A comparative study between caudal and penile blockade in pediatric patients undergoing hypospadias repair

Thesis

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LIST OF ABBREVIATIONS

Abb.		Full Term
AAG	:	Alpha-1 acid glycoprotein
AP	:	Anteroposterior
ASA	:	American Society of Anesthesiologists
CA	:	Caudal anesthesia
CNS	:	Central nervous system
CPR	:	Cardiopulmonary resuscitation
DPNB	:	Dorsal penile nerve block
ECG	:	Electrocardiography
$ETCO_2$	:	End tidal CO_2
FLACC	:	Face, leg, activity, cry, consolability
G	:	Gauge
Hr	:	Hour
HR	:	Heart rate
HS	:	Highly significant
IV	:	Intravenous
Kg	:	Kilogram
LA	:	Local Anesthetics
Ml	:	Milliliter

LIST OF ABBREVIATIONS

Abb.		Full Term
MM	:	Millimeter
Mg	:	Milligram
Mcg	:	Microgram
MBP	:	mean blood pressure
MAC	:	Minimal alveolar concentration
N	:	Number
NIBP	:	Noninvasive blood pressure
NS	:	Non-significant
Na	:	Sodium
NSAID	:	Non-steroidal anti-inflammatory drugs
PACU	:	postanesthesia care unit
PO	:	per oris
PR	:	per rectal
PSIS	:	Posterior superior iliac spine
SCL	:	sacrococcygeal ligament
S	:	Significant
Spo_2	:	Oxygen saturation in blood
SD	:	Standard deviation
VC	:	Ventral curvature

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INTRODUCTION

Pain relief after surgery continues to be a major medical challenge despite a significant improvement over the last decade in understanding acute pain mechanism.

Peri-operative pain relief in children can be established either by using various analgesics or opioids during a conventional general anesthesia or by applying various regional nerve block techniques along with general anesthesia.

Regional anesthesia, in combination with general anesthesia, is frequently used for children undergoing surgical procedures. The goal of this technique is a smoother intraoperative course and minimal requirements of general anesthetics, causing a faster, smoother wake up, decreased stress response and excellent pain relief in the postoperative period.

Hypospadias is the second most common genital birth defect in males, following cryptorchidism. It has an incidence of one in 350 live male births; also it is one of the common surgical procedures performed by pediatric urologists **(Tekgul S, et al, 2008)**.

Regional techniques are more effective in pain control than systemic opioids, non-steroid anti-inflammatory drugs, and paracetamol for postoperative analgesia in hypospadias repair **(Telgarsky, et al., 2006**).

The most preferred and common techniques are Penile block and caudal block **(Ivani , Mosseti . 2009).**

Caudal anesthesia is recommended for most surgical procedures of the lower part of the body, specifically below the umbilicus, including inguinal hernia repair, urinary and digestive tract surgery and orthopedic procedures on the pelvic girdle and lower extremities**. (Miller, Fleisher, 2010).**

Recently, due to improved composition, dosage and concentration of local anesthetics and low incidence of negative side effects, such as motor blockade and postoperative nausea and vomiting, occurring mostly after recovery from general anesthesia; caudal anaesthesia performed after induction of general anesthesia has become one of the most used and accepted regional blocks for children undergoing hypospadias repair**. (Metzelder , et al., 2010).**

For decades, penile block was known to be widely and effectively used for various types of penile reconstructive surgery. **(Metzelder, et al., 2010).**

Also it has been firmly established that penile nerve block decreases postoperative pain in children undergoing hypospadias repair**. (Chhibber, et al,. 1997).**

An advantage of penile block over caudal anesthesia is that there is minimal sensory and motor block to the lower extremities, which might hinder ambulation postoperatively in a day surgery patient **(Wider, Goldschneider, 2014).**

AIM OF THE WORK

In this study, the aim is to compare postoperative analgesia between caudal anesthesia versus penile block with bupivacaine in elective hypospadias repair in pediatric patients.

Surgical Anatomy

Hypospadias:

Hypospadias is a common congenital anomaly in which the anterior urethra is incompletely developed and does not extend to the tip of the glans penis. The abnormal urethra meatus could be located anywhere along the shaft to the perineum. The corpus spongiosum may be deficient or completely absent from the distal urethra. Severity is varied from the glanular to the perineal position. **(Duckett JW, 1998)**

Embryology:

Sex differentiation in the embryonic life of the external genitalia occurs between the $7^{th}$and 17^{th} weeks of gestation. The Y chromosome initiates male differentiation through the SRY gene, which triggers testicular development. Under the influence of androgens secreted by the testes, external genitalia then develop into the penis and scrotum. **(Jenny H. Yiee et al, 2010)**

Etiology:

Many hypotheses have been submitted about the etiology of hypospadias, including genetic predisposition, maternal-placental factors, the use of assisted reproductive techniques and hormonal manipulation during pregnancy, all have been associated with a rise in the incidence of hypospadias. Also environmental factors are assumed to modulate candidate genes, causing altered development of the male external genitalia. Thus, the etiology of hypospadias is multifactorial.

(Baskin LS, 2000)(Silver RI, 2004)

Sensory penile innervation:

The penile shaft is composed of 3 erectile columns, the 2 corpora cavernosa and the corpus spongiosum, as well as the columns' enveloping fascial layers, nerves, lymphatics, and blood vessels, all covered by skin.

The penis is innervated by the pudendal nerve (S2-S4). This nerve eventually divides into the right and left dorsal nerves of the penis that pass under the pubis symphysis to travel just below the Buck fascia to supply the sensory innervation to the penis. The dorsal penile nerve block (DPNB) is a common form of regional anaesthesia for circumcisions in children.

(Garry DJ, et al, 2006) (Soh CR; et al, 2003)

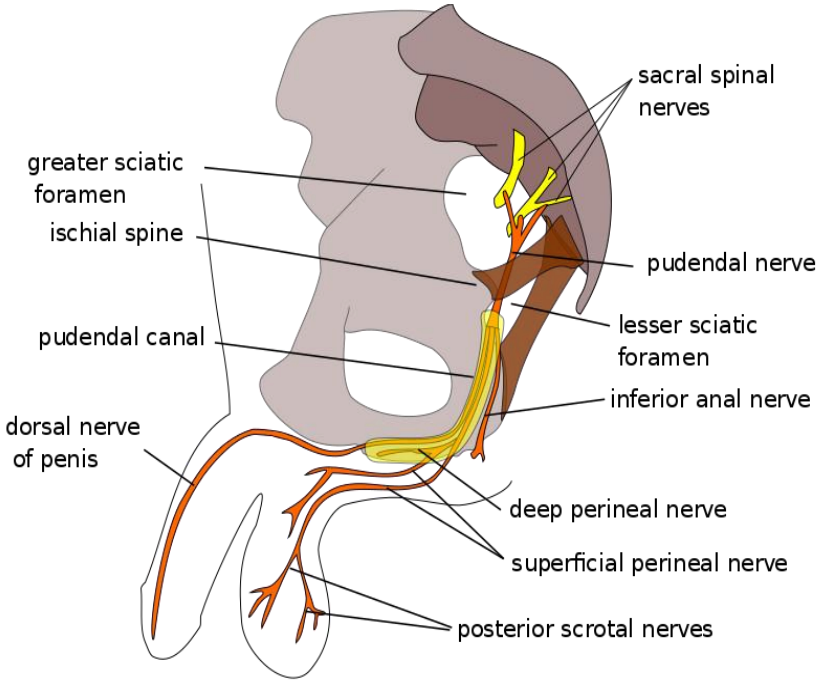

Fig.(1): Sensory penile innervation **(Garry et al., 2006).**

Classification:

The condition is classified by the site of the meatus and lack of fusion.

Classification	ICD-11	Meatus Opening	Image
Anterior	Glandular	urinary meatus that opens at the site of the frenulum	**A**
Coronal	Coronal	urinary meatus opens in the ventral portion of the coronal sulcus	**B**
Distal	Penile	urinary meatus that opens along the shaft of the penis	**C**
Penoscrotal	penoscrotal	urinary meatus opens where the shaft of the penis meets the scrotum	**D**
Scrotal	Scrotal	urinary meatus that opens on the scrotum	**E**
Perineal	Perineal	urinary meatus that opens in the perineum	**F**

Table.(1): Classification of hypospadias **(Baskin LS, et al, 2001)**