

Understanding the simplest (spinal anesthesia). It is not so easy

Volume 15 Issue 6 - 2023

Editorial

In the 16th century, Leonardo da Vinci wrote “the simplicity is the highest degree of sophistication”, and spinal anesthesia fits perfectly into this brilliant definition. I have been studying spinal anesthesia for 49 years and have always heard that the technique is extremely simple for those who perform it, however, for those who study it properly, it is complex. Spinal anesthesia was and will always be the first regional anesthesia taught in almost all anesthesiology teaching centers around the world. However, preceptors and students think that spinal anesthesia is limited to a simple puncture of the subarachnoid space confirmed by the presence of cerebrospinal fluid (CSF). Most of the time, spinal anesthesia begins exactly after the deposition of drugs in the CSF, and few understand this wonderful encounter (local anesthetic and CSF).

In a recent Editorial, I showed that subarachnoid puncture can be performed in four positions such as sitting, lateral decubitus, prone, and on some orthopedic tables where there is a space between the buttocks and the chest, in the supine position.¹ In another article, I showed that spinal anesthesia is much more than a single shot of hyperbaric bupivacaine.² Finally, in an educational article, I showed that two schools teach neuroaxis anesthesia, one in the sitting position and the other in the lateral decubitus position.³ In this article, we show how different local anesthetic solutions such as hypobaric, isobaric, and hyperbaric behave when injected into different puncture positions. In an article trying to show that spinal anesthesia is much more than a single shot of hyperbaric bupivacaine and most of the time punctured in the sitting position, we ask numerous questions about only using this approach.² In the article, we list seven reasons to only use the hyperbaric solution (Table 1). The anatomy of the cadaver was very well described by Leonardo da Vinci.⁴ and the anatomy mainly with MRI which demonstrates a space between the dura mater and the spinal cord in adults⁵ and children⁶ the density of local anesthetics (hypobaric, isobaric, hyperbaric), injection speed, different doses, different types of punctures (sitting, lateral decubitus, jackknife position), puncture sites (lumbar and thoracic) and the association with adjuvants, can provide a way for knowledge of its performance for each patient and type of surgery. Each type of surgery and each type of patient deserves spinal anesthesia according to the needs of the procedure.

Table 1 Seven reasons to only use the hyperbaric solution

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| 1 | Lack of knowledge of modern anatomy by MRI, CT, US |
| 2 | Lack of knowledge of the use of isobaric and hypobaric solutions |
| 3 | Lack of teaching and training for performing subarachnoid punctures in lateral decubitus and prone position |
| 4 | Difficulty acquiring other approaches to the subarachnoid space |
| 5 | Lack of knowledge of the anterior (motor) and posterior (sensory) roots, being able to perform anesthesia without motor blockade |
| 6 | Ignorance of performing thoracic puncture shown by security in MRI |
| 7 | Unawareness of performing continuous spinal anesthesia? |

Luiz Eduardo Imbelloni,¹ Marildo A Gouveia,²
Sylvio Valença de Lemos Neto³

¹Instituto Nacional de Câncer INCA Senior Researcher, Brazil

²Former President of LARSA Internacional, Brazil

³INCA Anesthesiologist, Responsible for the CET-SBA of Instituto Nacional de Câncer (INCA), Brazil

Correspondence: Dr Luiz Eduardo Imbelloni, MD, PhD, Instituto Nacional de Câncer INCA Senior Researcher, Rio de Janeiro, RJ, Brazil, Tel + 55.11.99429-3637, Email dr.luiz.imbelloni@gmail.com

Received: November 30, 2023 | **Published:** December 13, 2023

Epidural segmental anesthesia can be used for punctures at different levels: cervical region, thoracic region, lumbar region, and sacral region. For many years it was thought that it would only be possible to perform segmental anesthesia with the epidural technique. However, the segmental spinal anesthesia was described in 1909, with a puncture in T2 for surgeries on the head, neck, upper limbs, and thorax, a puncture between the T12 and L1 vertebrae for lower abdomen and lower limb surgeries, and the puncture between the T7 and T8 vertebrae is very often difficult to perform and is not necessary.⁷ Thus, with a single thoracic puncture.⁸ or combined spinal-epidural anesthesia.⁹ Segmental spinal anesthesia can be obtained. Studying 636 patients of different types of surgery receiving a single shot thoracic puncture with a low dose of local anesthetic, showed a rapid onset of action, low incidence of arterial hypotension, and without neurological complications.¹⁰ Another study, with 300 patients comparing two types of needles (cutting tip versus pencil tip), showed that the incidence of paresthesia was compared to lumbar puncture, all transient and no neurological complications were observed, showing that a lower thoracic puncture is safe.¹¹

After the initial studies comparing general anesthesia and spinal anesthesia for laparoscopic cholecystectomy, numerous other studies were published. In a recent article, all the steps and advantages of spinal anesthesia for laparoscopy cholecystectomy.¹² and a meta-analysis of randomized clinical trials have shown that spinal anesthesia is a viable technique, and safe for elective laparoscopic cholecystectomy.¹³ Access to the thoracic subarachnoid space has become so safe that thoracic continuous spinal anesthesia was recently performed by the Italian group.¹⁴ culminating in an editorial showing the safety of the technique, which is an interesting alternative to general anesthesia.¹⁵ In a recent narrative review, the objective is to evaluate critically the various publications on thoracic spinal anesthesia (TSA), and after synthesizing the information available in the various studies, to provide a summary of the evidence that justifies the use of TSA in anesthesia in the 21st century.¹⁶ The application of the three local

anesthetic solutions (hypobaric, isobaric, hyperbaric) injected in different puncture positions (sitting, lateral decubitus, prone position) and the position of the surgical table during the surgical procedure were presented in seven items in 14 tables and six figures, for a complete understanding of spinal anesthesia, better indication for the different procedures, patient satisfaction and safety of the technique.³ The article showed the possibility of performing hemi-spinal anesthesia (unilateral and posterior) and the possibility of performing completely sensory spinal anesthesia without any degree of motor block, simply understanding the anterior (motor) and posterior (sensitive) roots and offering the best for patient satisfaction and safety of the technique.¹⁷

This year I completed 49 years of dedication to anesthesia, especially spinal anesthesia. At my residence, the epidural was the most used technique, as there were no suitable needles (caliber 20G, 21G, 22G) to disseminate the spinal anesthesia technique. With the emergence of fine needle caliber (26G, 27G, 29G) and different tip designs (cutting and pencil tip), there was great interest in studying the technique, greatly reducing post-puncture headaches. Most spinal anesthesia teaching centers do so in the sitting position and with a hyperbaric local anesthetic solution, failing to teach in other positions (lateral decubitus and prone position). Spinal anesthesia in the world is restricted to lumbar puncture, with different needle calibers and designs and hyperbaric solutions. Many anesthesiologists are unaware of the safety of performing TSA, allowing for safety, with low doses, and few reported complications, after MRI studies, showing 0.5 to 1 cm, between the dura mater and the spinal cord, both in adults and children.^{5,6}

The function of residency in anesthesiology is to train doctors for the daily life of the specialty. However, to fully understand spinal anesthesia, it takes a lot of time to study, research, publish, and experience, to make what everyone thinks is very simple, but without offering the best the technique can offer to patients. I can say that there was a complete change in the understanding of spinal anesthesia when I spent 5 hours with motor block after spinal anesthesia with 15 mg of 0.5% isobaric bupivacaine for a 50-minute procedure.¹⁸ This suffering alerted me to completely change my behavior. Every patient deserves spinal anesthesia to provide safety, comfort, and satisfaction. Finally, I would like to suggest to everyone reading this Editorial that to understand Spinal Anesthesia, it is necessary to read all the references cited here, and much more about what scholars of the technique have written around the world since Bier and Jonnesco. Everyone must study and practice, as knowledge without practice leads to immense distance. Knowledge with practice is total understanding.

Acknowledgments

None.

Conflicts of interest

The author declares that there are no conflicts of interest.

Funding

None.

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