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### Review

## Test dose in regional anesthesia<sup>☆</sup>



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#### ABSTRACT

**Introduction:** The use of the test dose in regional anesthesia is not standardized, and there is no consensus regarding what dose it should be or about the anesthetic or type of drug to be used. Moreover, many anesthesiologists do not use it routinely in their practice.

**Objective:** To review the test dose for regional anesthesia, its indications and utility, the drugs used, and positive signs.

**Methods:** A non-systematic search was conducted in medical database publications including MedLine, SciELO and Embase.

**Results:** The application of the test dose before giving the full injection of the local anesthetic helps in detecting the inadvertent placement of the needle or catheter in the intravascular or the subarachnoid spaces.

**Conclusions:** The test dose must be used every time critical doses of a local anesthetic are utilized or when normal doses are given to patients with risk factors. The test dose is not necessary in labor analgesia.

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### Dosis de prueba para anestesia regional

#### RESUMEN

**Introducción:** El uso de la dosis de prueba en anestesia regional no está estandarizado: no existe consenso sobre su dosis, el anestésico o el tipo de fármaco que se debe utilizar, y muchos anestesiólogos no la utilizan rutinariamente en su práctica.

**Objetivo:** Hacer una revisión de la dosis de prueba para anestesia regional, sus indicaciones, su utilidad, los fármacos utilizados para ella y los signos considerados como positivos.

**Métodos:** Se realizó una búsqueda no sistemática de publicaciones en bases de datos médicas que incluyeron MedLine, SciELO y Embase.

**Resultados:** La aplicación de la dosis de prueba previa a la inyección total de anestésico local ayuda a detectar la colocación inadvertida de una aguja o catéter en el espacio intravascular o subaracnoideo.

##### Palabras clave:

Anestesia de conducción  
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*Conclusiones:* La dosis de prueba debe utilizarse siempre que se utilicen dosis críticas de anestésico local o incluso dosis normales en pacientes con factores de riesgo. En analgesia para trabajo de parto la dosis de prueba no es necesaria.

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## Introduction

In all procedures where substantial doses of local anesthetic are used there is a possibility of the inadvertent injection into the intravascular or subarachnoid space, or of massive systemic absorption and subsequent toxicity.

Even at therapeutic doses, the inadvertent administration of the local anesthetic into the intravascular space may have fatal consequences, and resuscitation following local anesthetic-induced circulatory collapse is very difficult.<sup>1</sup> Consequently, early identification, a high degree of suspicion, and constant application of various preventive measures are required.<sup>2</sup>

The consensus of the American Society of Regional Anesthesia underscores the importance of prevention in reducing the frequency and severity of toxicity due to local anesthetics. Although imperfect, the test dose is the most reliable method for the early detection of intravascular<sup>3,4</sup> or intra-spinal placement of a needle or catheter.

The goal of the test dose in regional blocks is to rule out inadvertent intravascular injection, while in epidural blocks the goal is to rule out the presence of the needle or the catheter either in the subarachnoid or the intravascular space.

The use of the test dose is not standardized, as there are multiple controversies regarding its safety, and there is no consensus about the dose, the anesthetic or the type of drug to be used. In obstetrics, for example, despite the fact that not giving a test dose before an emergency cesarean section is associated with severe consequences for the mother and the fetus, most obstetric anesthesiologists in Britain do not use a test dose<sup>5</sup> in patients, previously managed with peridural analgesia, taken to emergency cesarean section. In our setting, although there are no statistics, this practice is also very common.

Hence the importance of reviewing the indications, utility, positive results, and the way of using the test dose.

## Methods

A non-systematic search was conducted in medical database publications including MedLine, SciELO and Embase. The following MESH terms were used: regional anesthesia and test dose, local Anesthetic and Toxicity.

### The test dose

Ideally, a test dose must detect the wrong placement or migration of the needle or catheter into the intravascular or the subarachnoid space, and never yield a false positive response. It must be safe, effective and reliable, allowing practical interpretation within a reasonable period of time.<sup>6,7</sup>

In order to detect subarachnoid placement, the test dose must prevent a high block leading to respiratory problems or cardiovascular instability.<sup>8,9</sup> In order to detect intravascular placement, it must be able to elicit clear clinical signs and symptoms of toxicity of rapid onset, either cardiovascular or of the central nervous system; these should resolve rapidly and have little probability of causing harm.<sup>10</sup>

Multiple studies have tried to determine the components of an effective test dose.<sup>9-12</sup> Moore and Batra conclude that the test dose for peridural block must contain 0.015 mg of epinephrine in order to detect the intravascular component, and local anesthetic to induce prompt spinal anesthesia.<sup>13</sup>

The use of lidocaine as a single component of the test dose has been described, with reports of presentation of atypical symptoms.<sup>14</sup> When direct intravascular injection occurs, prodromic signs may be missed or not appear, and the patient may move rapidly to develop seizure activity or symptoms of agitation or cardiac depression.<sup>15</sup> Particularly with the more potent local anesthetics, cardiotoxicity may occur simultaneously with seizures, or even precede them.<sup>14</sup>

Studies with ropivacaine and levobupivacaine have shown several limitations regarding the use of these two drugs as a test dose.<sup>16,17</sup>

The use of hyperbaric solutions has been recommended in test doses in order to limit the extent of the block, should the injection go to the subarachnoid space.<sup>18-22</sup> However, due to the commercial unavailability of preparations containing hyperbaric lidocaine and epinephrine, many authors continue to recommend the dextrose-free solution.<sup>21,22</sup>

Hemodynamic changes brought about with the test dose with epinephrine are usually not observed or are hidden or diminished in the elderly, in patients with sedation, beta-blockers or under general anesthesia, in women in labor<sup>3-5,13</sup> and in patients with low output.<sup>2</sup> This has created the need for alternative methods for determining whether the catheter or needle for regional block has been placed in the intravascular space. Some proposed methods include: an injection of 1-2 cm<sup>3</sup> of air during chest auscultation, using Doppler evidence for the presence of air.<sup>23</sup> In children under general anesthesia, changes in T-wave amplitudes have been described after administering epinephrine, as a reliable indicator of accidental intravenous injection.<sup>6,24-26</sup> In labor, it has been found that fentanyl can be used reliably and safely as an intravenous test dose.<sup>27,28</sup>

Among the various options, only fentanyl and epinephrine meet the suggested applicability and reliability standards for the detection of intravascular injection, according to the American Society of Regional Anesthesia. It has been shown that 100 mcg of intravenous fentanyl produces reliable symptoms of drowsiness and sedation in patients in labor.<sup>4,27</sup> As for epinephrine, a dose of 10-15 mcg/ml has a positive predictive value and 80% sensitivity for the detection of intravascular injection in adults if heart rate increases by 10 or more beats

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