Paravertebral Block

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List of abbreviations

AP	Articular process
APFJ	Articular process of the facet joint
ASRA	The American Society of Regional Anesthesia
COPD	Chronic obstructive pulmonary disease.
CPVBs	Continous paravertebral block
CSF	Cerebrospinal fluid
CTL	Costotransverse ligament
DVT	Deep vein thrombosis
ESM	Erector spinae muscle
ICN	The intercostal nerves
ITS	Inter transverse space
IVC	The inferior vena cava
IVF	Intervertebral foramen
LA	Local anesthetic
LMWH	Lower molecular weight heparin
LPB	Lumbar paravertebral blockade
LPVS	Lumbar paravertebral space
MP	Mastoid process
PM	Psoas muscle
PMOTS	Paramedian oblique transverse scan
PSIS	Posterior Superior Iliac Spine
PVB	Paravertebral blockade
PVS	Paravertebral space
QL	Quadratus lumborum muscle
THI	Tissue harmonic imaging
TP	Transverse process
TPVB	Thoracic paravertebral block
TPVS	Thoracic paravertebral space
US	Ultrasound
VB	Vertebral body

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Introduction

Paravertebral block is a method to block nerves lateral to spinal column as an alternative method to central neuroaxial blocks (**King and Chelly, 2012).**

Paravertebral block is a safe method which was initially utilized as an advantages alternative to spinal anaesthesia which would minimize the cardiovascular and respiratory effects of central neuraxial block **(Batra et al., 2011).**

Spinal nerves travel through paravertebral space as they become intercostal or lumbar nerves. Injection of small amounts of local anaesthetic solutions into this space produced unilateral analgesia of the trunk without any major physiological changes reported ***(*Fleischmann, 2012).**

Paravertebral space is a potential space and it is a wedge shaped space and has three boundaries, the transverse process and head of the ribs posteriorly, vertebral body, intervertebral discs and intervertebral foramen medially,

parietal pleura and intercostal space anterolaterally **(King and Chelly, 2012).**

There are numerous approaches to perform paravertebral block. They may all be done in a seated or lateral decubitus or prone position and they are done by different tecniques such as loss of resistance technique, nerve stimulation, ultrasound guided technique and surgical placement **(Fleischmann, 2012).**

These blocks may be used for acute pain control, as an adjunct to general anesthesia for peri-operative pain control such as thoracotomy, liver resection, Whipple, hysterectomy, nephrectomy and pelvic surgery and in some practices, as the primary anesthetic such as breast surgery and inguinal hernia repair **(King and Chelly, 2012).** After thoractomies and upper abdominal surgeries the paravertebral block is superior to intravenous analgesia in providing pain control and preserving postoperative pulmonary function **(Piraccini et al., 2011).**

There are many complications that result from paravertebral block such as vagal episodes, pneumothorax, major bleeding, infection, pidural or intrathecal spread, hypotension and local anaesthetics toxicity **(King and Chelly, 2012).**

The growth of ultrasound technology and, with it, our ability to visualize the pleura and other structures in and around the paravertebral space has increased the interest in performing paravertebral blocks. Ultrasound technology has allowed us to broaden the depth of our knowledge of the anatomy of the paravertebral space in addition to enabling us to visualize the anatomic structures, the needle, and the spread of local anesthetic **(Fleischmann, 2012).**

The Paravertabral block is used for intraoperative and post operative analgesia to improve the patient' s outcome, reduce complications rate, hospital cost and length of stay **(Piraccini et al., 2011).**

Aim of the work

The purpose of this essay is to discuss the paravertebral block as a regional anaesthetic technique, its indications, its different tecniques, the most recent and relevant developments for paravertebral block, its advantages and its complications.

Anatomy of

the Paravertebral Space

This is a potential space, which is turned into a temporary cavity by fluid as local anesthetic (LA) forming a wedge-shaped space. The most important structures that passing through the paravertebral space (PVS) are the intercostal and sympathetic nerves ***(Richardson et al., 2011).***

Paravertebral blockade (PVB) is achieved by placement of local anaesthetic around the nerve bundles as they arise from their corresponding intervertebral foramina. PVB is often used without prefix to refer to thoracic PVB (TPVB). It should be noted that cervical stellate ganglion block and lumbar paravertebral blocks are also types of PVB ***(Dodd and Hunsley, 2011***).

Relationships:

A) Thoracic paravertebral space:

The thoracic paravertebral space is a wedge-shaped potential space, its depth is greater medially when distended. It communicates with the cervical paravertebral space

cephalad, but the psoas muscle probably limits direct communication with the lumbar paravertebral space caudally. Medially it is bound by the vertebral body, intervertebral disc and intervertebral foramen ***(Richardson et al., 2011).***

The boundaries:

- The anterolateral boundary is formed by the parietal pleura.
- The medial boundary is formed by the posterolateral aspect of the vertebral body, the intervertebral discs, the intervertebral foramen, the spinal nerves and connective tissues.
- The posterior boundary is formed by the superior costotransverse ligament (CTL) which extends from the inferior aspect of each transverse process to the superior aspect of the rib below. The superior costo-transverse ligament is continuous laterally with the internal intercostal membrane, which is the aponeurosis of the internal intercostal muscle and attaches medially to the upper and lower borders of the ribs ***(Fleischmann, 2012).***

Thoracic paravertebral space (TPVS) is subdivided into an anterior (extrapleural) and posterior (subendothoracic) space by endothoracic fascia, which is continous with internal

intercostal membrane laterally and prevertebral fascia medially ***(King and Chelly, 2012).***

This space is continuous with the intercostal space laterally and with the intervertebral foramen and epidural space medially.The cephalad limit of the thoracic paravertebral space remains unclear. The caudad limit of the space is generally accepted to be L1, at the origin of the Psoas Muscle ***(Fleischmann, 2012)***

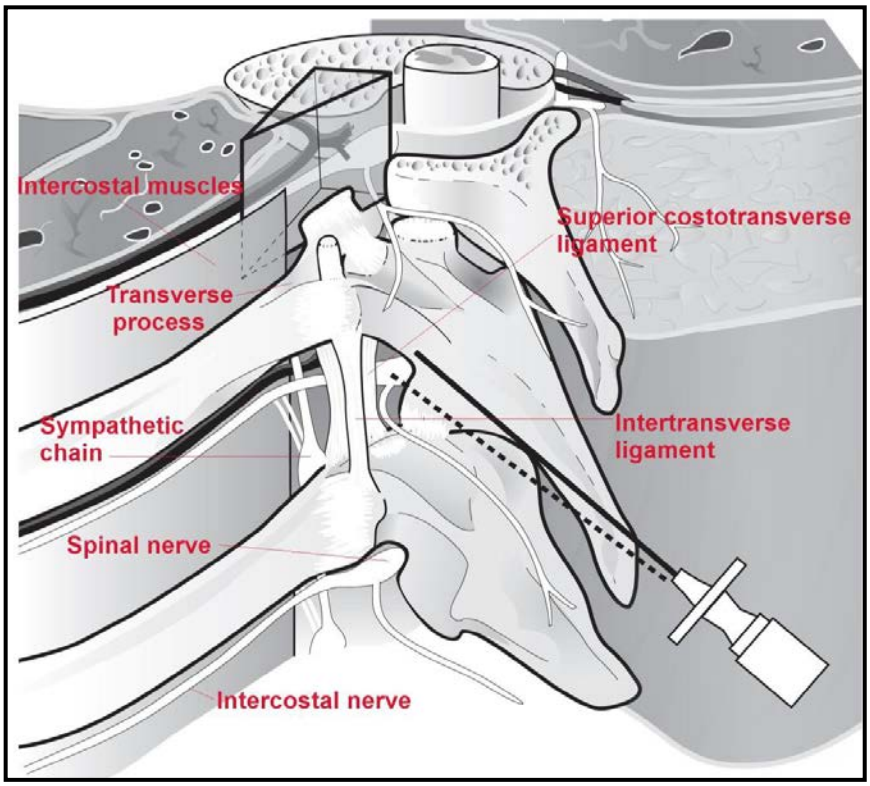

Figure (1): Drawing of the paravertebral space. The boundary of the space is depicted by a transparent wedge ***(Dodd and Hunsley, 2011***).

B) Lumbar paravertebral space:

The anatomical compartment, formed by the psoas major muscle and its fascia on the anterior side, the transverse processes on the lateral side and the quadratus lumborum muscle and paraspinal muscles on the posterior side, confines a space in which the lumbar plexus is located ***(Ponde and Desai, 2012).***

C) Cervical paravertebral space:

The paravertebral space was taken as the space adjacent to the vertebral bodies, confined anterior-laterally by the anterior scalene, posteriorly by the middle scalene and transverse process and medially by the vertebra body ***(Ponde and Desai, 2012).***

Contents of Paravertebral Space:

The contents of paravertebral space include the spinal nerves as they emerge from the vertebral foramen, the dorsal rami, the rami communicantes, the intercostal vessels, the sympathetic chain, and loose connective tissue and fatty tissue. The nerves remain, for the most part, unsheathed in the paravertebral space which allows for rapid uptake of local anesthetic ***(Fleischmann, 2012).***