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# A 74-Year-Old Man with Severe Comorbidities and Successful Abdominal Aortic Aneurysm Repair with Thoracic Segmental Spinal Anesthesia: A Case Report

## Authors' Contribution:

Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
Literature Search F  
Funds Collection G

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**Patient:** Male, 74-year-old  
**Final Diagnosis:** Abdominal aortic aneurysm (AAA)  
**Symptoms:** Dispnoea • pain in lumbar region • pulsatile mass  
**Clinical Procedure:** Open surgical repair of AAA • spinal anesthesia  
**Specialty:** Anesthesiology • Surgery

**Objective:** Unusual or unexpected effect of treatment

**Background:** Elderly patients with severe or multiple comorbidities can be at high risk for complications of general anesthesia. This report is of a 74-year-old man with severe comorbidities, including ischemic heart disease (IHD) and chronic obstructive pulmonary disease (COPD), and successful abdominal aortic aneurysm repair with thoracic segmental spinal anesthesia.

**Case Report:** The patient, aged 74, had previously been diagnosed with severe COPD and IHD. He was classified as American Society of Anesthesiology (ASA) grade IV, diagnosed with an abdominal aortic aneurysm (AAA) measuring 6 cm in diameter, and had to undergo surgical repair of the aneurysm with the insertion of a synthetic graft. Due to a shortage of beds in the ICU and the desire to avoid the complications associated with general anesthesia, the decision was made to proceed with thoracic spinal regional anesthesia, which is not a customary choice for this type of surgery. Spinal anesthesia was administered at the Th10-11 level, utilizing 8.5 mg of Bupivacaine, 50 mcg of Fentanyl, and 4 mg of Dexason. An epidural catheter was placed at the same level. The surgical procedure lasted 145 min and was successfully completed under regional anesthesia.

**Conclusions:** This report has highlighted that developments in spinal thoracic anesthesia mean that this can be a successful alternative to general anesthesia in high-risk patients, even for major emergency surgery.

**Keywords:** Anesthesia, Spinal • Aorta, Abdominal • Bupivacaine • Thoracic Vertebrae

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## Introduction

More than 100 years have passed since the seminal introduction of “general spinal anesthesia” by Thomas Jonnesco in 1909, utilized for various types of surgeries. This technique involved puncturing the subarachnoid space between the 1<sup>st</sup> and 2<sup>nd</sup> thoracic vertebrae, and between the 10<sup>th</sup> thoracic and 1<sup>st</sup> lumbar vertebrae for abdominal surgeries, achieving profound and comprehensive analgesia [1]. Neuraxial anesthesia is used alone or in combination with general anesthesia for most procedures below the neck [2]. Spinal anesthesia performed at the thoracic level of the spine is commonly known as thoracic spinal anesthesia. It is a neuraxial anesthesia technique that has been a subject of considerable debate among anesthesiologists, including the risk of external injury to the spinal cord, cranial distribution of the local anesthetic, and blocking of the sympathetic fibers that innervate the heart, potentially resulting in severe bradycardia and low blood pressure [3-5]. In 2006 and 2007, Van Zundert et al published a case report and subsequently a feasibility study on 20 patients with severe chronic obstructive pulmonary disease (COPD) undergoing surgery, such as laparoscopic cholecystectomy, using combined spinal-epidural anesthesia at the thoracic level of the spine [6,7]. In most patients, either general anesthesia or regional anesthesia can be used without any problems. However, in certain cases, the nature of the surgical intervention or the patient's comorbid conditions may dictate the choice of anesthesia technique, including the use of thoracic spinal anesthesia. [8-10]. Patients with lung disease facing surgical interventions are at a higher risk of experiencing complications both during and after the procedure. Various complications, such as laryngospasm, bronchospasm, and prolonged mechanical ventilation, pose challenges in managing patients with COPD undergoing abdominal surgery [11]. Regional anesthesia techniques are the method of choice for patients with known cardiopulmonary disorders. In some geriatric centers, this technique is becoming the preferred choice of anesthesia [12]. The literature on major abdominal surgery performed under neuraxial anesthesia techniques is scarce, making it challenging to find relevant studies. With this context in mind, we report the case of a male patient with a known history of COPD, classified as American Society of Anesthesiology (ASA) grade IV, diagnosed with an abdominal aortic aneurysm (AAA), who underwent resection of the aneurysmal segment under thoracic spinal anesthesia [13]. Case reports have been published previously for endovascular or open surgical aortic repair under regional epidural anesthesia [14,15].

This report is of a 74-year-old man with severe comorbidities, including ischemic heart disease (IHD) and chronic obstructive pulmonary disease (COPD), and successful abdominal aortic aneurysm repair with thoracic segmental spinal anesthesia.

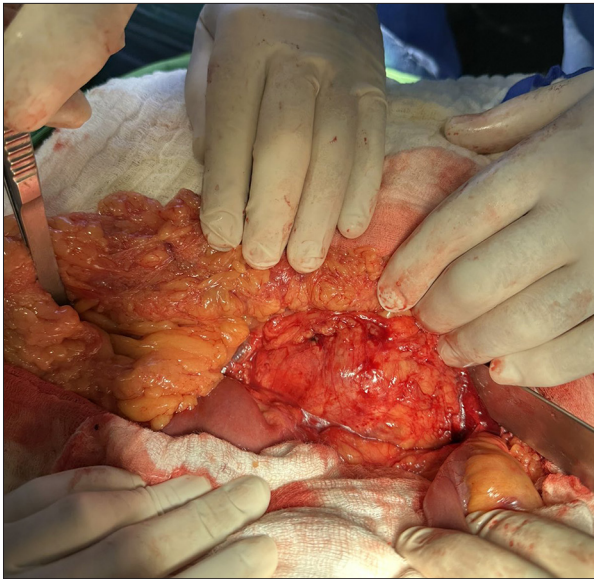


**Figure 1.** Performing thoracic spinal anesthesia at Th10-11 with 27-G spinal needle.

## Case Report

A 74-year-old man who was a cigarette smoker was diagnosed with an abdominal aortic aneurysm (AAA) measuring 6 cm in diameter. He was scheduled for open surgery to repair the aneurysmal portion of the AAA, which would involve replacing it with a synthetic vascular graft. General anesthesia is typically the method of choice for such operations due to its ability to ensure hemodynamic stability, control of the airways and ventilation, and provide muscle relaxation during surgery. However, in situations where Intensive Care Unit (ICU) beds for postoperative care are lacking, along with a scarcity of resources for respiratory support in the postoperative period, the complications of general anesthesia in patients with severe respiratory issues necessitate considering alternative methods. This was particularly relevant for this patient, who had severe COPD, heart problems, and was on medications including anticoagulants, beta-blockers, calcium channel blockers, and bronchodilators. There was a contingency plan in case of the need for ICU admission, transferring him to a hospital with ICU beds located very close (2 km) to the hospital where the operation was done.

It was decided to proceed with regional anesthesia, a combination of spinal anesthesia performed at a low thoracic level combined with epidural anesthesia. Spinal anesthesia was administered at the Th10-11 level using a 27-gauge (G) Quincke spinal needle (Figure 1), and an epidural catheter was placed at the Th11-12 level using an 18-G Tuohy needle. The medications used were 8.5 mg of Bupivacaine (1.7 ml of 0.5% heavy Bupivacaine), 50 mcg of Fentanyl, and 4 mg of Dexamethasone, all administered subarachnoidally via the spinal needle. Fifteen min after administration, the sensory block extended from Th6 to L1.



**Figure 2.** Abdominal aortic aneurysm before removal of the aneurismatic part.

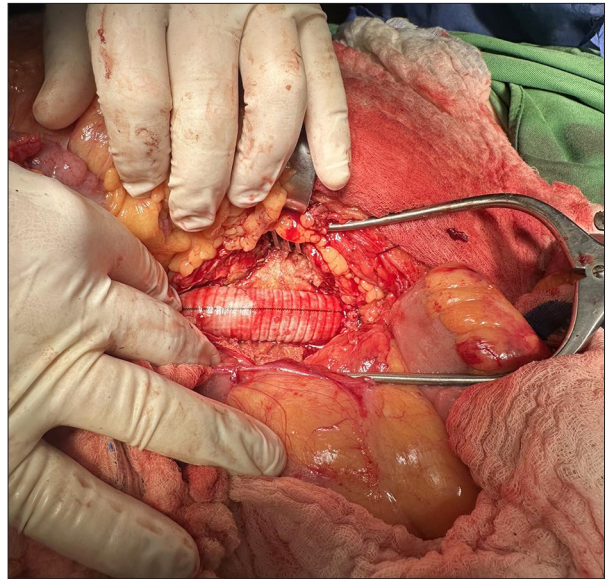
Within the first 20 min after the anesthesia was administered, a drop in blood pressure to 80/40 mm Hg was recorded, which was successfully treated with intravenous normal saline 0.9% and bolus doses of 5 mg Ephedrine. Blood pressure returned to normal levels 30 min after initiation of spinal anesthesia. This was the only adverse effect noted during the surgical procedure. The surgery lasted 145 min, and in the final 40 min, epidural anesthesia was initiated with a bolus of 8 ml of 0.375% Bupivacaine.

Very good analgesia was achieved at the end of the operation through the epidural catheter. The catheter was also used for postoperative pain control, administering a combination of 0.125% Bupivacaine with 1 mcg/ml Fentanyl. No drop in blood pressure or other adverse effects were noted during the epidural anesthesia.

The surgery was performed without any complications. The patient underwent graft reconstruction of the AAA under thoracic spinal anesthesia, achieving very good analgesia and without any respiratory compromise (Figures 2, 3). After the surgery, he was transferred to a surgical ward in a very stable condition, awake, with normal vital signs. No neurological sequelae were recorded during the hospital stay. On the 5<sup>th</sup> postoperative day, he was discharged to home.

## Discussion

This case report shows that spinal thoracic anesthesia as a regional neuraxial technique can be safely used for a major abdominal operation such as AAA. This technique emphasizes that



**Figure 3.** Aorta abdominalis after placement of an aortic vascular graft.

anesthesia and analgesia provided for this patient was sufficient for open surgery, repair the aneurysmal portion of the AAA.

Thoracic spinal anesthesia is not commonly described in anesthesia textbooks, and its use above the L1-L2 level of the lumbar spine is not recommended [16,17]. Several studies using magnetic resonance imaging (MRI) have demonstrated that the posterior distance between the spinal cord and dura mater in the thoracic region, which is widest in the mid-thoracic region [18,19], supports the safety of performing spinal anesthesia in this area.

Although not routinely used, several publications have demonstrated that thoracic spinal anesthesia is a convincing and satisfactory method for various types of surgeries. Imbelloni et al, in a study involving 1406 patients who underwent thoracic spinal anesthesia, concluded that there were no neurological deficits following its use [20]. Our case report supports all these major findings. It was a safe procedure and did not cause a neurologic deficit for our patient.

In certain patients, due to underlying conditions and the nature of the surgical intervention, the risk of perioperative complications, including prolonged ICU stays after general anesthesia, is heightened [21]. In such instances, regional anesthesia may be preferred to minimize complications associated with general anesthesia. In our case, by employing thoracic spinal anesthesia, the patient did not require an ICU bed, resulting in a shorter hospital stay and lower financial costs. Spinal anesthesia, compared to general anesthesia, offers several advantages, such as improved postoperative analgesia, reduced reliance on opioid analgesics, preservation of spontaneous breathing during surgery, and the benefit of remaining conscious throughout the

procedure, which in turn can decrease postoperative cognitive dysfunction [22]. It has been reported that, as a result, both ICU and hospital stays are shortened, leading to a reduction in financial costs [23,24]. Compared to all the above, our patient did not require ICU admission, his hospital stay was shorter, there was no cognitive dysfunction, and it resulted in lower financial costs due to both regional anesthesia and zero days of ICU stay.

Although thoracic spinal anesthesia is rarely used for various types of operations, the case report presented here demonstrates its successful application and management even in major surgery. The placement of an aortic graft in a patient with an AAA is considered high-risk surgery, with several possible complications [25].

There are case reports of endovascular repair and open surgical repair of AAA by regional anesthesia solely using epidural anesthesia [14,15], but there are few case reports on using spinal thoracic anesthesia for this kind of surgery. Both epidural and spinal anesthesia were effectively used for this procedure.

Patient and medical personnel satisfaction was high, and the procedure was completed without any complications. This report has highlighted that developments in spinal anesthesia

can provide a successful alternative to general anesthesia in high-risk patients, even for major emergency surgery, including abdominal aortic aneurysm repair.

## Conclusions

Several studies have shown that thoracic spinal anesthesia, when administered by qualified professionals, is safe and effective for various types of abdominal surgery, most notably for laparoscopic cholecystectomy. However, more data are needed to substantiate its safety advantages compared to current anesthesia techniques.

This report has highlighted that developments in spinal anesthesia can provide a successful alternative to general anesthesia in high-risk patients, even for major emergency surgery, including abdominal aortic aneurysm repair.

## Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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