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Case Series

Thoracic segmental spinal anaesthesia a boon in challenging case scenarios: A case series

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ABSTRACT

Thoracic segmental spinal anaesthesia is a regional anaesthesia technique that can strategically serve as an alternative asset to general anaesthesia for certain high-risk cases. The procedure is picking up pace as it is beneficial in maintaining hemodynamic stability for these patients and reducing side effects encountered with general anaesthesia. Segmental Thoracic Spinal anaesthesia is a realistic, reliable, and reasonable anaesthesia technique that can be implemented for abdominal and thoracic surgeries. Additionally, it has fewer postoperative complications and superior patient satisfaction. We would like to discuss 5 case scenarios where TSA were used mode of anaesthesia as they were found to be high risk for GA.

1. Introduction

Thoracic segmental spinal anesthesia (TSA) is conventionally employed for high-risk patients undergoing surgery with comorbid illness where they are considered a greater risk for general anaesthesia. General anesthesia (GA) is routinely employed for most surgeries. However, cardio – respiratory disturbance, delirium & cognitive dysfunction, PONV, unsatisfactory pain relief are a few unpleasant side effects encountered with GA. Worldwide, there is currently a heightened focus on thoracic segmental spinal anesthesia for several common surgeries.[1]

In year 1909 Thomas Jonnesco proposed to perform General Spinal Anesthesia, which would be to perform segmental spinal anesthesia by using subarachnoid puncture as close as possible to the innervation of the operative field.[2] Segmental spinal anaesthesia as the name suggests the block is restricted to a specific segment of the body. A certain privilege that can be highlighted are normally lumbar spinal anaesthesia would cause sympathetic block leading to venodilation and decreased preload, in TSA large portion of body experience no venodilation so it safeguards intraoperative adverse changes in blood pressure.[3] Anatomically its shown that thoracic nerve roots are thinner with lesser CSF volume compared to lumbar nerve roots hence lower drug volume is required for TSA and hence lesser chance of LA toxicity. Superior quality of muscle relaxation with diminished respiratory or circulatory compromise. In addition to above mentioned points, the patients experience less motor block over their legs helping them in early ambulation post-surgery.[4] With above observations we would like to justify that TSA with good expertise can be performed in challenging case scenarios.

We present a series of cases where patients having multiple comorbid illnesses, ongoing atrial fibrillation, and post-spine surgery who had presented for routine surgery were successfully managed with thoracic segmental spinal anaesthesia.

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2. Case Reports

For all cases mentioned below, informed consent for regional anesthesia was taken in the preoperative area, and NBM status was verified. Once the patient was in OT, all ASA-specific standard non-invasive monitors (Heart rate, blood pressure & oxygen saturation) were attached.

2.1. Case 1

A 46-year-old male patient was scheduled for open inguinal hernioplasty. During pre-anesthetic check-ups, he had a history of suffering from rheumatic heart disease, for which he underwent balloon mitral valvotomy in 2005 and 2011. Later, in 2016, he underwent open mitral valve replacement. Post cardiac surgery, he had developed atrial fibrillation, for which he was on Tab Aspirin 75mg and Tab Acitrom 4mg OD. Presently, he could perform his day to day activities without any chest discomfort, palpitations, dyspnea, or syncope. Physical examination revealed him to be afebrile, with an irregularly irregular pulse-90 beats per minute, respiratory rate of 18 breaths per minute, and blood pressure of 120/86mmHg. His systemic examination was within normal limits.

Further, as part of routine investigations, ECG showed absent p waves and rapid ventricular rate (Figure 1). The chest X-ray revealed ball in cage mitral valve prosthesis, sternotomy sutures and cardiomegaly (Figure 2). 2D Echo findings were EF -50%, Dilated LA, mild global LV hypokinesia with functioning mitral prosthesis in situ, no intracardiac clots detected. Spine and airway assessment were normal. As per cardiologist advice tab Acitrom was stopped for 5 days and inj clexane 0.6mg BD dose was started as per bridging protocol. Repeat PT INR after 5days was within normal limits and was posted for elective open inguinal repair under regional anaesthesia.

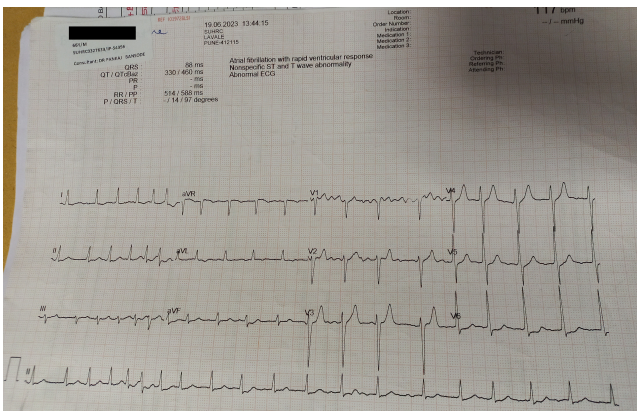

Figure 1: ECG suggestive of atrial fibrillation

The surgery lasted for 1 hour and 15 minutes. The motor block of thoracic spinal anesthesia was for 3 hours 40min, the sensory block was 4 hours 10min, and the analgesia duration was 6.2 hours. Inj paracetamol 1gm iv was given as rescue analgesic.

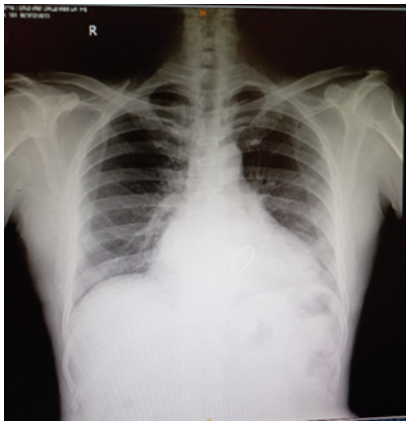

Figure 2: Chest X ray showing mitral valve prosthesis and cardiomegaly

2.2. Case 2

A 75-year-old male patient was planned for open inguinal hernioplasty. On PAC, cardiology reference was given in view of irregularly irregular pulse, high blood pressure, and ECG changes (showing Atrial fibrillation). No h/o of chest pain, palpitation, dizziness, or breathlessness. 2D Echo findings were EF -55%, Dilated LA, RA, mitral annular calcification & sclerotic aortic valve. All lab reports were within normal limits. The cardiologist had started Tab Amlodipine 5mg to optimize high BP and the patient was taken up for surgery under high-risk consent.

The surgery lasted for 1hr. The motor block of thoracic spinal anaesthesia was for 2 hours 30min, the sensory block 6hour 20min, and the analgesia duration was 6.2 hours. Inj paracetamol 1gm iv was given as rescue analgesic.

2.3. Case 3

A 49-year-old lady was posted for left lumbar incisional hernia repair. On history, she had undergone multiple abdominal surgeries done both under general and regional anaesthesia. As a result, she developed large incisional hernia. She was a known case of diabetes on OHA for 2years. Vital parameters were normal. Systemic examination, including airway and spine assessment were within normal limits. CT abdomen revealed that she had a 7.7x7.6cm defect in the left lateral abdominal wall with herniation of bowel loops. In the preoperative area, informed consent for regional anaesthesia was taken and NBM status was verified.

The surgery required the patient to be positioned laterally. Anterior lumbar incision was taken, mesh repair of hernia with adhesiolysis was performed. Throughout the procedure, the patient was hemodynamically stable. She did

not require any sedation or additional IV analgesia. The surgery lasted for 3.4 hours. The motor block of thoracic spinal anaesthesia was for 2hour 30minute sensory block 6hour 15minutes and analgesia duration was for 6.2 hours. Inj tramadol 50mg iv was given as rescue analgesic.

2.4. Case 4

A 66-year-old male patient was posted for bilateral inguinal hernioplasty. On PAC, he was a known case of hypertension & diabetes mellitus for 5 years and was on regular medication for the same. The patient had suffered from a stroke in 2014, resulting in right hemiparesis for which he was on Tab Ecosprin 75mg. On surgical history, he underwent spine surgery for lumbar canal stenosis under GA in 1992; on spine examination, previous surgical scar marks was visible in the lumbar area. The neurophysician had given surgical fitness for the patient as he currently didn't have motor or sensory deficits. The cardiologist had advised TMT, which showed a mildly positive test, but since his ECG & 2D Echo were acceptable, the patient was cleared under moderate cardiac risk.

The surgery lasted for 2hour. The motor block of thoracic spinal anaesthesia was for 2 hours, the sensory block 6 hours 12 minutes, analgesia duration was for 6.26 hours. Inj paracetamol 1gm iv was given as rescue analgesic.

2.5. Case 5

A 59-year male patient was posted for right inguinal hernia. On PAC, he underwent angiography two months back in view of ACS and was found to have LAD 50 to 60% stenosis(SVD) with EF=25%. No angioplasty was done, and the patient was on medical management (Tab Dytor10mg, tab aspirin75mg). ECG showed LBBB, 2DECHO findings were: LVEF: 25% dilated LV, mild LVH, severe left ventricular dysfunction, his TFT (Thyroid profile S/O Subclinical hypothyroidism). Rest all labs were normal. Systemic examination including airway & spine were normal. Patient was taken up for surgery under high risk consent. The surgery lasted for 1hr. The motor block of thoracic spinal anaesthesia was for 1 hour & 50 minutes, the sensory block was 5 hours, and the analgesia duration was 5.2 hours. Inj paracetamol 1gm iv was given as rescue analgesic.

In all case scenarios under all aseptic precautions, local anaesthesia with 2% lignocaine was given, following which thoracic spinal block was administered using 1.5 - 1.7 ml of isobaric ropivacaine 0.75% with fentanyl 15mcg using 25G Whitacre needle as shown in Figure 3. The level preferred & maintained in all cases was T8-L2 except in case 3, kept at T4-L1. The anaesthestic blockade was obtained after 10 minutes of administration of the drug. All patient received IV dexamethasone 8mg.

Figure 3: Thoracic segmental spinal anaesthesia administration

3. Results

All of our patients were hemodynamically stable and satisfied with anaesthesia and analgesia at the postoperative period. The average total dose requirement was: 1.5 - 1.7 ml of isobaric ropivacaine 0.75% with fentanyl 15mcg. None of the patient developed nausea, vomiting or shivering as all patient had received prophylactic inj dexamethasone 8mg.

4. Discussion

Our observations in this case series affirms that thoracic segmental spinal anesthesia offers numerous advantages not witnessed in general anesthesia or lumbar spinal anesthesia. On high risk patients where GA is vulnerable TSA has made it achievable for patients to undergo certain major abdominal surgery.[1–3] Our patients did not complain of paraesthesia during spinal anaesthesia. Paraesthesia can occur with any technique of spinal anesthesia, but serious consequences on insertion above the termination of the spinal cord. The low potential for cord damage with this technique was given in the earlier case report by Imbelloni et al., who studied the anatomy of the thoracic spinal canal using magnetic resonance imaging (MRI). MRI confirms that the spinal cord and the cauda equina are touching the dura mater posteriorly in the lumbar region and anteriorly in the thoracic region.[4] This guides a safer needle advancement without cord damage, such as accidental perforation of the dura mater during spinal anesthesia. This sheds light on lower prevalence of neurologic complications and better safety profile while performing thoracic segmental spinal anaesthesia.[5–7]

During the intra-operative period, the quality of anesthesia was satisfactory in all patients. All patients were hemodynamically stable throughout the procedure, and no patients required additional oxygen, analgesia & inotropic support. Naresh W Paliwal et al.; also concluded that segmental spinal with a low dose of local anesthetics is associated with minimal hemodynamic fluctuations, motor

Table 1: TSA characteristics

Case No	Duration of action (minutes/seconds)		Duration of analgesia	Complication
	Sensory	Motor		
1	4hr 10min	3hr 40min	6.2hr	None
2	6hr 20min	2hr 30min	6.3hr	None
3	6hr 15min	2hr 30min	6.36hr	None
4	6hr 12min	2hr	6.26hr	None
5	5hr	1hr 50min	5.2hr	None

block, faster recovery, early ambulation, and minimal postoperative pulmonary & cardiac compromise.[8] As a result, a good deal of abdominal cancer surgeries, breast cancer surgeries, and laparoscopic cholecystectomies has been successfully performed under thoracic segmental anesthesia. However, patients preferred for this technique need to be assessed carefully and reserved for experienced clinicians with a good learning curve.[9–11]

Arunkumar et al. in their study have administered segmental epidural anaesthesia(TEA) for inguinal surgery. We felt TSA can be performed at minimal time duration, amount of LA used in TSA is much lesser compared to TEA hence decreased chance of LA toxicity & better confirmation of TSA space by observation of clear flow of CSF. There is always a chance of dural puncture with TEA. If performed with excellence the analgesia and muscle relaxation is top-notch with TSA.[12]

Comparing Paravertebral block (PVB) with TSA, our observations were its an invasive, complex technique which requires expertise. USG guided PVB has a higher success rate compared to landmark technique. It carries grave aftermath like organ, vessel or neurological injury, PDPH, LA toxicity & pleural puncture.[13]

In our study, we used isobaric 0.75% Ropivacaine. It is a pure S (−) enantiomer of propivacaine. CC/CNS ratio of ropivacaine is 5 and bupivacaine is 3.5, so on inadvertent intravascular injection, it manifested decreased cardiac and neuro toxicity, claiming to be safer than bupivacaine. Ropivacaine is less lipophilic than bupivacaine. Therefore, it has lower penetration into myelinated motor fibers (Aα) and more inclination towards sensory fibers (Aδ &C). Adhikari et al. studied intrathecal isobaric (3 mL) 0.75% ropivacaine against 0.5% isobaric bupivacaine for lower abdominal surgeries and found comparable sensory block characteristics in both groups with significantly early motor recovery and lower incidence of hypotension and bradycardia in ropivacaine group.[14] Madhu et al.; observed in their study that isobaric Ropivacaine provides safe and equally effective SAB with reduced motor duration compared to hyperbaric bupivacaine.[15] It has a differential blocking effect on nerve fibers; at the lowest concentrations, hence good differentiation between motor and sensory block. It predominantly causes sensory anesthesia, which is desirable for early ambulation for patients.[16]

We emphasize that for high-risk patients for abdominal surgeries, TSA provided adequate anaesthesia & analgesia without any significant adverse events. In such cases where GA can be detrimental, TSA can be a safer option in the hands of skilled anaesthesiologists.

5. Conclusion

Single-dose segmental thoracic spinal anesthesia with isobaric 0.75% Ropivacaine and opioid can be a safer substitute for above high-risk patients coming for routine abdominal surgery, as it resulted in stable hemodynamic parameters in perioperative period & faster recovery due to better postoperative pain control subsequently early hospital discharge.

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None.

7. Conflict of Interest

The authors declare no conflict of interest.

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