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CASE REPORT REGIONAL ANESTHESIA

Segmental thoracic spinal anesthesia for abdominal surgery; a report of three cases

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ABSTRACT

Segmental thoracic spinal anesthesia (STSA) has recently been introduced in clinical practice, but still is not a common procedure. Although there have been some concerns about its potential complications, the method may benefit a specific subset of patients. We present the case reports of three patients, who were operated upon using the STSA technique. Two were performed as emergency procedures, and the third was an elective one. One of the three patients required minimal sedation near the end of the surgery, but none required general anesthesia or intensive care support. All patients recovered completely without complications and were discharged on Day 2. In certain patients, STSA may be a safe and beneficial alternative to general anesthesia. To demonstrate its potential benefit, risks, and use as a routine technique, adequately powered randomised, controlled clinical trials are required.

Keywords: Segmental; Thoracic; Spinal anesthesia; Elective; Emergency; Abdominal; Surgery.

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1. INTRODUCTION

General anesthesia (GA) is used for most of the patients undergoing major surgery.[1] However, some patients, such as the elderly, are more vulnerable to complications when this technique is used, including hemodynamic instability, increased need for intensive care admission, prolonged hospital stay, or major medical complications.[2] Regional anesthesia may provide the patient with a different way to proceed with surgery. Although segmental thoracic spinal anesthesia (STSA) has also been used to provide anesthesia for abdominal procedures, yet it is not in common practice due to concerns about its potential complications such as spinal cord injury.[3] There have been several case reports and preliminary studies on the use of this technique that demonstrate its feasibility.[4] This report expands on the potential application and benefit of this approach.

2. CASE REPORT

Case 1

A 78-year-old male, BMI 20.8 kg/m^2, diagnosed with rectosigmoid carcinoma was planned for an elective diversion transverse colostomy. Patient had multiple comorbids including diabetes mellitus type-II, hypertension, and hyperlipidemia and was on multiple medications.

Preoperatively, patient was bed bound and frail. As the patient's condition categorized him as a high-risk case, we decided to proceed the surgery with thoracic spinal anesthesia. Assessment of the patient revealed a lethargic, cachexic, and frail patient. He appeared mildly dehydrated. However, his vital signs were stable. His blood pressure was 115/80 mmHg and heart rate was 86 beats/min. ,

Anatomical landmarks were identified; site of needle insertion was at the 8th thoracic interspace via paramedian approach in sitting position. Local anesthetic (LA) 5 mL of lignocaine 2% was applied to anesthetize the skin and subcutaneous tissues. Pencan® (B. Braun, Germany) needle 25G 80 mm was used to administer the spinal anesthesia. Levobupivacaine 0.5% 1.3 mL combined with fentanyl 10 µg (total volume 1.5 mL) was administered slowly once free flow of cerebrospinal fluid (CSF) was obtained. Patient was then positioned supine, and adequacy of the spinal anesthesia was checked. Level of sensation was checked with cold touch and pin prick test. Segmental sensory block was achieved from T2 until L3 dermatomes within three minutes. Post spinal anesthesia patient required two doses of intravenous (IV) ephedrine 6 mg at 5th and 10th minute following the spinal injection. No other adverse event was noted throughout the procedure. Duration of surgery lasted around one hour. Patient does not require rescue analgesia or conversion to GA. Once the surgery was complete, the patient was monitored in the recovery bay for 30 min before he was discharged to the ward and was followed-up for 24 h. In the recovery, patient's vital signs remained stable. Bromage score was zero before he was discharged to the ward. No adverse event was recorded during the postoperative period. He was able to be discharged home on day 2.

Case 2

A 46-year-old male with recurrent right renal stone was scheduled for an open pyelolithotomy. Patient had no other medical illness apart from the renal stones. Patient was fully active and had stable vital signs. Systemic examination revealed no significant findings. Laboratory investigations revealed his renal profile to be consistent with acute kidney injury, but other parameters were within acceptable range. Patient weighed 79 kg with BMI of 29.2 kg/m^2. Spinal block was performed at the T11 interspace, approached through paramedian plane in sitting position. A Spinocan® (B. Braun, Germany) needle 25G 80 mm was used to administer the SA. Levobupivacaine 0.5% 1.8 mL combined with fentanyl 20 µg (total volume 2.2 mL) was administered for this block. Segmental sensory block established from the T4 to L3 dermatome. There was partial motor block of the lower limbs over the hips but spared the knees and ankles. Patient was put into lateral position for the remainder of the surgery. There was a fall of blood pressure from 110/82 to 80/60 mmHg at the fifth and tenth minutes, which responded well to IV ephedrine and phenylephrine. Fifteen minutes prior to completion of the surgery, patient started to experience pain at the operative site. Fentanyl 50 µg IV was given twice as rescue analgesia. Target-controlled infusion initiated with propofol 1 % added with ketamine for light sedation. Surgery lasted for around two hours and thirty minutes. Patient had uneventful recovery and was discharged on day 2.

Case 3

A 68-year-old female, 165 cm tall and weighing 74 kg, diagnosed with end stage renal failure, was on regular hemodialysis therapy. She was dialyzed via peritoneal dialysis method as previous attempt at brachio-cephalic fistula formation had failed and recently passed right neck internal jugular catheter had blocked. Patient comorbidities included diabetes mellitus, hypertension, and previous transient ischemic attack in 2019 without neurological sequelae. She was referred from district hospital and posted for an emergency Tenckhoff catheter readjustment due to blockage. Assessment of patient revealed her to be with stable vital signs. For this procedure, a Pencan® needle 25G 80 mm was used and 1.8 mL of levobupivacaine 0.5% combined with fentanyl 20 µg (total volume 2.2 mL) was administered at the T10 interspace. Patient was then positioned supine for the surgery. Dermatomal block between T2 to L2 achieved. Post spinal patient required single bolus of 100 µg of IV phenylephrine to maintain MAP > 60 mmHg. No other adverse event or hemodynamic instability was recorded throughout the procedure. No additional sedation or rescue analgesic was required. The surgery lasted for 2 h and 30 min. Patient was also discharged on day 2.

3. DISCUSSION

Thoracic spinal anesthesia was performed for the first time in 1908, and it picked anesthetists' interest in the neuraxial technique in an effort to avoid the risks and complications of GA. The number of surgical cases has been increasing over time, with an estimated 310 million major surgical cases performed globally in 2020.[5] However, some patients with significant medical problems may be required to bear the exponential risk associated with the administration of GA to undergo surgery, including airway instrumentation, post-operative nausea and vomiting, as well as respiratory and cardiac complications.[6] This group of patients may require post-operative intensive care support. Preliminary evidence suggests that neuraxial block technique is well tolerated for laparoscopic procedures such as cholecystectomy and is an effective method of anesthesia.[4,7] The allure of performing spinal anesthesia is the potential circumvention to the complications associated with GA.

Several advantages of thoracic spinal anesthesia over the lumbar approach includes lower doses required to block upper abdomen or lower thoracic dermatomes, less involvement of the lower limbs with the benefit of early ambulation, and a lesser degree of preload reduction from vasodilatation of the lower limbs. When compared

to lumbar spinal anesthesia, STSA had the inherent risk of spinal needle penetration of the dura matter in the thoracic region, which could result in spinal cord injury. This is one of the primary reasons why anesthesiologists avoid performing spinal anesthesia (SA) at higher levels, particularly above the second and third lumbar interspaces.[8] Another risk of thoracic SA is respiratory impairment caused by paralysis of the thoracic nerves that innervate the anterior abdominal wall muscles, which impairs coughing and forceful expiration. These mechanics are critical, especially in patients with chronic airway disease, and if they fail, can have disastrous consequences. Lower doses of LA in this technique, on the other hand, may avoid these issues. When planning thoracic SA, patients must be carefully selected. Thoracic SA is not a common procedure. In our report, we carefully selected these patients with the goal of proceeding with surgery while avoiding the need for GA and intensive care support. We chose the paramedian or paraspinous approach because the median technique for thoracic SA was thought to be more difficult to perform. For all three cases, we used lower doses of LA (ranging from 1.3 mL to 1.8 mL of levobupivacaine 0.5%) combined with fentanyl. Thoracic SA is not appropriate for extended period of surgery, unless an indwelling catheter is used. There have been reports of surgical times ranging from 136 min for a single shot block to 191 min when a catheter was threaded.[9, 10] Our findings were similar in terms of surgical duration, though one of our patients who underwent open pyelolithotomy required rescue analgesia and light sedation when the procedure lasted longer than 2 h and 15 min. This leads us to believe that the potential optimal single shot, post-thoracic SA surgical time should not exceed 120 min. Hemodynamic are generally stable, and one or two doses of ephedrine or phenylephrine were effective. All our patients were able to be discharged home without any complications or lower limb weakness on day 2.

4. CONCLUSION

Thoracic spinal anesthesia has a beneficial effect in these selected patients, owing to the reduced risk of a prolonged hospital stay, intensive care admission, and complications from general anesthesia. Segmental thoracic spinal anesthesia should be considered by anesthesiologists as an additional technique in their practice.

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6. Conflict of interest

None declared by the authors

7. Authors' contributions

MAA: Conceptualization; Writing – original draft

MFMY: Conceptualization; Writing- review & editing

MHAR: Writing- review & editing

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