Ultrasound Guided Single Injection Thoracic Paravertebral Block versus Preemptive Surgical Incision Infiltration in Pediatric Renal Surgery

Thesis

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By

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Abstract

In this study demonstrated that ultrasound guided single injection thoracic paravertebral block was superior to the preemptive surgical incision infiltration in children undergoing open renal surgery, as it showed lower CHEOPS and OPS scores, less need of postoperative rescue analgesia and longer time to first request, however thoracic paravertebral block needed longer time to be performed. Both techniques showed hemodynamic stability during the intraoperative and postoperative periods. Depth of thoracic paravertebral space can be measured using ultrasound visualization, mean depth in cm was significantly correlated to age of patients included in the PVB group.

Keywords

OPS-PVB- ANZCA- EMLA- SPVB

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List of Abbreviations

ANZCA	:	The Austrialian and NewZeland College of Anesthetists.
ALT	:	Alanine transaminase
ASA	:	American Society of Anesthesiologists.
AST	:	Aspartate transferase
BT	:	Bleeding time
BUN	:	Blood urea nitrogen
CB	:	Caudal block.
CBC	:	Complete blood picture
CHEOPS	:	Children's Hospital of Eastern Ontario Pain Scale.
CNS	:	Central nervous system.
CSF	:	Cerebrospinal fluid.
CT	:	Clotting time.
CTL	:	Costotransverse ligament.
ECG	:	Electrocardiogram.
EMLA	:	Eutactic mixture local Anesthetic.
EP	:	Epidural.
FLACCL	:	The face, legs, activity, cry, and consolability.
FPS-R	:	Faces Pain Score-Revised
GA	:	General Anesthesia
GABA	:	Gammaamino-Aminobutyric Acid.
GFR	:	Glomerular filtration rate
Group (PVB)	:	Ultrasound guided single injection thoracic paravertebral block group.
Group (SII)	:	Preemptive surgical incision infiltration group
HALN	:	Hand assisted laparoscopic nephrectomy.
ICM	:	Internal intercostals membrane,
LA	:	Local Anesthetic.
LRT	:	Loss of resistance technique.
MAC	:	Minimal alveolar concentration.
NMDA	:	N-methyl-D-aspartat
NSAIDs;	:	Non-steroidal anti-inflammatory drugs.
OPS	:	Objective behavioral pain score.
P value	:	Probability value.

PACU	:	Post Anaesthesia Care Unit.
PC	:	Prothrombin concentration
PCA	:	Patient controlled analgesia
PONV	:	Postoperative nausea and vomiting.
PSM	:	Paraspinal muscles,
PT	:	Prothrombin time
PTT	:	Partial thromboplastin time.
PVB	:	Paravertebral block
PVS	:	Paravertebral space..
RA	:	Regional anaesthesia.
SPVB	:	Somatic paravertebral block.
SVT	:	Supraventricular tachycardia.
TP	:	Transverse process
TPVB	:	Thoracic paravertebra block.
TPVS	:	Thoracic paravertebral space
US	:	Ultrasound.
VAS	:	Visual analogue score
VATS	:	Videoassisted Thoracoscopic Surgery.

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INTRODUCTION

Local or regional analgesia is the platform of multimodal analgesia for all pediatric patients, and paravertebral block (PVB) undergoing surgery or painful procedures, unless there is a specific contraindication. Local and regional analgesia provides dense intraoperative analgesia that continues into the postoperative period. Lower amounts of volatile anesthetic agents are needed and an opioid-sparing effect is produced[(1).] There is evidence-based literature to show that combined regional and general anesthesia in pediatrics may actually improve outcome and thereby decrease hospital stay. The availability of better equipment and safer local anesthetic agents has also improved the safety of regional anesthetic techniques. [(2)]

Classical pyeloplasty is an open procedure using a subcostal incision. Transabdominal or posterior approaches are also possible. Nephrectomy or heminephrectomy is performed for various underlying pathologies that include a multicystic dysplastic kidney, congenital renal dysplasia, severe reflux nephropathy, and severe obstructive uropathy. Most of these children are healthy with normal renal function and have no electrolyte disturbances. The children may be placed in a lateral or prone position. General Anesthesia (GA) is usually maintained with tracheal intubation and controlled ventilation. Combined GA and regional techniques are suitable for open procedures.. [(3)]

One of the most exciting recent advances in technology in pediatric regional anesthesia has been the introduction of anatomically based ultrasound imaging to facilitate nerve localization. Regional anesthetic techniques in children have been considered challenging due to (1) targeting neural structures that often course very close to critical structures (e.g., nerves of the brachial

plexus run close to the pleura as they traverse the supraclavicular region), and particularly during central neuraxial blocks where the safety margin is narrow for needle placement particularly close to the spinal cord, (2) the prerequisite for sedation or general anesthesia masking potential warning signs (paresthesia), and (3) the need for limiting the volume of local anesthetic solution below toxic levels. With the possibility of visualizing the target structures, ultrasound technology may encourage many anesthesiologists who had previously abandoned regional techniques to resume or increase their use of regional anesthesia in children.[4]

Thoracic paravertebral block has been demonstrated to provide effective analgesia in adults for a variety of procedures, including unilateral thoracic and abdominal surgeries, and to offer pain relief with minimal undesirable effects compared with epidural, intercostal, or intrapleural analgesia. [5,6]

Although the efficacy of both the continuous and multilevel techniques of paravertebral blocks has been demonstrated, the use of single injection technique would further simplify the use of paravertebral blocks. Single injection paravertebral block (PVB) provided clinically relevant postoperative analgesia in children undergoing major renal surgery. [7]

The routine use of wound infiltration with long-acting local anesthetics in addition to general anesthesia can improve postoperative pain management after a wide variety of surgical procedures. When administered before surgery, this simple technique can also decrease anesthetic and analgesic requirements during surgery, as well as reduce the need for opioid-containing analgesics postoperatively. More effective pain relief in the early postoperative period, as a result of the residual sensory block produced by local anesthetics, facilitates recovery by enabling earlier ambulation and discharge home (i.e., “fast-track”

recovery). In addition, use of local anesthetic-based techniques for preventing pain can decrease the incidence of postoperative nausea and vomiting (PONV) because of their opioid-sparing effects. **(8)**

AIM OF THE WORK

The aim of this work was to compare ultrasound guided single injection thoracic paravertebral block (TPVB) and preemptive local infiltration at the site of the surgical incision as regards decreasing analgesic requirements, hemodynamic stability and incidence of complications during intaoperative and postoperative periods in children undergoing renal surgery.

Anatomical Considerations

Anatomy of the spinal cord:

The **spinal cord** (as shown in fig.1) [9,10] is a cylinder of nervous tissue that begins at the foramen magnum and passes through the vertebral canal as far as the inferior margin of the first lumbar vertebra (L1) in adult male, (L2) in an adult female and (L3) in pediatrics.

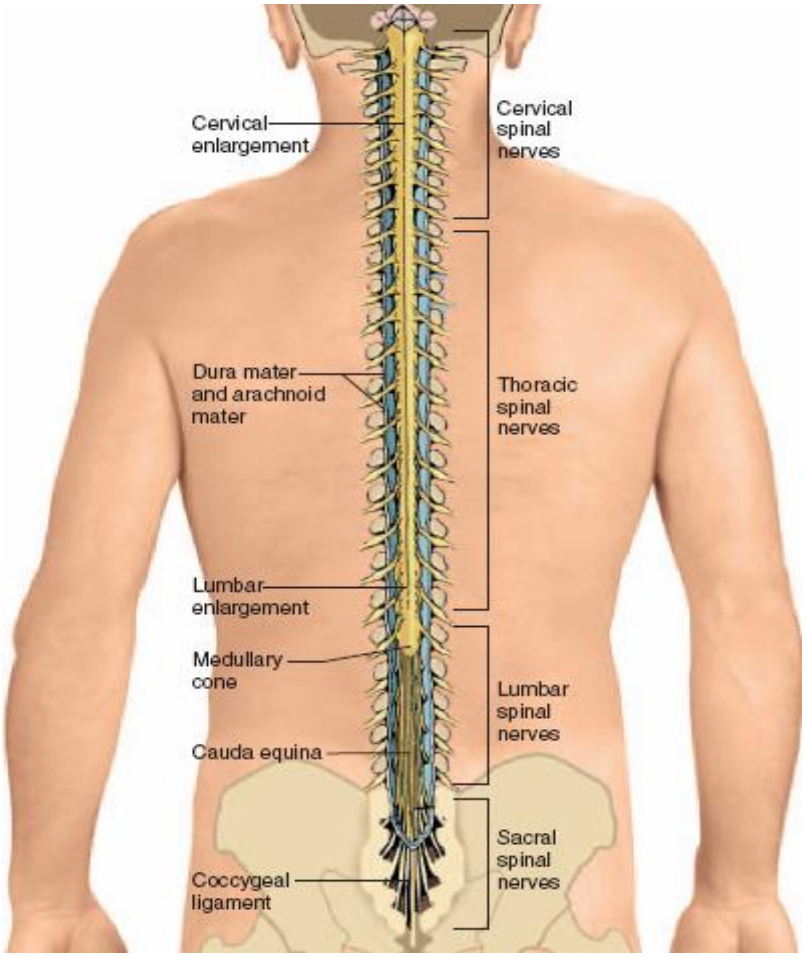

Fig.(1): The spinal cord dorsal aspect [9,10]