

Thoracic Spinal Anesthesia – A Suitable Alternative to General Anesthesia in Elderly Patients with Co-Morbidities: A Case Series**Rajendra Verma¹, Vineeta Goda², Surendra K.Sethi³, Mamta Damor⁴, Saka Venni Vinod⁵, Mahendra Kumar Verma⁶**¹MD (Anesthesiology), Associate Professor, Department of Anesthesia, Government Medical College Dungarpur, Rajasthan, India, 314804²MD (Anesthesiology), Associate Professor, Department of Anesthesia, Government Medical College Dungarpur, Rajasthan, India, 314804³MD (Anesthesiology), Professor, Department of Anesthesia, RNT Medical College Udaipur, Rajasthan, India⁴MD (Anesthesiology), Associate Professor, Department of Anesthesia, Government Medical College Dungarpur, Rajasthan, India, 314804⁵DNB (Anesthesiology), Resident, Department of Anesthesia, Government Medical College Dungarpur, Rajasthan, India, 314804⁶MD (Community Medicine), Assistant Professor, Department of Community Medicine, RVRS Government Medical College Bhilwara, Rajasthan, India, 311001

Received: 25-11-2023 / Revised: 23-12-2023 / Accepted: 26-01-2024

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Conflict of interest: Nil

Abstract:**Introduction:** Elderly patients with comorbidities are more prone to perioperative complications under general anesthesia. In this case series, we report our experience with eight elderly patients who underwent abdominal surgery successfully performed under thoracic spinal anesthesia.**Methods:** TSA was performed in eight patients with serious comorbidities above 60 years of age for abdominal surgery between April 2023 and June 2023 in the emergency operation room at tertiary care hospital.**Results:** A total of eight patients with a mean average age of 61.75±19.23 years and ASA score >3 were included. TSA was performed in all patients without any complications. The majority of surgeries were explorative laparotomy 5/8. The peak sensory level achieved between the T3–T5 dermatome level and motor blockade was M3 (Bromage score). The mean duration of surgery was 60.63±24 min. Sedation is required in three patients. Intraoperative hypotension occurred in three patients and was corrected with IV fluids and intravenous Mephen-termine. None of the patients required GA. The postoperative period was uneventful in all patients.**Conclusion:** In this study we demonstrated that TSA is a safe and effective alternative technique for anesthesia in high-risk abdominal surgery without postoperative complications. In our series, the outcomes were excellent; however, further research is warranted to better understand the role of TSA in high-risk patients.**Keywords:** Thoracic spinal anesthesia, Anesthetic technique, general anesthesia, Bupivacaine heavy, Ropivacaine heavy, Comorbidity.

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Introduction

General anesthesia in elderly patients with comorbidities is the leading cause of postoperative morbidity and mortality. Anesthetic management is often challenging in these patients because of decreased cardiopulmonary reserve and associated comorbidities.

General anesthesia may pose additional risks and complications in these patients. Thoracic spinal anesthesia is a safe and effective technique with multiple advantages, including preservation of respiratory drive, minimizing postoperative pulmonary complications, decreased need for mechanical

ventilation, improved perioperative outcome, and enhanced patient safety.

Methodology

We have presented a case series of eight high-risk patients scheduled for various elective/emergency abdominal surgeries conducted under thoracic segmental spinal anesthesia at a tertiary care centre during a period of two months from April to June 2023.

Case 1: A 70-year-old male patient presented to emergency department with distension of abdomen,

difficulty in breathing with history of constipation for three day. CT scan finding suggesting of intestinal obstruction. He had a history of cough with expectoration for three months, was a chronic smoker for 30 years, and was on irregular treatment for chronic obstructive pulmonary disease. Bilateral rhonchi on chest auscultation with normal heart sounds. Chest X-ray showed chronic obstructive pulmonary disease (COPD) changes, ecg showed P pulmonale. 2D- ECHO show right ventricular hypertrophy with aortic valve sclerosis.

Case 2: A 66 year-old male patient posted for emergency exploratory laparotomy for ruptured liver abscess. Patient was chronic alcoholic since 30 years. On systemic examination patient was febrile with distended abdomen, bilateral icterus, bilateral pitting pedal edema, reduced right sided breath sounds on chest auscultation, right sided intercostal drain in situ and normal heart sounds. The vital parameters recorded were HR-100/min, NIBP-125/90 mm Hg and peripheral oxygen saturation (SpO₂) -90% with normal airway. Among routine blood investigations complete blood count and coagulation profile were within normal limits.

However, the various other blood investigations were deranged i.e. blood urea-163.7 mg/dl, serum creatinine- 2.02 mg/dl, serum electrolytes- Na⁺ 129.2 mEq/L and K⁺ 5.30 mEq/L, total bilirubin-12.93 mg/dl, direct bilirubin-7.96 mg/dl, alkaline phosphatase-368 IU/L, albumin/globulin-0.31 with sinus tachycardia in ECG and right sided pleural effusion in chest X-ray.

Case 3: A 68 year-old female patient with acute intestinal obstruction posted for emergency exploratory laparotomy. She had cough with expectoration since 10 days, dyspnea on exertion, history of bronchial asthma since 30 years on regular treatment with bronchodilators and steroids.

On examination heart sounds were normal with distended abdomen and bilateral wheeze on chest auscultation. The vitals were HR-94/min, NIBP-120/74 mm Hg, SpO₂- 90%. All investigations were within normal limits except chest X-ray which has showed bilateral multiple opacities.

Case 4: A 71 year-old male patient scheduled for exploratory laparotomy for ruptured liver abscess had history of fever, chronic smoker since 30 years, on examination patient had distended abdomen, pedal edema with diminished breath sounds dim in right side on chest auscultation.

All routine investigations were within normal limits except ECG which has showed sinus tachycardia.

Case 5: A 81 year-old female patient scheduled for open cholecystectomy, a known case of hypertension since 10 years and on regular treatment with antihypertensive medications. The general physical examination was within normal limits except ECG

which has showed left ventricular hypertrophy. 2D echo finding showed aortic sclerosis and diastolic dysfunction grade 2.

Case 6: A 60 year-old female patient with hydro-nephrotic kidney was scheduled for nephrectomy. She had history of tobacco chewing with mouth opening <2 finger, mallampati grade 4. The other systemic examination and investigations were within normal limits.

Case 7: A 82 year-old male patient scheduled for exploratory laparotomy for acute intestinal obstruction. The general condition was poor with history of smoking, dyspnea on exertion, chronic cough, and pulmonary tuberculosis 15 years back and took treatment for it. On systemic examination bilateral crepitation's were present on chest auscultation, chest X- ray showed hyper inflated lungs with multiple patchy lesions on right side with vital parameters; HR-108/min and NIBP-170/110 mm Hg.

Case 8: A 65 year-old female patient scheduled for splenectomy for a huge hydatid cyst in spleen. She had history of uncontrolled diabetes and on insulin since last 7 days with HbA_{1c}-10.5. The general condition was average, systemic examination and routine investigations were within normal limits.

Thoracic spinal anaesthesia technique

All patients were explained about thoracic spinal anaesthesia technique in detail and written informed consent was obtained. After arrival of patients in operation theatre, standard monitoring was established and preloading was done with 20ml/kg ringer lactate in each patient.

After recording the baseline vital hemodynamic parameters, patients were placed in the lateral decubitus position. Under all aseptic precautions, spinal anaesthesia was given at thoracic level between T11 and T12 intervertebral space. After free flow of clear CSF local anesthetic drug was administered and patients were turned supine immediately with no tilt.

Sensory block was tested by pinprick method along midclavicular line and motor block with Bromage score. When desired and adequate block for respective surgery was achieved, the surgery was allowed to start. Inj. midazolam 1mg IV was given in all patients to relieve anxiety and discomfort. Inj. fentanyl 1-2 µg/kg was used for intraoperative analgesia if required. Oxygen supplementation was done with nasal cannula 5 liters/min in those patients who required intraoperative sedation. Perioperative hypotension was managed by 6mg IV bolus doses of mephentermine and IV fluid bolus. Bradycardia was treated with atropine 0.01mg/kg IV. Postoperatively, close monitoring was done in each patient to monitor any neurological or hemodynamic consequences.

Thoracic spinal anaesthesia was performed in total eight patients scheduled for abdominal surgery with comorbidities. The mean standard deviation of age was 60 ± 24 years, ASA physical status was 3 and above and majority of the surgeries were emergency exploratory laparotomy. (Table 1) The 50% of the patients received intrathecal hyperbaric Bupivacaine 0.5% 1.5ml with inj. Fentanyl 20ug and 50% patients received Hyperbaric Ropivacaine .75% 1.5ml with inj. Fentanyl 20ug. The peak sensory level achieved in the range of T3 to T6 thoracic

level and all patients achieved motor blockade as modified score 3.

The mean average of duration of surgery was 60 ± 24 min. None of patients required general anaesthesia however three patients required sedation and oxygen supplementation. Only 3 patients had hypotension which was easily treated with crystalloids and bolus dose of mephentermine. All patients were discharged without any postoperative complications.

Table 1: Demographic characteristics and surgical distribution

Characteristics	Values
Gender (Male/Female)	4-Apr
Age (in years)	61.75±19.23
Weight (in kg)	60.05±6.36
ASA PS (3/4/5)	3/2/2003
Type of Surgeries (n)	
Exploratory laparotomy	5
Open cholecystectomy	1
Nephrectomy	1
Splenectomy	1

Data expressed as number and Mean±SD.

Table 2: Block characteristics

Variable	Characteristics	n=8
Level of block	Between T10 to T12	8 (100%)
Drug	Ropivacaine heavy 0.75%, 1.5ml with inj. fentanyl 20ug Bupivacaine heavy .5% 1.5 ml with inj. fentanyl 20ug	4 (50%) 4 (50%)
Complete motor block	Bromage score 3	8 (100%)
Peak sensory level	T3 T4	3 (37.5%) 5 (62.5%)
Duration of surgery		60±24

Table 3: Sedation/analgesia/anaesthesia/complications

Parameters	N (%)
Intraoperative sedation requirement	(37.5%)
Conversion to General anaesthesia	0 (0)
Paresthesia	1 (12.5%)
Hypotension	3 (37.5%)
Bradycardia	0
Pruritus	0
Post Dural Puncture Headache	0
Postoperative neurological consequence	0
Postoperative cardiopulmonary complications	0

Discussion

As far as we know there is limited literature on thoracic spinal anaesthesia in elderly patients (>60 years) with multiple comorbidities. However, most of studies focused on patients with ASA PS 1 or 2 with either conventional spinal anaesthesia technique or general anaesthesia in abdominal surgeries.

From the past two decades anesthesiologists from several regions have shown interest in evaluating the safety and efficacy of thoracic spinal anaesthe-

sia. One of the key advantages of thoracic spinal anaesthesia in elderly patients with comorbidities is reduced cardiopulmonary complications associated with general anaesthesia. Patients with significant cardiopulmonary diseases such as COPD, bronchial asthma, bronchitis, hypertension, diabetes and hepato-renal dysfunction often exhibit reduced cardiovascular reserve and impaired gas exchange making them more vulnerable to significant hemodynamic changes and postoperative pulmonary complications. The major cause of concern in its administration is possibility of spinal cord trauma

leading to transient or permanent neurological sequel because spinal cord ends at L2 interspace that's why conventional spinal anaesthesia is preferred below that level, however, safety of TSA has been documented by available literature.[1]

A study by Lee found that spinal cord in thoracic region is more ventrally located than the lumbar region as documented by the highest distance between duramater and spinal cord at T6 (9.5±1.8 mm).² Imbelloni et al conducted a study in MRI and found a distance of 5.19 mm, 7.75 mm and 5.88 mm between duramater and spinal cord at T2, T5 and T10 respectively.[2,3] Some case reports [4,5,6] have published which recommended thoracic spinal anaesthesia over general anaesthesia in patients with impaired pulmonary function so we successfully performed this technique in few pulmonary compromised patients as well.

There was no impairment of pulmonary function because major muscle of inspiration is diaphragm which is not affected in this technique as it is supplied by cervical nerves. Exhalation was also not affected as it is a passive process except forceful exhalation which requires contraction of anterior abdominal muscles. In present case series only three patients had hypotension which was easily treated with IV fluids and vasopressor agents. El Moutaz et al [7] found an incidence of hypotension in 28.5% of patients in a randomized controlled trial. The literature has reported less hypotension encountered in thoracic spinal anaesthesia compared to lumbar spinal since sympathetic blockade in this technique is restricted to fewer dermatomes that lead to less reduction in systemic vascular resistance and less local anesthetic dose is required for thoracic spinal anaesthesia. [8,9] None of patients in our study had postoperative pulmonary complications and need of intensive care unit admission. Hence, thoracic spinal anaesthesia seems to be a safe and reliable anesthetic technique with acceptable hemodynamics' and adequate surgical anaesthesia in elderly patients undergoing major abdominal surgery. However it is important to note that thoracic spinal anaesthesia require a high level of expertise and anaesthesia provider must have proper patient selection as well as a thorough un-

derstanding of spinal anatomy, dermatomes and nerve distribution for performing this technique efficiently.

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