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Dual Epidural Technique in Kyphoscoliotic Patient Posted for Abdominoperineal Resection with End Colostomy- A Case Report

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KEYWORDS

Kyphoscoliosis, Abdomino Perineal Resection, Double Epidural Technique, Anesthesia Management, Pain Control.

ABSTRACT:

Background: Kyphoscoliosis, a complex spinal deformity involving abnormal curvature in both the coronal and sagittal planes, presents significant challenges for anesthetic management, especially during major surgical procedures such as abdomino perineal resection (APR). The altered anatomy and potential for respiratory compromise make traditional anesthetic techniques inapt .

Case presentation and clinical discussion: In a case involving a 71-year-old patient scheduled for APR due to rectal cancer, a double epidural technique was planned to address the challenges posed by severe kyphoscoliosis. This approach involved the insertion of two epidural catheters at different levels of the spine to ensure comprehensive coverage of the surgical field. The thoracic epidural was used for anesthesia during the abdominal phase of the surgery, while the lumbar epidural provided anesthesia for the perineal portion. The patient received a combination of local anesthetics and opioids through the epidurals, resulting in excellent analgesia throughout the surgery and minimizing respiratory depression. The patient experienced stable hemodynamics and satisfactory pain control in the immediate postoperative period, with no complications related to the epidural catheters or the anesthetic management.

Conclusion : This case demonstrates the safety and effectiveness of the double epidural technique for patients with kyphoscoliosis undergoing complex surgeries like APR, highlighting the importance of individualized anesthetic planning and innovative techniques in managing high-risk patients.

Introduction

Kyphoscoliosis, a spinal deformity characterized by forward and lateral bending of spine[1], significantly impacts the patient's anatomy and physiology, particularly affecting respiratory and cardiovascular function. These changes necessitate a tailored approach to anesthetic management to ensure patient safety and optimize surgical outcomes. APR (Abdomino perineal resection), a major surgical intervention for low rectal cancer, results in a permanent colostomy after removing distal colon, rectum and anal sphincter[2]. It involves significant pain and potential postoperative morbidity, making effective pain management a critical component of the anesthetic plan. Managing anesthesia for patients with kyphoscoliosis undergoing major surgical procedures like APR is a complex task requiring careful planning and innovative techniques. Traditional anesthetic techniques may exacerbate respiratory compromise in these patients, while systemic opioids can lead to unwanted side effects. Utilizing a single epidural technique at the lower thoracic level alone may lead to inadequate analgesia coverage in the perineal

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region whereas citing the epidural at the lumbar level alone will result in diaphragmatic splinting due to inadequate pain relief and will also require excessive use of local anesthetics and parenteral analgesics. The dual epidural technique has emerged as a promising alternative for anesthesia management in such patients, facilitating targeted delivery of local anesthetics and opioids to cater to both surgical analgesia and postoperative pain relief[3]. Notably, in a recent case of a patient with chronic obstructive pulmonary disease (COPD) undergoing major abdominal surgery, the successful use of dual epidural catheters in conjunction with general anesthesia was reported[4]. The utilization of a dual epidural catheter approach was chosen for managing a patient with severe kyphoscoliosis undergoing APR due to the extensive involvement of the splanchnic area during the surgery and the limited reach of a single epidural catheter. To our knowledge, this is the first case, where dual epidural technique was employed in a technically-difficult kyphoscoliotic spine, with ultrasound assistance. This case report discusses the anesthetic management, rationale for the approach, implementation steps, and outcomes, emphasizing its potential benefits for similar cases in the future.

Case

A 71-year-old male patient, 55kg , 150cm presented with intermittent bleeding per rectum over the past 6 months. He had a history of adenocarcinoma of the rectum and has undergone 32 cycles of chemoradiotherapy. Furthermore, he was a chronic smoker with COPD, using MDI Foracort and Rotahaler BD for 3 years. . His medical history includes peripheral neuropathy on T. Gabapentin 100mg BD and a 5 pack year history of smoking for 30 years, which significantly increased the risk of postoperative pulmonary complications (PPCs) and exacerbates his COPD (GOLD Class B). His last exacerbation occurred one month prior to the planned surgery date. Also ,he had experienced breathlessness for the past 4 years, with an MMRC (modified medical research council) dyspnea grade of 2 and Metabolic equivalents <4.The planned surgical access was via a xypho-pubic incision and perineal portion.

General examination: He presented with mild pallor , grade 3 clubbing, and his vitals were stable.

Inspection	- Right shoulder drooping
	- Muscle wasting
	- Asymmetric spine curvature
	- Reduced chest expansion
	- Use of accessory respiratory muscles
	- Prolonged expiration
	- Digital clubbing grade 3
	- Pursed-lip breathing
Palpation	- No bony tenderness
	- Malalignment of thoracic spine curved towards right
	- Increased anterior-posterior chest wall diameter (barrel chest)
Auscultation	- Wheezing
	- No murmurs

Airway : Modified Mallampatti grade 3, with an adequate mouth opening, a thyromental distance of 7cm, upper lip bite test indicating grade 3, and no abnormal dentition.

Figure 1- A 71-year-old man with thoracic kyphoscoliosis

Evaluation

The bedside pulmonary function tests indicated a very poor cardiopulmonary reserve during the sabrasez breath holding test, with a 12-second duration and room air saturation at 95%. The arterial blood gas revealed a $PCo2$ of 45 mmHg, pH of 7.41, and HCO3 level of 23 mmol/l. Additionally, the patient's ARISCAT (Assess Respiratory Risk in Surgical Patients in Catalonia) score of 69 points indicated a high likelihood of postoperative pulmonary complications. Radiographic

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imaging, including a chest x-ray and CT scan, identified moderate kyphoscoliosis with a Cobb's angle of 60° and extensive rotation and curvature of the thoracic spine to the right with wedge deformation of vertebral bodies[5].

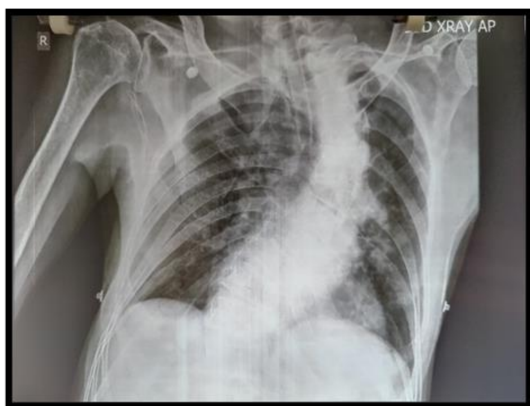

Figure 2 - chest xray showing thoracic **kyphoscoliosis**

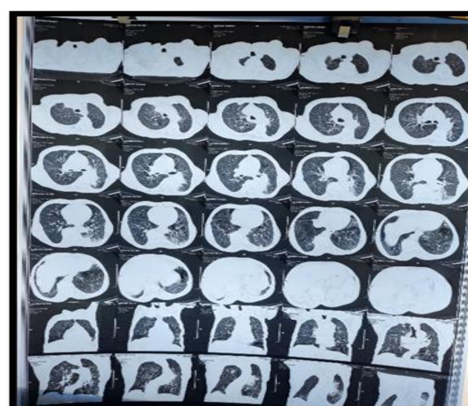

Figure 3-CT chest- restrictive lung disease

The pre-operative pulmonary function test (PFT) demonstrated a moderately significant obstructive condition with an FEV1/FVC ratio of <70% and FEV1 at 71%. The ECG also showed left ventricular hypertrophy with normal sinus rhythm. Additionally, the preoperative echocardiography revealed normal findings, including normal right ventricular size, preserved right ventricular contractility, and an LVEF of 67%, along with mild concentric left ventricular hypertrophy and no pulmonary hypertension.

Intraoperative management

- After obtaining informed and written consent, the patient was transferred to the operating room, where all essential ASA standard monitors such as ECG, spo2, blood pressure, heart rate, and end-tidal CO2 were assessed and baseline measurements recorded.
- We performed a pre procedure ultrasound scan while the patient was in a sitting position to evaluate the alignment of the spine and interlaminar spaces in the lower thoracic and lumbar region

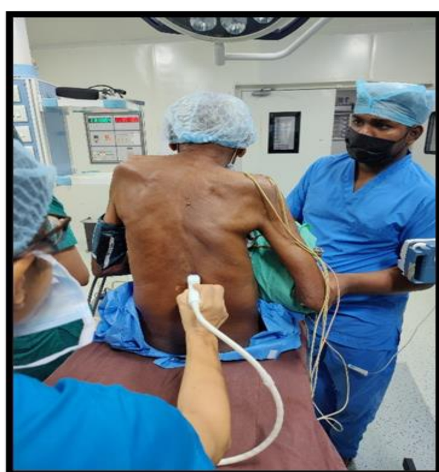

Figure 4- Ultrasound Scanning of spine before needle insertion to find interlaminar spaces and their alignment

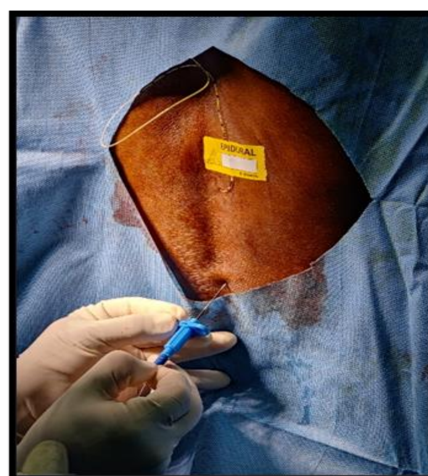

Figure 5-Dual Epidural Technique-Fixing the tip of epidural catheter in thoracic (T10) and Lumbar (L3) Level

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- Two epidural catheters were placed using an 18 gauge Tuohy needle at two levels, employing the loss of resistance technique. The catheters were threaded 5 cm above and below , fixed at the T10-11 and L3-4 levels, respectively.The insertion of the catheters was done under local anaesthesia following the local infection control protocol. Correct placement was confirmed through a negative aspiration test and a 3 mL injection of 2% lignocaine with adrenaline. A pinprick test indicated hypoesthesia spread from T7 to S1 levels 15 minutes before administering general anaesthesia.
- The patient was adequately preoxygenated for 4 minutes and premedicated with intravenous medications including Inj. Glycopyrrolate 0.2mg, Inj. Midazolam 1mg, and Inj. Fentanyl 100mcg. General anesthesia was induced with Inj. Propofol 100mg and paralysis was achieved with Inj. Atracurium 30mg. The patient was intubated with an 8-sized ET tube and secured at 21cm after confirming bilateral equal air entry. The plane of anesthesia was maintained with O_2, N_2O, and sevoflurane with MAC up to 1.1 . Lung protective strategy implemented 330 ml tidal volume, respiratory rate of 16, 5cmH2O PEEP and peak plateau pressure<30 and fio2 40%[6] .
- During the initial phase of the surgery, when surgeon performed abdominal resection , we activated the thoracic epidural with 8ml of 0.25% Inj. Bupivacaine with Inj. Fentanyl 25mcg, followed by 5ml of 0.25% Inj. Bupivacaine every hour. Fifteen minutes before the perineal resection began, the lumbar epidural was activated with 5ml of 0.25% Inj. Bupivacaine, followed by the same dosage every hour.
- During the extensive 5-hour surgery, the patient's vital signs stayed within the appropriate range, thereby necessitated minimal intravenous analgesics and neuromuscular blocking agents . Following the procedure, the patient was extubated on the table after demonstrating adequate tidal volume and respiratory efforts. Subsequently, the patient was transferred to the postoperative intensive care unit, where oxygen saturation maintained above 97% with low-flow oxygen therapy via nasal prongs. Postoperative arterial blood gas analysis indicated a pH of 7.42, pCO_2 of 35.6, and HCO_3 of 21.1, confirming adequate respiratory function. Epidural top-ups were administered three times a day using 0.25% Inj. Bupivacaine based on the patient's numeric rating scale (NRS) for pain, with the goal of maintaining the pain scale below 4. The thoracic epidural was removed after 2 days, followed by the removal of the lumbar epidural 2 days later.
- During the interview at the end of her hospital stay, the patient expressed satisfaction with the postoperative epidural analgesia received and did not report any discomfort related to the procedure.

Discussion

Abdominoperineal Resection (APR) is a complex surgical procedure that involves incisions in both the abdominal and perineal regions. The method of choice for this type of extensive surgery is epidural anesthesia, specifically the double epidural catheter technique with catheter levels in the thoracic and lumbar regions, as it provides superior pain relief in targeted areas without compromising respiratory and cardiopulmonary functions . This strategy supports early recovery of bowel function, quicker resumption of oral intake, decreased hospital length of stay, reduced postoperative complications, and potentially improved long-term outcomes[7] .Considering the patient's medical history of COPD and kyphoscoliosis, there is a concern for arterial hypoxemia, ventilation-perfusion mismatch, and reduced lung wall compliance, indicating an increased risk of postoperative pulmonary complications after general anesthesia. PPCs in major abdominal surgery include pneumonia, pulmonary edema, pulmonary thromboembolism, atelectasis, and acute exacerbation of COPD[8]. However, the use of epidural anesthesia reduces intraoperative and postoperative intravenous opioid and muscle relaxant consumption, offering advantages such as targeted pain relief, decreased risk of postoperative pulmonary complications, nausea, and vomiting, improved cardiovascular stability, quicker recovery, and reduced risk of deep vein thrombosis.

Conclusion:

The use of the dual epidural technique offers targeted pain control in the intra operative period, with reduced respiratory complications. The technique's versatility, from providing segmental anesthesia and muscle relaxation with improved surgical conditions and reduced cardiovascular stress, to delivering

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postoperative analgesia, makes it a valuable tool in managing complex cases. However, the decision to utilize the dual epidural technique should be case-based, considering the patient's condition, surgical needs, and the expertise of the anesthesia team.

With meticulous planning and execution, dual epidural technique can be a viable alternative that contributes to a safer and more comfortable surgical experience for patients with spine abnormalities posted for major surgeries with abdomino pelvic incisions.

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