient anaesthesia while maintaining hemodynamic stability.

Single-shot caudal epidural anaesthesia provided effective intraoperative anaesthesia and postoperative analgesia lasting 8–10 hours which reduced the requirement for systemic opioids together with their potential cardiac and respiratory side effects.

Fluoroscopy-based caudal epidural anaesthesia demonstrates safe efficacy as a rescue method for adult patients who suffer from serious spinal deformities together with contraindications for general anaesthesia. The study demonstrates that personalizing anaesthetic procedures and using imaging techniques for difficult anatomical situations together with choosing methods which decrease operational dangers will lead to better patient results while ensuring patient comfort and surgical success.

CONCLUSION:

Fluoroscopy-guided caudal epidural anaesthesia is a safe and effective technique in adult patients with severe spinal deformities and significant cardiac comorbidities.(9) It provides reliable intraoperative anaesthesia, maintains hemodynamic stability, and offers prolonged postoperative analgesia when conventional lumbar neuraxial blocks fail. Careful preoperative planning and the use of imaging guidance are crucial in such high-risk patients to minimize complications and optimize surgical outcomes.

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