

# Layered and Thoracic Segmental Spinal Anaesthesia in Patients with Kyphoscoliosis for Various Surgeries: A Case Series

PRASHANTH GOWTHAM RAJ<sup>1</sup>, LAGADAPATI MADHAV AVINASH<sup>2</sup>,  
AMINGAD BASAVARAJ BHAGYASHREE<sup>3</sup>, KAGGATHI RAMESH VASANTHA KUMAR<sup>4</sup>



## ABSTRACT

Kyphoscoliosis involves exaggerated anterior and lateral curvatures of the spine, affecting the dorsolumbar spine. Associated multiple organ system dysfunctions cause difficulties with both general and regional anaesthetic techniques. Co-existing neuromuscular disorders, pulmonary infections, difficulties in securing the airway, postoperative pulmonary morbidities, and the need for mechanical ventilation associated with general anaesthesia make neuraxial anaesthesia the most widely used technique in these cases. Continuous neuraxial techniques in these patients offer advantages over single-shot spinal anaesthesia in achieving the desired level of anaesthesia, managing patchy blocks, extending the duration of anaesthesia, and providing postoperative analgesia, but they are technically more challenging. Single-shot spinal anaesthesia can be a simple, safer, and effective alternative for surgical procedures of shorter duration. Performing thoracic segmental spinal anaesthesia in these patients is very challenging due to the complete distortion of anatomy and possible obliteration of neuraxial spaces. Layered spinal anaesthesia involves combining multiple local anaesthetics with different baricities to produce a successful subarachnoid block. Present series is reported with successful and uneventful use of the layered and thoracic segmental spinal anaesthetic technique in patients with kyphoscoliosis for various surgeries, including laparoscopic procedures.

**Keywords:** Dorsolumbar spine, Layered spinal anaesthesia, Spinal anaesthetic technique

## INTRODUCTION

Kyphoscoliosis is a spinal deformity characterised by exaggerated anterior curvature (kyphosis) and lateral curvature (scoliosis) of the vertebral column. Restrictive lung disease and pulmonary hypertension progressing to cor pulmonale are the principal causes of death in these patients [1]. Difficulties in airway management and cardiopulmonary dysfunctions make general anaesthesia hazardous, whereas regional anaesthesia is also challenging due to technical problems caused by the abnormal curvature of the spine, difficulties in identifying the intervertebral space, and unpredictability in the spread of local anaesthetics or the level of anaesthesia [2]. Neuraxial blocks are controversial and pose many challenges, given the difficulties in identifying anatomical landmarks, neuraxial spaces, performing dural puncture, and predicting the extent of the spread of local anaesthetics and the level of anaesthesia block [3,4]. Layered spinal anaesthesia is produced by combining two drugs with different baricities for spinal anaesthesia, which can be single-shot or continuous techniques [4]. Several published case reports reveal that spinal anaesthesia is safe and effective in this subset of patients undergoing short-duration surgical procedures [5,6]. Both single-shot and continuous neuraxial anaesthetic techniques are equally favourable in these patients for both open and laparoscopic surgeries [4-6]. Authors report a few cases of kyphoscoliotic deformities with and without co-existing poliomyelitis, sensory and motor deficits managed successfully with single-shot thoracic segmental and layered spinal anaesthesia without any complications. Most previous publications were isolated case reports, but this case series is the first of its kind. Authors have used a modified paramedian approach described by Huang J to perform dural puncture in all the patients [7].

## CASE SERIES

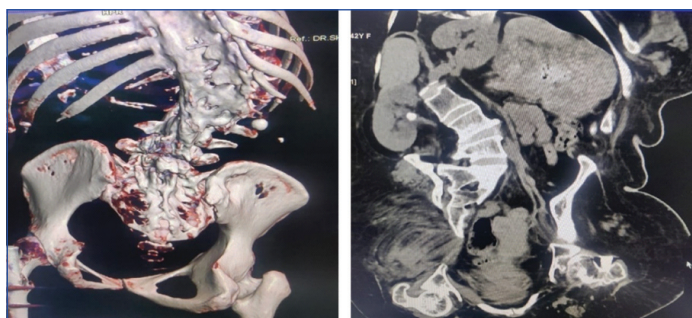
**Case 1:** A 42-year-old female, 156 cm in height, 88 kg, Body Mass Index (BMI) 36.2 kg/m<sup>2</sup>, moderately obese, unmarried, with

thoracolumbar kyphoscoliosis and asymmetric thorax, pelvis, and left lower limb shortening, along with multiple right renal pelvic calculi, was scheduled for elective supine Percutaneous Nephrolithotomy (PCNL). She had undergone three corrective spine surgeries for kyphoscoliosis since childhood. Her family reported her snoring while asleep. She exhibited grade 3 clubbing, room air SpO<sub>2</sub> of 94%. Airway examination was unremarkable. A long surgical scar from T4 to S5 was observed on spine examination. Another circular scar measuring 4×4 cm was visible in the right upper lumbar paramedian area [Table/Fig-1]. Pulmonary function tests indicated severe restrictive lung disease with Forced Expiratory Volume in the first second (FEV1) at 36% and Forced Vital Capacity (FVC) at 40%. A 2D Echocardiogram (ECHO) revealed moderate pulmonary hypertension. Her



**[Table/Fig-1]:** Patient's spine in case no 1.

creatinine level was 1.5 mg/dL, and Magnetic Resonance Imaging (MRI) reconstructive imaging showed excessive lumbar lordosis, scoliotic curvature of the lumbar spine, and kyphotic thoracic spine with axial rotation deformities [Table/Fig-2,3]. After discussions with the patient, her family, and the urologist, a collective decision was made to proceed with surgery under layered thoracic spinal anaesthesia. She underwent layered spinal anaesthesia, with a spinal tap performed in the sitting position at the T9-T10 level using a 25G Quincke's needle and a modified paramedian approach. A 0.8 cc of Inj. ropivacaine heavy 0.75% was administered initially, and she was kept seated for five minutes while the spinal needle remained in place with the stylet to prevent Cerebrospinal Fluid (CSF) loss, achieving a dermatomal level of T12 by the end of the five minutes. Subsequently, 1.2 cc of Inj. ropivacaine 0.5% isobaric with Inj. fentanyl 25 µg was injected through the same needle, following which she was positioned supinely. Anaesthesia extending up to the T6 level was achieved. The subarachnoid block was layered with Inj. ropivacaine heavy 0.75% to aid in patient positioning and ureteral catheterisation for imaging, locating renal calculi, and Inj. ropivacaine 0.5% isobaric to achieve anaesthesia for performing percutaneous puncture and nephrolithotomy, respectively. The surgical procedure proceeded uneventfully and lasted for an hour. There was one episode of hypotension, which was managed with Inj. mephenteramine 6 mg and a 200 mL ringer lactate bolus. Following surgery, she was monitored in the High Dependency Unit (HDU) for 24 hours, during which there were no complications. Complete recovery from motor blockade took six hours, with analgesia provided for 14 hours. She was transferred to the postoperative care unit on day 2. Her entire postoperative period was uneventful, and she was discharged on day 4.



[Table/Fig-2]: Reconstructive imaging.

[Table/Fig-3]: MRI of the spine in case no 1. (Images from left to right).

**Case 2:** A 36-year-old female, 152 cm in height, 52 kg in weight, BMI 22.5 kg/m<sup>2</sup>, with symptomatic calculous cholecystitis and dorsolumbar kyphoscoliosis since childhood, was scheduled for elective laparoscopic cholecystectomy. She had been asthmatic since childhood, using a levosalbutamol metered dose inhaler only during episodes of breathlessness, which typically lasted for 5 to 10 minutes after inhalation. These episodes of breathlessness exhibited seasonal variation, with more occurrences during the winter season, and the most recent episode was three months ago. She displayed grade 3 clubbing, with a moderate obstructive and severe restrictive pattern on pulmonary function tests, and a room air SpO<sub>2</sub> of 92-94%. A 2D ECHO revealed moderate pulmonary hypertension. Following counselling of the patient and her family, they agreed to proceed with thoracic segmental spinal anaesthesia. The patient underwent thoracic segmental spinal anaesthesia with a spinal tap at the T8-T9 level using a 25 G Quincke's needle and 1.6 cc of isobaric Inj. ropivacaine 0.5%, and Inj. fentanyl 25 µg in the lateral position. A block achieving a dermatomal level from T12 to T4 was successful. Intravenous Inj. midazolam 0.6 mg and Inj. ketamine 20 mg were administered to alleviate shoulder pain following pneumoperitoneum creation. Oxygen supplementation was provided via a face mask at 5 L/

min. There was one episode of bradycardia and hypotension, which was managed with Inj. atropine 0.6 mg, Inj. ephedrine 6 mg, and intravenous fluids. The patient herself moved to the shifting trolley at the end of the surgery without motor block of the lower limbs and received complete postoperative analgesia for 10 hours. The rest of the perioperative period was uneventful, and she was discharged on day 5.

**Case 3:** A 25-year-old male, 154 cm in height, 52 kg in weight, BMI 21.9 kg/m<sup>2</sup>, with acute appendicitis and suspected impending rupture of an appendicular abscess, along with a dorsolumbar kyphoscoliotic spine and poliomyelitis involving both lower limbs, was scheduled for emergency laparoscopic appendectomy. He presented with a fever of 101°F, tachycardia (HR 128/min), grade 2 clubbing, room air saturation of 95%, power grade 0 in both lower limbs with deformities and shortening. Neutrophilic leucocytosis was also noted. Clinically, he appeared to have toxemia but was haemodynamically stable. An emergency 2D ECHO revealed mild pulmonary hypertension. Due to the emergency nature of the situation, only bedside pulmonary function tests could be conducted. The patient demonstrated a breath-holding time of 15 seconds, forced expiratory time of three seconds, and a match blow test performed at a distance of 15 cm. After obtaining informed written consent, thoracic segmental spinal anaesthesia was performed at the T8-T9 level using a 25G Quincke's needle, with 1.6 cc of isobaric Inj. ropivacaine 0.5% and Inj. fentanyl 25 µg administered in the sitting position, followed by immediate supine positioning. Anaesthesia was achieved at the T12 to T6 dermatomal level. Intravenous Inj. midazolam 0.8 mg and Inj. ketamine 20 mg were given to alleviate shoulder pain before the initiation of pneumoperitoneum. Oxygen supplementation was provided via a face mask at 5 L/min. The surgical procedure lasted for 1 hour 30 minutes and was uneventful. The patient remained haemodynamically stable throughout the procedure, without requiring additional sedation or analgesia intraoperatively. He experienced excellent postoperative analgesia for 12 hours.

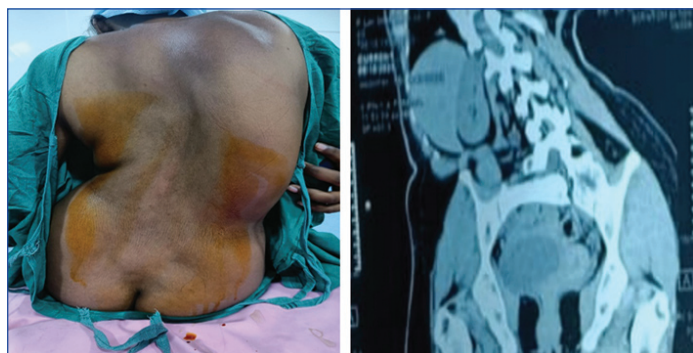
**Case 4:** A 22-year-old female with dorsolumbar kyphoscoliosis, weighing 48 kg, 148 cm in height, BMI 21.9 kg/m<sup>2</sup>, a primigravida at 39 weeks of single live intrauterine gestation in labour with severe cephalopelvic disproportion, was referred from a remote area for an emergency caesarean section. She exhibited grade 3 clubbing, with a heart rate of 120/min, blood pressure of 102/66 mmHg, asymmetric thorax and pelvis. Her SpO<sub>2</sub> was 92% on room air, with a respiratory rate of 22/min. She had a history of at least four admissions in the last five years due to breathlessness and was diagnosed with severe pulmonary hypertension, requiring management in the Intensive Care Unit (ICU) with non invasive ventilation at least two times during previous hospital admissions. She was on some oral medications but was irregular with them. The patient was taken for an emergency caesarean section due to severe cephalopelvic disproportion with thick meconium-stained amniotic fluid. She was positioned in the left lateral position with continuous oxygen supplementation via a face mask at 6 L/min. Coloaded with Ringer's lactate was continued. Inj. ranitidine 50 mg and Inj. metoclopramide 10 mg were administered slowly intravenously before transferring her to the operating room. Thoracic segmental spinal anaesthesia was performed at the T10-T11 interspace with a 26G Quincke's needle. Inj. levobupivacaine isobaric 1.2 cc with Inj. fentanyl 20 µg was given to achieve a dermatomal block from L1 to T4 with minimal motor block involving both lower limbs within two minutes. A lower segment caesarean section was performed with a surgical duration of 60 minutes. The induction to delivery time was three minutes. Inj. oxytocin 2U diluted in 10 cc of 0.9% saline, followed by an infusion of eight units to aid uterine



contraction, was administered. The patient experienced two episodes of hypotension, managed with Inj. ephedrine 6 mg + 6 mg intravenously and intravenous fluid boluses. The rest of the intraoperative period was uneventful. She was transferred to the surgical ICU postoperatively for continuous monitoring. She had an uneventful postoperative period in the ICU with analgesia for eight hours and was later shifted to the postoperative ward two days following the lower segment caesarean section, and discharged on day 5.

**Case 5:** A 45-year-old male patient, weighing 72 kg and 158 cm in height, with a BMI of 28.91 kg/m<sup>2</sup>, presented with symptomatic calculous cholecystitis and thoracolumbar kyphoscoliosis, and was scheduled for laparoscopic cholecystectomy. He had been suffering from poliomyelitis involving his right lower limb since childhood, which had led to progressive spinal deformity resulting in thoracolumbar kyphoscoliosis and complete flaccid paralysis of the right lower limb with deformity. He exhibited grade 3 clubbing, a heart rate of 84/min, blood pressure of 130/82 mmHg, respiratory rate of 18/min, and SpO<sub>2</sub> of 94% on room air. A 2D ECHO revealed moderate pulmonary hypertension with right ventricular hypertrophy. The FEV1/FVC ratio was 0.5. After counselling and obtaining informed written consent, thoracic segmental spinal anaesthesia was performed with a spinal tap at the T9-T8 intervertebral space using a 25G Quincke's needle in the sitting position. Inj. ropivacaine 0.5% isobaric 1.6 cc and Inj. fentanyl 25 µg were administered, and the patient was immediately placed in a supine position after injection. A dense dermatomal block from T12 to T6 was achieved 10 minutes after drug injection. Inj. midazolam 1 mg and Inj. ketamine 25 mg were given to sedate the patient and alleviate shoulder pain from the pneumoperitoneum. The entire surgical procedure lasted one hour and 15 minutes, during which one episode of bradycardia with hypotension occurred intraoperatively and was treated with Inj. atropine 0.6 mg intravenously and a fluid bolus of 250 mL Ringer's lactate. The patient was able to move his unaffected lower limb without experiencing pain or discomfort during the surgical procedure. He was transferred to the Post Anesthesia Care Unit (PACU), where the analgesia lasted for eight hours, and the remainder of his hospital stay was uneventful.

**Case 6:** A 38-year-old unmarried female, weighing 60 kg and standing at 152 cm with a BMI of 25.9 kg/m<sup>2</sup>, had dorsolumbar kyphoscoliosis [Table/Fig-4,5] since childhood



[Table/Fig-4]: Patient's spine in case no. 6.

[Table/Fig-5]: CT scan of the spine in case no. 6. (Images from left to right).

and severe abnormal uterine bleeding secondary to multiple large leiomyomas of the uterus. She was scheduled for a total laparoscopic hysterectomy. On admission, she appeared clinically pale with 2+ clubbing, had moderate anaemia with an Hb level of 7.6 gm%, a heart rate of 112/min, and an SpO<sub>2</sub> of 94%. A 2D ECHO revealed mild right ventricular hypertrophy, moderate pulmonary hypertension with a Pulmonary Arterial Systolic Pressure (PSAP) of 54 mmHg, concentric Left Ventricular Hypertrophy (LVH), grade 2 Left Ventricular Diastolic Dysfunction (LVDD), and an Ejection Fraction (EF) of 55%. Her FEV1/FVC ratio was 0.5. She was admitted, received correction for anaemia with two units of Packed Red Blood Cells (PRBCs) transfused, underwent chest physiotherapy, incentive spirometry, deep breathing exercises, and was given bronchodilators to prepare for the procedure. A layered thoracic spinal with a spinal tap at the T9-T10 interspace using a 26G Quincke's spinal needle was performed with the patient in a sitting position. Inj. levobupivacaine 0.5% heavy 0.6 cc was given, followed by Inj. ropivacaine 0.5% isobaric 1.4cc, and Inj. dexmedetomidine 5 µg. The patient was then placed supine. A dense block up to T6 was observed, and after 15 minutes, the block progressed to T6. Inj. midazolam 0.6 mg and Inj. ketamine 15 mg intravenously were given to alleviate shoulder pain. Oxygen at 2 L/min was administered through nasal prongs, maintaining SpO<sub>2</sub> levels between 94-96%. The surgical procedure lasted almost two hours and was uneventful. The patient remained haemodynamically stable throughout the procedure with analgesia for 14 hours. The patient was discharged on the fifth day without any complications.

The details of all the cases are summarised in [Table/Fig-6,7]. All patients were evaluated; pre-existing co-morbidities were optimised as time permitted. Elective cases were prepared with chest physiotherapy, incentive spirometry, deep breathing exercises, and bronchodilators. All patients were taken up only after explaining possible complications involved in the anaesthetic procedure and obtaining informed written consent. IV access was secured with an 18G cannula, Ringer's lactate or 0.9% saline solution was used as maintenance fluid perioperatively. ASA standard monitoring and NPO guidelines were followed. Postoperative analgesia was managed with Inj. paracetamol 1 gm IV TDS. After discharge, each patient was kept in touch constantly with frequent communication for atleast three months. None of the patients had any neuronal, local anaesthetic, or procedure-related complications. All patients consented to publish their data, but only two patients consented to publish their pictures.

## DISCUSSION

Kyphoscoliotic patients have an asymmetric thoracic and pelvic cavity, limb shortening, sensory and motor deficits, and restrictive lung disease that decreases vital capacity, functional residual capacity, and tidal volume, while increasing respiratory rate, ventilation-perfusion mismatch, progressive cardiopulmonary dysfunction, and cor pulmonale, among other conditions [6,8]. General anaesthesia is not favoured due to difficulties in intubation, the presence of pulmonary infections, poor

Case no.	Age years	Sex	Height cm	Weight Kg	BMI (kg/m <sup>2</sup> )	SpO <sub>2</sub> on room air	Surgical procedure	Pulmonary Function Testing (PFT) pattern
1	42	F	156	88	36.2	94%	Supine percutaneous nephrolithotomy	Severe restrictive
2	36	F	152	52	22.5	92%	Elective laparoscopic cholecystectomy	Moderate obstructive severe restrictive
3	25	M	154	52	21.9	94%	Emergency laparoscopic appendicectomy	Moderate restrictive
4	22	F	148	48	21.9	92%	Emergency caesarean section	Severe restrictive
5	45	M	158	72	28.9	94%	Elective laparoscopic cholecystectomy	Severe restrictive
6	38	F	152	60	25.9	94%	Elective total laparoscopic hysterectomy	Moderate restrictive

[Table/Fig-6]: Details of the patients.

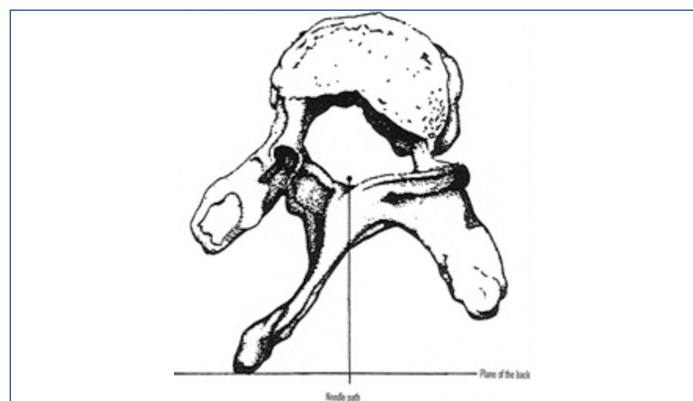
Case no.	2D Echo	Co-morbidities/previous history	Anaesthetic technique	Sensory block
1	Moderate pulmonary hypertension	OSA. Three corrective surgeries on spine	Layered spinal at T9-T10. Inj. ropivacaine 0.75% heavy 0.8cc, Inj. ropivacaine isobaric 1.2cc, Inj.fentanyl 20 µg	T6
2	Moderate pulmonary hypertension	Asthmatic. Currently on levosalbutamol MDI	Thoracic segmental spinal at T8-T9 Inj. ropivacaine 0.5% isobaric 1.6cc, Inj.Fentanyl 25 µg	T12-T4
3	Moderate pulmonary hypertension	Polio involving both lower limbs. Flaccid paralysis of both lower limbs	Thoracic segmental spinal at T8-T9 Inj. ropivacaine 0.5% isobaric 1.6cc, Inj.fentanyl 25 µg	T12-T6
4	Severe pulmonary hypertension with RVH	Previous admissions in ICU requiring NIV. Indication for CS:Severe CPD with thick MSAF non reassuring fetal heart rate	Thoracic segmental spinal at T8-T9 Inj.levobupivacaine 0.5% isobaric 1.2cc, Inj.fentanyl 20 µg	L1-T4
5	Severe pulmonary hypertension with RVH	Polio involving right lower limb with flaccid paralysis	Thoracic segmental spinal at T8-T9 Inj. ropivacaine 0.5% isobaric 1.6cc, Inj.fentanyl 25 µg	T12-T6
6	Moderate pulmonary hypertension	Hypertension, well controlled on Tab.Telma-H	layered spinal at T9-T10 Inj.levobupivacaine 0.5% heavy, Inj. ropivacaine 0.5% isobaric1.4cc, Inj.dexametomidine 5 µg	T6

**[Table/Fig-7]:** Different anaesthesia techniques used in the patients.

RVH: Right ventricular hypertrophy; OSA: Obstructive sleep apnoea; MDI: Metered dose inhaler; MSAF: Meconium-stained amniotic fluid

respiratory reserve, challenging extubation, and the potential need for postoperative ventilation. Regional anaesthesia and neuraxial blocks are also technically challenging to perform due to difficulties in positioning, spine and landmark identification, and lower success rates [8]. Low cerebrospinal fluid volume and unpredictable spread of local anaesthetics make it very difficult to choose the type of local anaesthetic, volume of local anaesthetics, dose of opioids, and other adjuvants [9]. In case number 1, it was impossible to locate the epidural space due to substantial scarring and obliterated interspinous and intervertebral spaces resulting from multiple previous corrective surgeries on her spine. Distortion of the epidural space after corrective surgeries for scoliosis prevents the normal spread of the local anaesthetics, resulting in a patchy block [9]. A single-shot spinal anaesthesia technique is simple, easy, and was considered the best anaesthetic choice because the intrathecal space is not directly affected, and the spread of local anaesthetic is more reliable than via the epidural route.

Huang J described a modified paramedian approach for neuraxial anaesthesia in patients with kyphoscoliosis [Table/Fig-7]. Intervertebral spaces, rather than interspinous spaces, were used to perform dural puncture in all the patients. The intervertebral spaces were identified by tracing the spine from the cervical region. Hyperbaric and isobaric drugs were used to layer the subarachnoid block in case no.1 and in case no.6 purposefully to aid proper positioning of the patient in lithotomy and surgical needs, similar to a previous report on layered block for caesarean section after patchy epidural labour analgesia [4]. In three other patients, isobaric local anaesthetics with opioids were used to restrict the level of anaesthesia only to lower and mid-thoracic dermatomes to produce true thoracic segmental anaesthesia for laparoscopic surgeries without any complications [10]. The intrabdominal pressure of pneumoperitoneum was kept below 12 mmHg. A lower intra-abdominal pressure is advantageous, particularly in gynaecological laparoscopic surgeries due to the patient being positioned head down in the Trendelenburg



**[Table/Fig-8]:** Modified paramedian approach in Kyphoscoliotic patients [7]

position [11,12]. Low doses of ketamine, along with midazolam intravenously, before creating pneumoperitoneum to alleviate shoulder tip pain, worked excellently without any excessive or residual sedation. Also, the thoracic segmental spinal technique was successfully used even in a case of emergency caesarean section (case no.6) using the “Rapid sequence spinal” no-touch, preoxygenation technique [13]. Surgical anaesthesia was achieved within two minutes. Authors suggest adopting such unique single-shot anaesthetic techniques in patients with kyphoscoliosis only when experienced surgeons are performing the surgical procedure. A well-experienced surgeon not only reduces the surgical time duration due to their technical expertise but also helps in managing difficulties or complications.

## CONCLUSION(S)

Thoracic segmental and layered spinal anaesthesia techniques can be simple, safe, effective, reliable, and economic alternatives in difficult situations for major but limited abdominal and laparoscopic surgeries. A skilled anaesthesiologist, together with an experienced surgeon, is essential in choosing such unconventional yet reliable techniques. Meanwhile, adequate patient preparation and patient cooperation play a major role in performing these anaesthetic procedures without any perioperative events or complications.

## REFERENCES

- [1] Schwartz JJ. Skin and musculoskeletal diseases. In: Schwartz JJ, eds. Anaesthesia and Co-Existing. 5<sup>th</sup> ed. Philadelphia: Saunders Elsevier; 2010: 505.
- [2] Ramez Salem M, Klowden AJ. General anaesthesia. In: Ramez Salem M, Klowden AJ, eds. Anaesthesia for Orthopaedic Surgery. 3rd ed. New York: Churchill-Living Stone; 1994.
- [3] Hebl JR, Horlocker TT, Kopp SL, Schroeder DR. Neuraxial blockade in patients with preexisting spinal stenosis, lumbar disk disease, or prior spine surgery: Efficacy and neurologic complications. *Anesth Analg*. 2010;111(6):1511-19. Doi: 10.1213/ANE.0b013e3181f71234. Epub 2010 Sep 22. PMID: 20861423.
- [4] Moran DH, Johnson MD. Continuous spinal anesthesia with combined hyperbaric and isobaric bupivacaine in a patient with scoliosis. *Anesth Analg*. 1990;70(4):445-47. Doi: 10.1213/00000539-199004000-00017. PMID: 2316886.
- [5] Higashizawa T, Sugiura J, Takasugi Y. Spinal anesthesia in a patient with hemiparesis after poliomyelitis. *Masui*. 2003;52(12):1335-37. Japanese. PMID: 14733088.
- [6] Veliath DG, Sharma R, Ranjan R, Kumar CR, Ramachandran T. Parturient with kyphoscoliosis (operated) for cesarean section. *J Anaesthesiol Clin Pharmacol*. 2012;28(1):124-26. Doi: 10.4103/0970-9185.92463. PMID: 22345961; PMCID: PMC3275946.
- [7] Huang J. Paramedian approach for neuroaxial anesthesia in parturients with scoliosis. *Anesth Analg*. 2010;111(3):821-22; author reply 822. Doi: 10.1213/ANE.0b013e3181e6389a. PMID: 20733167.
- [8] Klienman W, Mikhail M. Spinal, epidural, and caudal blocks. In: Morgan GE, Mikhail SM, Murray MJ, eds. *Clinical Anaesthesiology*. 4th ed. New York: McGraw Hill Inc; 2006:289-323.
- [9] Kardash K, King BW, Datta S. Spinal anaesthesia for caesarean section after Harrington instrumentation. *Can J Anaesth*. 1993;40(7):667-69. Doi: 10.1007/BF03009704. PMID: 8403141. [PubMed] [Google Scholar].
- [10] Shatri G, Singh A. Thoracic Segmental Spinal Anesthesia. 2023 Jul 31. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. PMID: 34283453.
- [11] Srivastava A, Niranjana A. Secrets of safe laparoscopic surgery: Anaesthetic and surgical considerations. *J Minim Access Surg*. 2010;6(4):91-94. Doi: 10.4103/0972-9941.72593. PMID: 21120064; PMCID: PMC2992667.

- [12] Bajwa SJ, Kulshrestha A. Anaesthesia for laparoscopic surgery: General vs regional anaesthesia. *J Minim Access Surg.* 2016;12(1):04-09. Doi: 10.4103/0972-9941.169952. PMID: 26917912; PMCID: PMC4746973.
- [13] Kinsella SM, Girgirah K, Scrutton MJ. Rapid sequence spinal anaesthesia for category-1 urgency caesarean section: A case series. *Anaesthesia.* 2010;65(7):664-69. Doi: 10.1111/j.1365-2044.2010.06368.x. PMID: 20642523.

**PARTICULARS OF CONTRIBUTORS:**

1. Associate Professor, Department of Anaesthesiology, AIMS, Hassan, Karnataka, India.
2. Private Practitioner, Department of Anaesthesiology, AIMS, Narasaraopet, Andhra Pradesh, India.
3. Associate Professor, Department of Anaesthesiology, HIMS, Hassan, Karnataka, India.
4. Professor, Department of Anaesthesiology, MNR Medical College, Sangareddy, Telagana, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Prashanth Gowtham Raj,  
No. 47, 4<sup>th</sup> Floor, HIMS Doctors Quarters, Hassan-573201, Karnataka, India.  
E-mail: rajprashanth83@gmail.com

**PLAGIARISM CHECKING METHODS:** [\[Jain H et al.\]](#)

- Plagiarism X-checker: Dec 16, 2023
- Manual Googling: Jan 18, 2024
- iThenticate Software: Feb 05, 2024 (5%)

**ETYMOLOGY:** Author Origin**EMENDATIONS:** 6**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Dec 15, 2023**Date of Peer Review: **Jan 15, 2024**Date of Acceptance: **Feb 07, 2024**Date of Publishing: **Mar 01, 2024**