

LABOR ANALGESIA – YESTERDAY, TODAY, TOMORROW

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The pain during childbirth, as one of the greatest pains in life, and pain relief during that intense pain have their own rich history. That history is a fascinating intersection of medicine, culture, religion, and women's rights.

In 1847 Dr. James Young Simpson administered ether to a woman with a deformed pelvis during childbirth which is a huge step forward in the progress of Western civilization¹. Few years later John Snow successfully administered chloroform to Queen Victoria during the birth of her eighth child, Prince Leopold. Although controversial due to moral and religious objections these represents the beginning of the modern era of obstetric anesthesia. The development of neuraxial anesthesia in obstetrics date back to the late 19th century with the intrathecal use of cocaine, the first epidural catheter appeared in the 1930s, in the 1960s 70s epidural analgesia gained popularity, and since the 1980s, has experienced a real boom². Opioids have been used in obstetrics for over 100 years; the beginnings are with a mixture of morphine and scopolamine called "twilight sleep"³, and since the 1950s, meperidine-pethidine has been used. Opioids such as fentanyl and alfentanil have proven to be insufficiently good in the past due to insufficient analgesia and prolonged concern for the health of the newborn⁴. The emergence of remifentanil in the 1990s opened a new opportunity for intravenous labor analgesia.

Today, the goal of modern obstetric anesthesia is to offer the mother safe and effective pain relief during labor, focusing on the mother's wishes and, above all, her well-being. Obstetric anesthesia goes far beyond just pain relief and anesthesia during labor. Day by day obstetric anesthesiologists increasingly provide high-quality obstetric care for both healthy and high-risk obstetric patients. Neuroaxial techniques are the most effective and commonly used techniques for analgesia during labor. Epidural analgesia is the gold standard for analgesia in obstetrics. In addition to epidural analgesia, combined spinal epidural (CSE) and the recently popular dural puncture epidural (DPE) techniques are also very commonly used and are particularly suitable for conversion to anesthesia for cesarean section^{5,6}. Spinal techniques (single-shot spinal technique and continuous spinal) provide a faster onset of analgesia, excellent analgesia, including sacral analgesia, but are used less frequently because of their short duration of action. In addition to neuraxial anesthesia techniques, there are many alternative methods. These methods can provide some degree of analgesia, with moderate maternal satisfaction, they are much less invasive, but have their own side effects (mostly sedation and respiratory depression). These methods can be particularly useful in patients in whom neuraxial techniques are contraindicated or unavailable. Pharmacological methods include fentanyl, meperidine, mixtures of oxygen and nitrous oxide, and more and more popular remifentanil⁷. There are also non-pharmacological options for pain relief during labor that are widely supported in holistic and obstetric models of care.

The future of obstetric anesthesia is likely to focus on safety, personalization, less invasiveness, widespread availability, and increased use of technology. What we can expect in the future are: portable analgesia devices in underdeveloped regions for global availability of painless childbirth; a personalized approach to each patient in terms of their genetic characteristics and

individual needs; the development of non-opioid analgesics for fewer side effects for both the mother and the newborn and the integration of nanotechnology with anesthesia for more precise, personalized, long-lasting, and safer control of labor pain⁸. And finally, labor analgesia using artificial intelligence (AI): whether it is computer software when placing central neuraxial blocks or the use of artificial neural networks in predicting the correct interval and the correct dose for breakthrough pain during maintenance of labor with epidural analgesia or prediction of nausea and vomiting and other side effects or early identification of patients who may develop complications in the postoperative period, etc⁹.

The future ahead is sure to be dynamic and innovative. Developing ethical frameworks for the use of AI in healthcare is equally important to ensure the safe and responsible use of AI. But what we should never forget is that AI greatly assists, but does not eliminate the need for a trained obstetric anesthesiologist. At least for now...

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