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Morphine with Bupivacaine versus Bupivacaine Only in Caudal Analgesia in Pediatrics Undergoing Hernia Repair

Thesis

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بسم الله الرحمن الرحيم

قالوا
سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

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List of Abbreviations

Ach	:	Acetylcholine
ADRs	:	Adverse Drug Reactions
AP	:	Anterior-posterior
BK	:	Bradykinin
CNS	:	Central Nervous System
CSF	:	Cerebrospinal fluid
CEM	:	Caudal epidural morphine
EREM	:	Extended-release epidural morphine
FLACC	:	Face, legs, activity, cry, consolability
GABA	:	Gamma amino butyric acid
HR	:	Heart rate
5-HT	:	5-Hydroxy trebtamine
IV	:	Intravenous
NMDA	:	N-methyl-D-aspartate
NO	:	Nitric oxide
PAG	:	Periaqueductal gray matter
PCA	:	Patient controlled analgesia
PSIS	:	Posterior superior iliac spine
RR	:	Respiratory rate
SCL	:	Sacrococcygeal ligament

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Introduction

Pain is one of the most misunderstood, underdiagnosed, and untreated medical problems, particularly in children. New Joint Commission on Accreditation of Health Care Organization regards pain as fifth vital sign and requires caregivers to regularly assess pain. Inadequate pain relief during childhood may have long-term negative effects including harmful neuroendocrine responses, disrupted eating and sleep cycles and increased pain perception during subsequent painful experiences. Postoperative pain can result in an uncooperative and restless child. Hence, it is preferable to prevent the onset of pain rather than to relieve its existence ***(Al-Zaben et al., 2015)***.

Various multimodal techniques have been designed for pediatric pain relief. These include both systemic and regional analgesia. The most commonly used regional technique is caudal epidural block ***(Xiang et al., 2013).***

The caudal epidural block involves placing a needle through the sacral hiatus to deliver medications into the epidural space. This approach to the epidural space is not only widely used for surgical anesthesia and analgesia in pediatric patients but also popular in managing a wide variety of chronic pain conditions in adults advantages of the caudal block are early extubation, ambulation, and decreased risk of chest infections, decreased postoperative analgesic requirements, and early discharge ***(Kim et al., 2014).***

Local anesthetics alone for caudal epidural block provide good operative conditions, but they have short duration of postoperative analgesia. Therefore, various adjuvants such as opioids, clonidine and midazolam were added to local anesthetics in caudal epidural block to achieve quick, dense and prolonged block ***(Gowala et al., 2009).***

Morphine is a pain medication of the opiate type which is found naturally in a number of plants and animals. It acts directly on the central nervous system (CNS) to decrease the feeling of pain. It can be taken for both acute pain and chronic pain. It can be given by mouth, by injection into a muscle, by injecting under the skin, intravenously, into the space around the spinal cord, or rectally.

Adverse effects of opioids :Itching, Nausea, Vomiting, Constipation, Drowsiness, dry mouth and Urine retention ***(Rockwood et al, .2009).***

Aim of the Work

The present study aims to evaluate the effect of adding Morphine to bupivacaine versus bupivacain alone in caudal analgesia for management of post operative pain in pediatrics undergoing hernia repair regarding density of the block, duration of analgesia and occurrence of complication

Chapter (I)

Anatomy of Caudal Canal

The anatomic features and variations relevant to caudal epidural block were the focuses of several recent reports. A thorough knowledge of the relevant anatomy may improve the success rate of caudal epidural needle placement while minimize the risks of complications.

The sacral cornua are vestigial remnants of the inferior articular processes of the 5th sacral vertebra and presented as two bony prominences at the caudal end of sacrum. Palpating the bilateral sacral cornua is essential to locate the sacral hiatus in the conventional landmark-based technique. However, the sacral cornua are not always palpable ***(Sekiguchi et al., 2004).***

Sacral Hiatus

The sacral hiatus, resulting from failure of fusion of lamina and spinous process of lower sacral vertebrae, is the caudal termination of the sacral canal. The sacral hiatus is bordered laterally by two sacral cornua and could be palpable as a dimple in between. Posteriorly, the sacral hiatus is covered by the skin, subcutaneous fat, and sacrococcygeal ligament (SCL). During caudal epidural block, inserting a needle into the sacral hiatus is essential to access the sacral canal. However, certain anatomic features and variations of sacral hiatus may make it difficult or impossible to insert a needle into the caudal epidural space or predispose this procedure to complications such as dual puncture ***(Aggarwal et al., 2009).***

The mean anterior-posterior (AP) diameter of sacral hiatus at its apex ranges from 4.6 ± 2 mm to 6.1 ± 2.1 mm and decreased with age. In clinical settings, an AP diameter of sacral hiatus at the apex of less than 3.7 mm was associated with difficulty in inserting a needle into the caudal epidural space by blind technique ***(Sekiguchi et al., 2004).***

Location of the Apex of the Sacral Hiatus

The apex of sacral hiatus is most commonly located at the S4 level (65-68%), followed by the S3 and S5 level (around 15% at each level) and the S1 to S2 level in 3-5% of cases. Complete agenesis of posterior wall of sacral canal (failure of fusion of sacral laminae) was noted in 1% of cases. The higher the apex of sacral hiatus is located, the shorter the distance between it and the dural sac termination could be. Accidental dural puncture might occur if the needle is inserted near the apex of the sacral hiatus that is located at a high level of sacrum. On the other hand, the lower the apex of sacral hiatus is located, the shorter the length of the SCL could be. A length of the SCL of less than 17.6 mm was associated with difficult caudal epidural block by blind technique ***(Aggarwal et al., 2009).***

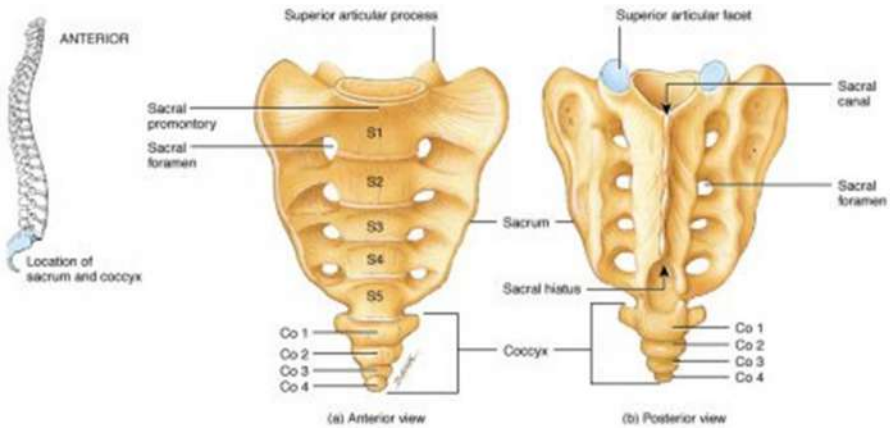

Fig. (1): A sacral hiatus in dry human sacra. ***(Nagar SK.2004)***

Spinal Cord And Dural Sac

Understanding of the anatomic differences between adults and infants are crucial in order to safely, and in a technically proficient fashion administer spinal anesthesia in children. (Table 1)

Table (1): Anatomic differences in Spinal canal between childrens and adults

Conus medullaris ends at L2-L3 compared to L1 in adults
Small pelvis with sacrum that starts more cephalad
Dural sac ends more caudex

The spinal cord terminates at a much more caudad level in neonates and in infants compared to adults, Fig. 1. The conus medullaris ends at approximately L1 in adults and at the L2 or L3 level in neonates and infants. In order to avoid potential injury to the spinal cord, dural puncture should be performed below the level of the spinal cord. The dural sac in neonates and infants also terminates in a more caudad location compared to adults, usually at about the level of S3 compared to the adult level of S1. The more caudad termination of the dural sac makes it more likely to have an inadvertent dural puncture during performance of a single-shot caudal block if the caudal needle is advanced too far into the caudal epidural space ***(Sekiguchi et al., 2004).***