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Review

Regional anesthesia in pediatrics – Non-systematic literature review[☆]



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ABSTRACT

Introduction: The use of pediatric regional anesthesia has grown to become the standard of care, because of its effective pain control, improved safety profile of the local anesthetic agents, in addition to the introduction of ultrasound.

Objective: To perform a non-systematic review of pediatric regional anesthesia.

Methods and materials: A search was conducted on the available scientific evidence in databases (Pubmed/Medline, ScienceDirect, OVID, SciELO), for a non-systematic review.

Conclusions: The use of pediatric regional anesthesia has increased due to its notable effect on pain management and furthermore as a result of the incremented use of ultrasound technology.

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Anestesia regional en pediatría – Revisión no sistemática de la literatura

RESUMEN

Introducción: El uso de anestesia regional en niños ha aumentado hasta convertirse en estándar de manejo, debido al efectivo control del dolor, mejor perfil de seguridad de anestésicos locales y a la implementación del ultrasonido.

Palabras clave:

Anestesia de conducción
Pediatría

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Ultrasonografía
Bloqueantes neuromusculares
Anestésicos locales

Objetivo: Realizar una revisión no sistemática sobre evidencia científica disponible en anestesia regional pediátrica.

Métodos y materiales: Se realizó una búsqueda, sobre la evidencia científica disponible, en bases de datos (Pubmed/Medline, ScienceDirect, OVID, SciELO), para realizar una revisión no sistemática.

Conclusiones: El aumento en el uso de la anestesia regional pediátrica, se debe a que proporciona control adecuado del dolor y al uso del US. La realización de bloqueos en niños anestesiados o sedados es más segura que en pacientes despiertos.

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Introduction

Notwithstanding the benefits of pediatric regional anesthesia (PRA), just a few practitioners originally used it. During the last decade, the use of PRA has grown¹, due to the introduction of local anesthetics (LA) with improved profiles and tools such as ultrasonography that provides improved safety and has been associated with better nerve blocks². However, with the exception of ilio-hypogastric and ilio-inguinal nerve blocks (II-IH), the safety advantages of ultrasound (US) over the traditional techniques have not been proven in children because of the limited number of trials³.

PRA provides intra- and postoperative anesthesia and is considered an integral part of the pain management guidelines⁴, in addition to preventing the harmful effects of improper pain management⁵.

Ultrasound guidance is not totally risk-free. A number of trials have shown that a practitioner that begins training may make mistakes when visualizing the needle and as a result of inadvertent probe movements. For this reason, the American Society of Regional Anesthesia prepared a document recommending the inclusion of US-guided regional anesthesia training as part of the medical school syllabus⁶.

The purpose of this article was to review the literature on the key aspects of PRA techniques.

Methodology

A non-systematic literature search was performed using PUBMED/MEDLINE, ScienceDirect and OVID, based on the terms "regional anesthesia", "pediatric", "ultrasound", and "new local anesthetics". The search and the selection of articles were done in an independent manner, and were restricted to meta-analysis, systematic reviews, Cochrane reviews, clinical essays, and non-systematic reviews. The date of publication was not limited and no Spanish articles were included.

Historical evolution

The history of PRA began with the discovery of the anesthetic properties of cocaine. Bier introduced spinal anesthesia and two of his patients were children⁷. Gaston Labat began to teach

RA and wrote the book: *Regional anaesthesia: Its techniques and clinical applications*⁸.

The number of PRA reports has increased as pediatric anesthesia has evolved. Despite the considerable interest in PRA since 1980, its use was not generalized because general anesthesia was the standard, in addition to the existing concern about causing neurological injury⁹ to the sedated or anesthetized patient.

In 1998 over 50 pediatric anesthesiologists published an article¹⁰ showing that the outcome of a nerve block in an anesthetized child is safer than in a patient that is awake and excited. Other authors wrote an editorial called *Regional Anesthesia: children are different*, stressing the need to avoid considering pediatric patients as small adults¹¹. Later on, other papers were published describing new techniques, local anesthetics, and adjuvants^{12,13}. Today, RA represents an unquestionable advantage for pain control and plays a relevant role in clinical practice¹⁴.

Neuraxial blocks

Epidural and caudal

Epidural analgesia, including the caudal approach, has been the cornerstone for postoperative pain management in children. It is currently indicated for open chest surgery, major abdominal and spine surgery. The current trend in lower limb surgery is the use of peripheral nerve blocks, including perineural catheters¹⁵.

The risk of serious complications is 1:10,000 in epidural anesthesia and 0.2:10,000 in caudal anesthesia¹⁵. The anatomic characteristics of children should be considered in order to avoid accidentally puncturing important anatomical structures⁶.

Neuraxial blocks in children based on anatomical landmarks are safe and currently there is no evidence of the need for the routine use of ultrasound^{16,17}.

The loss of resistance in the smaller patients should be done with air because it facilitates the identification of any unintended puncture of the dura mater⁶. The advancement of caudal catheters in neonates is not recommended because of the high rates of contamination¹⁵. In older patients, the recommended approach is from the low lumbar area, ideally inserting the catheter as close as possible to the surgical site. Visualizing the tip of the catheter using ultrasound,

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