

Comparing the analgesic efficacy of two different doses of dexmedetomidine as adjuvant to bupivacaine for pediatric patients undergoing supra-umbilical abdominal surgeries using caudal block

Randomized control trial

Thesis

Submitted for complete fulfillment of master degree in Anesthesia

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2016

ABSTRACT

Local anesthetics are commonly used for caudal analgesia, but the major problem is the relatively short duration of action, thus early analgesic intervention is needed in the postoperative period. A number of adjuvants, such as clonidine and dexmedetomidine, and others have been studied to prolong the effect of caudal analgesia [1, 2].

Dexmedetomidine, a centrally acting α 2-adrenergic agonist, has similar physiologic properties to clonidine.

In this study, we compared the effectiveness between two different doses of dexmedetomidine and bupivacain versus bupivacain alone in supra-umbilical pediatric surgeries. Thirty-six patients aged from 1 year till 6 years old will be randomly allocated into three groups:

Group A: will receive caudal bupivacaine 0.25%, 2 mg/kg (1ml/kg) and dexmedetomidine 0.5 μ g/kg.

KEY WORDS:

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Acknowledgment

First of all, I should thank Allah the greatest and most merciful not only for helping me through this work, but also for helping me all through my life.

I would like to express my deepest gratitude and thanks to **Prof. Dr. Saad El Basha Ahmed**, Professor of Anesthesia, Surgical Intensive Care and Pain Management, Faculty of Medicine –Cairo University for his kind continuous encouragement and great support throughout the work. It was a great honor to work under his meticulous supervision.

Also I am really deeply grateful to **Prof. Dr. Nevine Mahmoud Gouda**, Professor of Anesthesia, Surgical Intensive Care and Pain Management, Faculty of Medicine – Cairo University for her great help, valuable time, careful supervision, continuous advice and her efforts that made this work come to light.

I am also greatly indebted to **Dr. Ahmed kareem Abdelhady**, Lecturer of Anesthesia, Surgical Intensive Care and Pain Management, Faculty of Medicine – Cairo University for his careful and great support. He did not spare any effort in guiding me towards the best.

I am really thankful to everyone who took part in exhibiting this work to light.

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three groups

Figure 15 mean (SD) for time (hours) required to receive first analgesic dose. 82

Figure 16 Postoperative CHEOPS pain score over 24 hours 84

LIST OF ABBREVIATIONS

ACLS	<i>Advanced Cardiac Life Support</i>
ASA	<i>The American Society Of Anesthesiologists</i>
ASRA	<i>The American Society of Regional Anesthesia</i>
CNS	<i>Central Nervous System</i>
CPR	<i>Cardiopulmonary Resuscitation</i>
CVS	<i>Cardiovascular System</i>
DBP	<i>Diastolic Blood Pressure</i>
DVT	<i>Deep Venous Thrombosis</i>
GA	<i>General Anesthesia</i>
ICU	<i>Intensive Care Unit</i>
IL	<i>Interleukin</i>
LA	<i>Local Anesthetics</i>
LAST	<i>Local Anesthetic Systemic Toxicity</i>
MAP	<i>Mean Arterial Blood Pressure</i>
MODS	<i>Multi-organ Dysfunction Syndrome</i>
NCI	<i>National Cancer Institute</i>
NRM	<i>Nucleus Raphe Magnus</i>
PE	<i>Pulmonary Embolism</i>
PICU	<i>Pediatric Intensive Care Unit</i>
PRAN	<i>Pediatric Regional Anesthesia Network</i>
PSIS	<i>Posterior Superior Iliac Spine</i>
RAS	<i>Reticular Activating System</i>
SBP	<i>Systolic Blood Pressure</i>
SIRS	<i>Systemic Inflammatory Response Syndrome</i>
TEA	<i>Thoracic Epidural Anesthesia</i>
TNF α	<i>Tumor Necrosis Factor Alpha</i>
VAS	<i>Visual analog scales</i>

INTRODUCTION

Caudal block is one of the most popular and safe techniques in pediatric analgesia. With a high success rate, that can be used for any surgery below the level of the umbilicus.

Bupivacaine is the most commonly used local anesthetic in caudal anesthesia in pediatric practice, and it provides reliable, long lasting anesthesia and analgesia when given via caudal route. [1]

Prolongation of caudal block using a single-shot technique has been occurred by adding various adjuvants such as α_2 agonists like dexmedetomidine.

Dexmedetomidine is highly selective α_2 agonists having analgesic, anxiolytic, sedative and sympatholytic effect with high ratio of α_2/α_1 activity (1620:1 as compared with 220:1 for clonidine).[2]

This ensures that its action is selective for the central nervous system (CNS) without unwanted cardiovascular effects from receptor activation.

The stress response associated with supra umbilical procedures in pediatrics may cause changes in hormonal secretion.

Enhanced plasma cortisol level and suppressed anabolic hormones, such as insulin may have deleterious effects during the perioperative period if not attenuated may result in higher postoperative morbidity and longer intensive care unit (ICU) stay. [3]

It has been suggested that regional anesthesia can reduce stress response associated with surgical trauma.

REVIEW OF LITERATURE

ANATOMY OF CAUDAL AREA

Anatomy of caudal area

Caudal anesthesia (CA) is epidural anesthesia of the cauda- equina roots in the sacral canal, accessed through the sacral hiatus. it is a common pediatric regional technique that is quick to learn and easy to perform, with high success and low complication rates. it provides high quality intra-operative 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

The epidural space in a child can easily be reached with a caudal approach without the risk of dural puncture, as compared to an approach via the thoracic or lumbar route.

Single-shot caudal analgesia is the most useful and popular pediatric regional block. Pediatric anesthesiologists with extensive clinical experience attest to the ease of performance, reliability, and safety of the caudal block especially in patients weighing over 10 kg. [4]

- **Anatomy and boundaries:**

The sacrum is a large of an equilateral triangle, It articulates with the fifth lumbar vertebra above and the coccyx below (Figure 1). with its base identified by feeling the two posterior superior iliac processes. The caudal opening of the canal is the sacral hiatus (see Figure 1), roofed by the firm elastic membrane, the sacro-coccygeal ligament, which is an extension of the ligamentum flavum. [5]

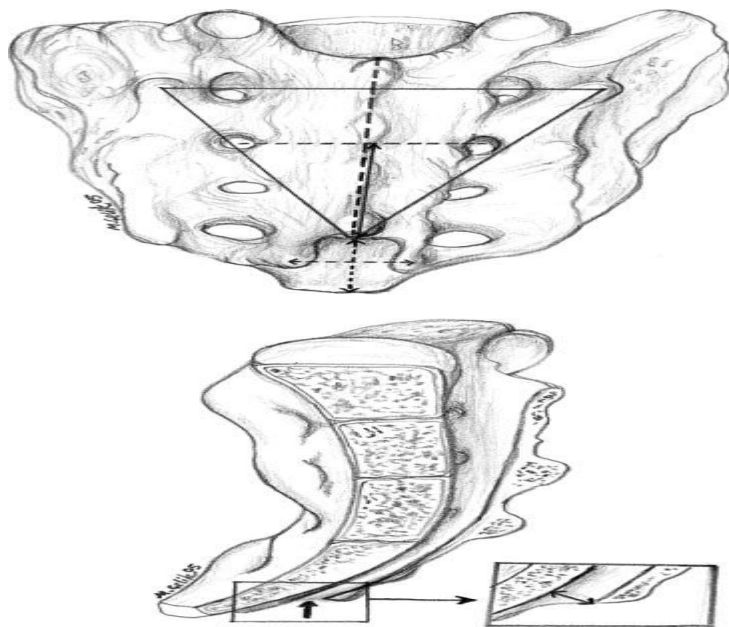


Figure 1: anatomy of sacrum

The remnants of the inferior articular process elongate downwards on both sides of the sacral hiatus. These two bony processes are called the sacral cornua (horns) and define important clinical landmarks during CA. [6]

The sacral hiatus is located at the distal (caudal) part of the sacrum and its lateral margins are formed by the two sacral cornua. The sacral hiatus is shaped by incomplete midline fusion of the posterior elements of the distal portion of the fifth or sometimes the fourth sacral vertebra. This inverted U-shaped space is covered by the posterior aspect of the sacro- coccygeal membrane and is an important landmark in CA. [6]

The hiatus is covered only by skin, a subcutaneous fatty layer and the sacro- coccygeal membrane. The distal most portion of the dural sac and the sacral hiatus usually terminate between levels S1 and S3. [6]