A COMPARISON BETWEEN CAUDAL EPIDURAL BUPIVACAINE WITH BUPIVACAINE PLUS NALBUPHINE FOR POSTOPERATIVE ANALGESIA IN CHILDREN

Thesis

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Abstract

Any expertise acquired in this field should be extended into the postoperative period, which is the period of severe, intolerable pain requiring attention. So there is a need for extended analgesia without any side effects to achieve this goal.There is some evidence that early analgesic may reduce the incidence of chronic pain after surgery via suppression of central neural sensitization before the nociceptive stimulus triggered the activation of pain pathway.Caudal block is increasingly performed in pediatric regional anesthesia practices. It is preferred in order to relieve postoperative pain in children of all age groups undergoing pelvi-abdominal or lower limbs surgeries. Day-case surgical procedures in pediatrics have increased. Therefore, postoperative pain should be effectively relieved in a safe manner. These patients have a shorter hospital stay, and side effects may not be noticed at home. Caudal block has the importance in decreasing consumption of systemic analgesics.

Keyword

PDPH, **CHEOPS, BUPIVACAINE**, **POSTOPERATIVE**, **NALBUPHINE**

List of Abbreviations

CA:	**Caudal anesthesia**
CEB:	**Caudal Epidural Block**
CSF:	**Cerebrospinal Fluid**
PDPH:	**Post Dural Puncture Headache**
LA:	**Local Anesthetics**
AAG:	**Alpha- 1-acid glycoprotein**
EDTA:	**Ethylenediamine tetraacetic acid**
MEGX:	**Monoethylglycinexyl idide.**
Cmax:	**Peak plasma concentration.**
PaO2:	**Arterial oxygen tension.**
PABA:	**Para-Amino Benzoic Acid**
CNS:	**Central Nervous System**
TRI:	**Transient Radicular Irritation**
ETT:	**Endotracheal tube**
HR:	**Heart rate**
MAP:	**Mean arterial pressure**
AIIMS:	**All India Institute of Medical Sciences**
MAC:	**Minimum Alveolar concentration**
PCEA:	**Patient Controlled Epidural Analgesia**
VAS:	**Visual Analogue Scale**
CHEOPS:	**Children Hospital of Eastern Ontario behavioral scale**

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INTRODUCTION

Caudal anesthesia for pediatric surgery was first reported in 1933.[1] Since then studies have described the indications for pediatric caudal block, the level of analgesia, recommended doses and pharmacokinetics of local anesthetics used in caudal anesthesia and the general or specific advantages and disadvantages of the technique .[2-5]

Caudal anesthesia (CA) is epidural anesthesia of the cauda equina roots in the sacral canal, accessed through the sacral hiatus. CA is a common pediatric regional technique that is quick to learn and easy to perform, with high success and low complication rates. CA provides high quality intraoperative and early postoperative analgesia for sub-umbilical surgery.

In children, CA is most effectively used as adjunct to general anesthesia and has an opioid-sparing effect, permitting faster and smoother emergence from anesthesia. [6]

A single shot caudal anesthetic provides relatively brief analgesia, on the order of 4 to 8 hours depending on the agent used, and is appropriate for inpatient and outpatient management strategies.

A successful caudal anesthetic blockade affords the anesthesiologist the opportunity to reduce intraoperative use of volatile anesthetic agent and to use a narcotic-sparing approach that

ultimately may benefit the patient while providing a better postoperative course with less nausea and vomiting. [7]

Prolongation of anesthesia can be achieved by adding various adjuvants, such as opioids and non-opioids like clonidine, ketamine, midazolam and neostigmine, with varying degrees of success. [8-12]

Nalbuphine also was added in epidural analgesia and provide an increase in the efficacy and the duration of postoperative analgesia.[13]

AIM OF THE WORK

To compare the effects of plain bupivacaine 0.25%and bupivacaine 0.25% plus nalbuphine 0.1 mg/kg single-shot caudal epidural for postoperative pain relief in children undergoing surgeries of lower half of the body.

CAUDAL CANAL BLOCK

Caudal Epidural Block

Caudal anesthesia has been used for many years and is the easiest and safest approach to the epidural space. When correctly performed there is little danger of either the spinal cord or dura being damaged.

Caudal or sacral epidural block is gaining wider publicity because of proven efficacy in pediatric patient pain management, acute & chronic pain management, spinal endoscopy & epidural adhesiolysis. Though caudal technique was reported earlier than lumbar technique, the first technique lost much of its clinical utility. This was because of inconsistent results secondary to inadequate understanding of anatomy.[14]

Applied Anatomy

The caudal (sacral) canal extends from the upper border of sacral bone (in relation to lumbar epidural space) to the sacral hiatus. Whole of this canal is enclosed in sacral bone.

Sacrum

The five sacral vertebrae unite to form sacrum. The sacrum articulates with fifth lumbar vertebra superiorly, coccyx inferiorly & iliac bones laterally. The anterior surface of sacrum has four paired openings for the exit of anterior rami of sacral nerves ***(figure 1).***

The posterior surface is convex & rough in nature because of fusion of vertebral elements. Median sacral crest runs over the posterior surface (thick crest represents the fused portions of sacral spinous process). The posterior surface has four pairs of foramina for escape of posterior rami of sacral nerves. These foramina are smaller when compared to anterior foramina. The laminae of fifth sacral vertebra (sometimes fourth also) fails to fuse; the resultant gap is called the sacral hiatus. On either side of sacral hiatus are the remnants of the inferior articular processes of the fifth sacral vertebra which are called the sacral cornua. The sacral hiatus is covered by sacrococcygeal membrane which is an extension of the ligamentum flavum and is pierced by coccygeal & fifth sacral nerves. Medial to sacral foramina intermediate sacral crest can be appreciated. They are formed by fusion of transverse process of sacral vertebrae. These crests end at sacral cornua, which are also nothing but remnants of articular process of fifth sacral vertebra. (14)

The sacrum of children is also more narrow and flat compared to the adult population. (6)

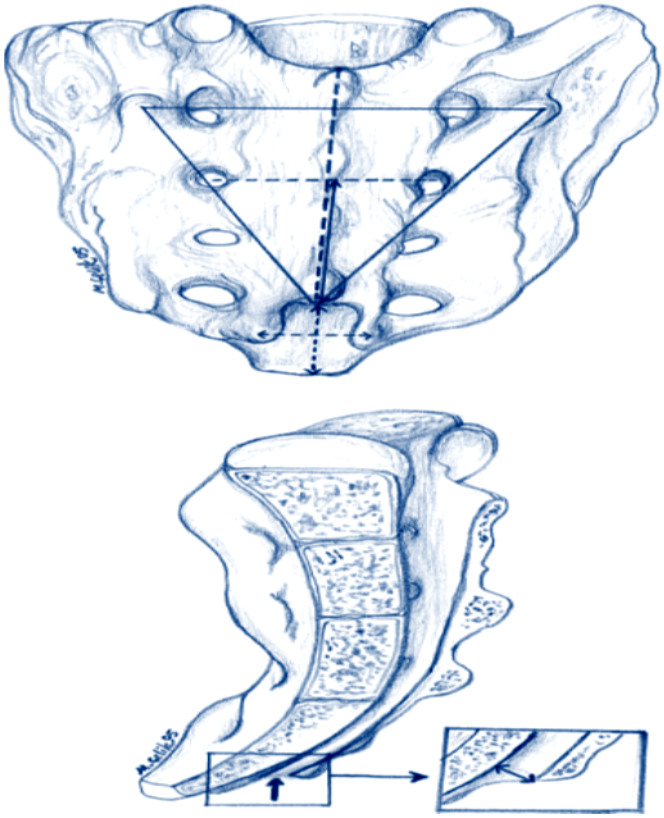

Figure 1: Anatomy of the sacrum, anterior and lateral view. [16]

Coccyx

Coccyx, otherwise called tail bone gets attached superiorly to sacrum & inferiorly to anococcygeal ligament. Coccyx is actually made up of 3 to 5 vestigeal remnants of vertebrae. The inferior portion of coccyx is mobile & prone for fractures. Coccyx curves anteriorly & superiorly. Ganglion impar is situated at the junction of sacrum & coccyx. [14]

Sacral (caudal) canal

This canal has a total volume of 30-35ml in adults after the contents have been evacuated (cadaver). The spinal cord ends at the lower border of L_1 vertebra, subsequently the sacral & coccygeal nerves pass to sacral canal as cauda equina. The dura ends at S_2 level & the pia continues as filum terminale to get attached to coccyx. The sacral nerve roots (upper four) anterior rami exit through anterior sacral openings & posterior rami through posterior sacral openings. As mentioned earlier, the fifth sacral nerve & coccygeal nerves traverse the canal & pierce through sacrococcygeal membrane to come out. The vertebral venous plexus continues into sacral canal, they are more concentrated towards anterior surface. The remainder of the sacral canal is filled with adipose tissue, which is subject to an age-related decrease in its density. This change may be responsible for the transition from the predictable spread of local anesthetics administered for caudal anesthesia in children to the limited and unpredictable segmental spread seen in adults. The sacral hiatus is covered only by skin, a subcutaneous fatty layer and the sacrococcygeal membrane. The most distal portion of the dural sac and the sacral hiatus usually terminates between levels S1 and S3. [15] ***(Figure 2).***

Anomalies in the position of the dural sac reflection can result in unintended dural puncture. [15]

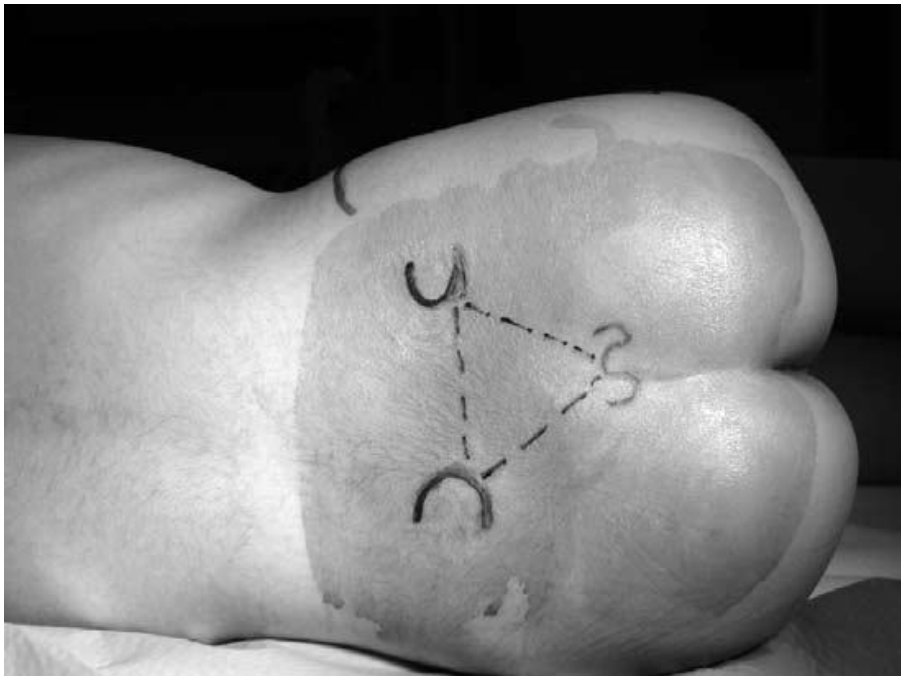

Figure 2: Surface anatomy for sacral hiatus localization. [6]

The sacral canal contains:

1. The terminal part of the **dural sac**, ending between S1 and S3.

2. The five sacral nerves and coccygeal nerves making up the **cauda equina**. The sacral epidural veins generally end at S4, but may extend throughout the canal. They are at risk from catheter or needle puncture.

3. The **filum terminale** - the final part of the spinal cord which does not contain nerves. This exits through the sacral hiatus and is attached to the back of the coccyx.

4. **Epidural fat**, the character of which changes from a loose texture in children to a more fibrous close-meshed texture in adults. It is this difference that gives rise to the predictability of caudal local anesthetic spread in children and its unpredictability in adults.