Ain Shams University
Faculty of Medicine
Department of
Anesthesiology,
Intensive Care and Pain
Management

Comparison between Bupivacaine with Neostigmine and Bupivacaine alone in Caudal Block for Pediatrics undergoing Lower Abdominal Surgery

Submitted for Partial Fulfillment of Master Degree in Anesthesia

By

Ahmed Ibrahim Ali Sharaf

M.B.,B.Ch (Ain Shams University)

Supervised By

Prof. Dr. Bahaa Eldin Eweis Hassan

Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Prof. Dr. Hatem Saied Abdelhamid

Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Maha Sadek Elderh

Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
2018

Acknowledgment

*First of all, all gratitude is due to **Allah** almighty for blessing this work, until it has reached its end, as a part of his generous help throughout my life.*

*Really, I can hardly find the words to express my gratitude to **Prof. Dr. Bahaa Eldin Hassan Eweis,** Professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, for his supervision, continuous help, encouragement throughout this work and tremendous effort he has done in the meticulous revision of the whole work. It is a great honor to work under his guidance and supervision.*

*I cannot forget the great help of **Prof. Dr. Hatem Saied Abdelhamid**, Professor of Anesthesia, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University for her invaluable efforts, tireless guidance and for her patience and support to get this work into light.*

*I would like to express special thanks to **Dr. Maha Sadek Elderh,** Lecturer in Anesthesia, Intensive Care and Pain Management, Faculty in Medicine, Ain Shams University for his faithful supervision, precious help and continuous support throughout this work.*

Last but not least, I dedicate this work to my family and friends, whom without their sincere emotional support pushing me forwards, this work would not have ever been completed.

Ahmed Ibrahim Ali Sharaf

List of Contents

List of Abbreviations

Abbrev.	Full term
AP	: Antero-posterior
BP	: Blood pressure
CB	: Caudal Block
CNS	: Central nervous system
ECG	: Electrocardiogram
GABA	: Gaba-amino-butyric acid
HR	: Heart rate
IU	: International unit
IV	: Intravenous
LAS	: Local anesthetics
MAP	: Mean arterial blood pressure
MOPS	: Modified objective pain score
NMDA	: N-methyl-D-aspartate
PACU	: Post Anaesthesia Care Unit
pKa	: Ionization constant
RR	: Respiratory rate
SCL	: Sacrococcygeal ligament
SD	: Standard deviation
SPSS	: Statistical package for social sciences

List of Tables

List of Figures

Abstract

Background: Peripheral nerve blocks provide prolonged analgesia restricted to the site of surgery e.g. penile block for circumcision or sciatic nerve block for pediatric surgery. The drawback is not all anesthesiologists are familiar with the necessary spectrum of peripheral nerve blocks in children. That is why Caudal block is preferred as all types of surgery below the umbilicus can be covered by it: 'one technique fits all'. The main goal of caudal block is to provide postoperative pain relief, in addition it can be effective intraoperative and it is accepted that the block is performed in anesthetized children

Objectives:

The aim of this work is to compare Bupivacaine with Neostigmine and Bupivacaine alone as regard intraoperative hemodynamics and postoperative pain control for lower abdominal surgery in pediatrics.

Patients and Methods*:*

Prospective randomized controlled clinical Trial

Results: In the present study, we found that the use of Neostigmine, during single dose injection, as an additive to the local anesthetic bupivacaine in caudal epidural analgesia prolongs the duration of postoperative analgesia following lower abdominal surgery as in hernia repair compared with caudal bupivacaine alone. The addition of low dose Neostigmine 2 mic.gm/kg body weight to 0.25% Bupivacaine (1ml/kg body weight) significantly improved the quality as well as the duration of analgesia after hernia repair surgical procedure in children aged 1-6 year.

Conclusion: In conclusion, caudal bupivacaine plus 2μg/kg neostigmine provided excellent analgesia lasting up to 24 hours post-operative, without serious side effects and minimal additional analgesics thus providing a safe, simple and effective postoperative analgesia for children undergoing lower abdominal surgery

Keywords: Caudal Block, hernia repair, Neostigmine

INTRODUCTION

Pain is one of the most misunderstood, under diagnosed, and untreated medical problems, particularly in children. 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)*.**

In children, regional anesthesia procedures can be safely used to achieve intra- and postoperative analgesia in all age groups. Regional anesthesia is an essential element of a multimodal pain concept and should be performed on children wherever appropriate and possible ***(Ecoffey et al., 2010).***

An effective pain therapy improves the operative outcome, as an untreated surgical stimulus leads to a range of hemodynamic, hormonal, metabolic, immunological-inflammatory reactions and behavioral abnormalities. The use of regional anesthesia results in greater hemodynamic stability; The intraoperative opioid consumption is reduced, thus enabling a rapid and smooth recovery of children from anesthesia ***(Bosenberg, 2012).***

Caudal anesthesia is one of the most important pediatric regional anesthetic technique. The technique is relatively easy

to learn, has a remarkable safety record and can be used for a large variety of procedures ***(Schuepfer et al., 2000).***

Peripheral nerve blocks provide prolonged analgesia restricted to the site of surgery e.g. penile block for circumcision or sciatic nerve block for pediatric surgery. The drawback is not all anesthesiologists are familiar with the necessary spectrum of peripheral nerve blocks in children. That is why caudal block is preferred as all types of surgery below the umbilicus can be covered by it: 'one technique fits all'. The main goal of caudal block is to provide postoperative pain relief, in addition it can be effective intraoperative and it is accepted that the block is performed in anesthetized children ***(Krane et al., 1998).***

The use of an adjuvant as Neostigmine in caudal block with Bupivacaine for hernia repair surgeries is better, as it help in reducing the side effects of other adjuvant substances as opioids (itching, respiratory depression & drowsiness). It is an anticholinesterase drug, inhibits the breakdown of acetylcholine and induces analgesia by increasing cyclic guanidine monophosphate by generating nitric oxide, which shown to have better postoperative analgesic effects and increases the duration of caudal block ***(Bosenberg, 2012).***

AIM OF WORK

The aim of this work is to compare Bupivacaine with Neostigmine and Bupivacaine alone as regard postoperative pain control and hemodynamics for lower abdominal surgery as hernia repair in pediatrics, is the use of Neostigmine with Bupivacaine beneficial for the patient as regard decreasing the analgesia used after the operation?

Chapter 1

ANATOMY

Anatomy of Sacrum:

The sacrum is a large bone located at the terminal part of the **vertebral canal**, where it forms the posterior aspect of the pelvis. It is remarkably thick, which aids in supporting and transmitting the weight of the body.

Bony Landmarks:

The sacrum is formed by the fusion of the five sacral vertebrae. It has an inverted triangular, concave shape. The bone consists of a base, apex and four surfaces:

- **Base** – articulates superiorly with the fifth lumbar vertebra and its associated intervertebral disc.
- **Apex** – abuts the coccyx inferiorly.
- **Auricular surfaces** – located laterally on the sacrum, and shaped like the outer ear – hence the name. Each articulates with the auricular surface of the ilium.
- **Anterior and posterior surfaces** – provide attachment to pelvic ligaments and muscles.

Internally, the **central canal** of the vertebral column continues along the core of the sacrum and ends at the 4th sacral foramina, as the **sacral hiatus** ***(Sinnatamby C, Last R 2011).***

Surfaces of Sacrum:

There are two surfaces of the sacrum – a **coarse dorsal surface** and a relatively **smooth pelvic surface**. When the patient is standing, the pelvic surface faces anteroinferiorly while the dorsal surface is in the posterosuperior direction.

Dorsal Surface

The dorsal surface of the sacrum is coarse and rugged. This can be attributed to the **fusion** of the sacral vertebrae, which give rise to three bony ridges (or crests).

In the midline of the dorsal surface, there is a central ridge of bone, called the **median sacral crest.** It is formed by the fusion of the **spinous processes** of the first three sacral vertebrae. It gives attachment to the **supraspinous ligament** ***(Netter, 2014).***

The **intermediate sacral crests** are formed by the fusion of the sacral articular processes. The posterior sacroiliac ligaments are attached along this crest. It should be noted that the superior articulating process of S1 and the inferior articulating process of S5 are not fused. Therefore, the former articulates with the inferior articulating process of L5, while the

latter – also known as the **sacral cornu** – articulates with the **coccygeal cornu** (superior articulating process of coccyx) ***(Netter, 2014).***

Finally, the transverse processes of the five sacral bones fuse to form the **lateral sacral crests**, which offers a point of attachment to the posterior sacroiliac ligaments as well as the **sacrotuberous ligament.** Fortunately, the fusion of these processes is not complete, therefore the sacral nerve fibers are allowed to enter and leave the central canal through the four pairs of **posterior sacral foramina** ***(Netter, 2014).***

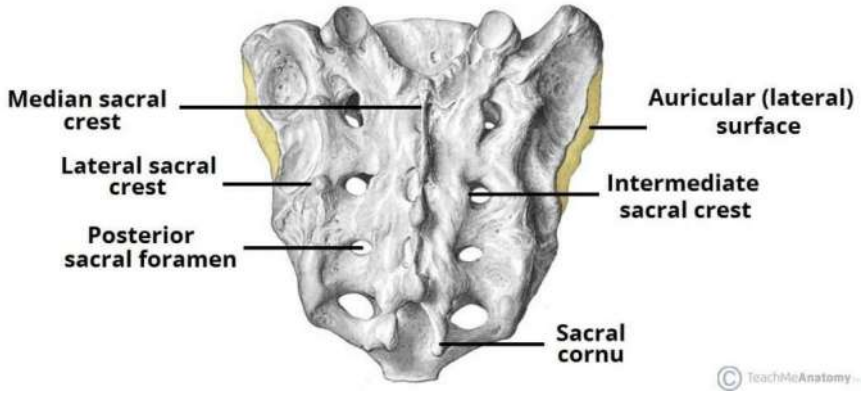

Figure (1): The posterior surface of the sacrum. The lateral surfaces are also partially visible

Pelvic Surface

The pelvic surface of the sacrum is less remarkable than the dorsal surface. In the adult, the surface is marked by four **transverse lines** – the remnants of the fused sacral intervertebral discs (fusion of the sacral vertebrae begins at age 20).

Superiorly, there is an anterior projection of bone, known as the **sacral promontory**. It forms the posterior margin of the **pelvic inlet** and as a result, it is serially continuous with the margin of the ala of the sacrum, arcuate line of the ilium, and the pectin pubis and pubic crest of the pubic bone ***(Netter, 2014).***

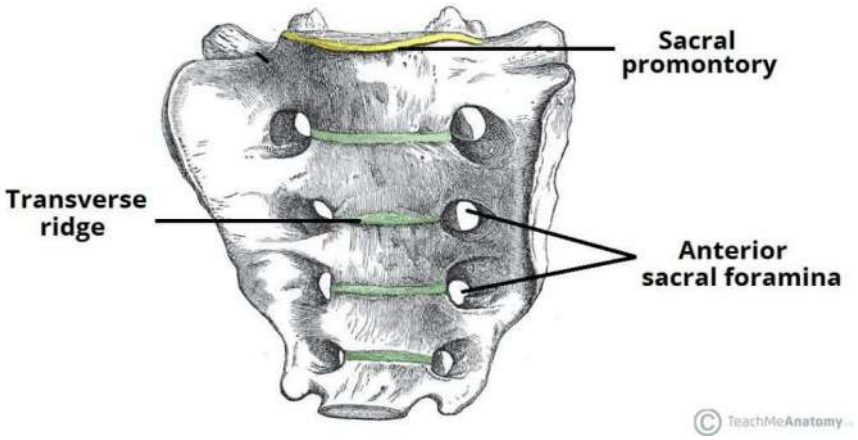

Figure (2): The anterior or pelvic surface of the sacrum

Neurovascular Relations:

As part of the pelvic girdle and vertebral column, the sacrum lies in close proximity to several important structures.

Spinal cord

The central canal of the sacrum is a place to the sacral fibers of the **cauda equina** (a bundle of spinal nerves that arise from the terminus of the spinal cord). The proximal parts of these fibers are contained within the **dural sac**, which terminates at about the level of S2.