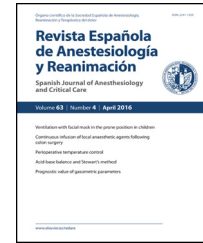




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## REVIEW

# Modern approach to an old technique: Narrative revision of techniques used to locate the epidural space<sup>☆</sup>

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**Abstract** Since the first description of the epidural technique during the 1920s, the continuous progress of knowledge of the anatomy and physiology of the epidural space has allowed the development of different techniques to locate this space while increasing both the safety and efficacy of the procedure. The most common techniques used today are based on the two main characteristics of the epidural space: the difference in distensibility between the ligamentum flavum and the epidural space, and the existence of negative pressure within the epidural space.

However, over recent years, technological advances have allowed the development of new techniques to locate the epidural space based on other physical properties of tissues. Some are still in the experimental phase, but others, like ultrasound-location have reached a clinical phase and are being used increasingly in daily practice.

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**PALABRAS CLAVE**

Localización;  
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## Visión moderna sobre una técnica antigua: revisión narrativa de técnicas de localización del espacio epidural

**Resumen** Desde la primera descripción de la técnica epidural en los años 1920, el progreso continuo en el conocimiento de la anatomía y de la fisiología del espacio epidural ha permitido desarrollar diferentes técnicas de localización de este espacio para aumentar tanto la seguridad como la eficacia del procedimiento. Las técnicas más utilizadas hoy en día se basan en las 2 principales propiedades descritas del espacio epidural: la diferencia de distensibilidad entre el ligamento amarillo y el espacio epidural y la existencia de una presión negativa en el espacio epidural. Sin embargo, en los últimos años, la evolución tecnológica ha permitido desarrollar nuevas técnicas de localización basadas en otras propiedades físicas de los tejidos. Algunas de ellas están todavía en una fase experimental, pero otras como las técnicas con ultrasonidos han alcanzado una fase clínica y se está expandiendo su uso en la práctica diaria.

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## Introduction

The first description of a method for localizing the lumbar epidural space using the difference in distensibility between the yellow ligament and the epidural space was published by Fidel Pagés in 1921. In this study, Pagés described how the physician performing the technique would feel the needle “release” as soon as it entered the epidural space.<sup>1,2</sup> The technique was soon modified by Sicard and Forestier,<sup>3</sup> who were the first to attach a syringe with fluid to the needle and exert continuous pressure on the plunger while the needle advanced through the ligaments, until “the injection [...], which was difficult, becomes as easy as if the needle were in the subarachnoid space”. Following this, the hanging drop technique was described.<sup>4</sup>

At the lumbar level, loss of resistance techniques are currently the most widely used to locate the epidural space, while at the thoracic and cervical level the hanging drop technique is preferred. Residents learning this technique must be constantly supervised due to the technical difficulty involved. In fact, studies have shown that the learning curve varies greatly among anaesthesiologists undergoing their training in obstetric anaesthesia.<sup>5</sup>

In recent years, in parallel with manual of loss of resistance techniques, new devices have been marketed to help anaesthesiologists identify the epidural space using visual or auditory indicators based on the different physical properties of the epidural space. In this narrative review, we will describe these different techniques. The literature search was performed using PubMed, and the most significant publications were identified using the following search criteria in both English and Spanish: localization, epidural space, techniques, and labour analgesia.

## Traditional techniques for locating the epidural space

### Manual techniques

The first 3 techniques that were described in the 1930s are today still the most widely used in practice due to their simplicity and effectiveness.

*Hanging drop technique.* This was first described by Gutierrez<sup>4</sup> in 1930 and is still used today. It consists of depositing a drop of saline solution on the tip of the needle. Once placed in the interspinous ligament, the needle is advanced using both hands while visually monitoring the drop. As soon as the needle enters the epidural space, the anaesthesiologist feels it “release” and observes that the drop of saline is aspirated by the needle. In the sitting position, the negative pressure is highest at the dorsal level, whereas at the lumbar level it disappears, especially in patients with hyperflexion and compression of the abdominal contents. This is why identification of the lumbar epidural space is more difficult with this technique.<sup>2</sup> In addition, the reliability of this method is limited by the “false hanging drop” phenomenon, described in approximately 2% of cases. In this case, the drop is aspirated due to muscle movement during respiration, rotation of the spine, or passage of the needle along the fascial planes, causing the anaesthesiologist to mistakenly identify these structures as the epidural space. The needle may also become obstructed, thus preventing identification of the epidural space and increasing the risk of accidental dural puncture.<sup>6</sup>

*Loss of resistance to fluid technique.* The loss of resistance to fluid technique has gained popularity in recent years because it is believed to be safer than the air technique. However, the scientific evidence is not yet strong

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