Prevention of Postdural-Puncture Headache after Accidental Dural Puncture

Essay

Submitted for Partial Fulfillment of Master Degree in Anesthesia

Presented by

Hosam Maher Masoud Ayad

M.B.B.Ch

Faculty of Medicine- Assiut University

Supervised by

Prof. Dr. Azza Mohamed Shafeek Abdel Mageed

Professor of Anesthesia and Intensive Care

Faculty of Medicine- Ain Shams University

Dr. Milad Ragaey Zekry

Lecturer of Anesthesia and Intensive Care

Faculty of Medicine- Ain Shams University

Dr. Wael Sayed Abd-Elghafar

Lecturer of Anesthesia and Intensive Care

Faculty of Medicine- Ain Shams University

Faculty of Medicine

Ain Shams University

2015

FIRST OF ALL, THANKS TO ALLAH

I would like to express my deep gratitude, appreciation and sincere thanks to ***Prof. Dr. Azza Mohamed Shafeek Abdel Mageed,*** *Professor of Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for her supervision, valuable remarks, until this work was fulfilled.*

I would like to express my special deep gratitude, appreciation and sincere thanks to ***Dr. Milad Ragaey Zekry,*** *Lecturer of Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for his continuous support, meticulous supervision, great valuable remarks, encouragement and assistance until this work was fulfilled.*

And special thanks to Dr. Wael Sayed Abd-Elghafar, Lecturer of Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for his great help and support throughout this work.

Finally, *I would like to express my special deep thanks and gratitude to my family; especially my Mother and my Father for their continuous support and encouragement throughout my life and for providing me the environment needed for concentration and progress.*

Contents

List of Abbreviation

Abb.		Meaning
5-HT1D	:	5- hydroxytryptamine receptor 1 d
ACTH	:	Adrenocorticotrophic hormone
ADP	:	Accidental dural puncture
BMI	:	Body mass index
C7	:	Cervical vertebrae number seven
CNS	:	Central nervous system
CSF	:	Cerebro spinal fluid
CT	:	Computerized tomography
EBP	:	Epidural blood patch
G	:	Gauge
HIV	:	Human immunodeficiency virus
ITC	:	Intrathecal catheter
ITCP	:	Intrathecal catheter placement
L1	:	Lumbar vertebrae number one
L2	:	Lumbar vertebrae number two
L4	:	Lumbar vertebrae number four
L5	:	Lumbar vertebrae number five
mg	:	Milligram
ml	:	Milliliter
mm	:	Millimeter
NPO	:	Non per oral
NSAIDS	:	Non steroidal anti-inflammatory drugs
PCIA	:	Patient controlled intravenous analgesia
PCSA	:	Patient controlled spinal anesthesia
PDPH	:	Post-dural puncture headache

List of Abbreviation (Cont...)

Abb.		Meaning
PEBP	:	Prophylactic epidural blood patch
PRES	:	Posterior reversible encephalopathy syndrome
PSPH	:	Post spinal puncture headache
RCT	:	Randomised controlled trials
T4	:	Thoracic vertebrae number four
T5	:	Thoracic vertebrae number five
T9	:	Thoracic vertebrae number nine
UDP	:	Unintentional dural puncture
V.C.	:	Vertebral Column

List of Tables

List of Figures

Introduction

Evidence is accumulating that the use of neuraxial blocks, principally continous epidural techniques to provide postoperative analgesia, may be able to decrease perioperative morbidity. These techniques may also decrease length of hospital stay. To gain maximum benefit and minimize complications from these blocks, attention to technique and anatomy is essential, and the blocks should be used when the risk-benefit equation for the block is favorable ***(Miller, 2011).***

Accidental dural puncture is a well-know complication of epidural analgesia. The incidence of spinal headache following accidental dural puncture (PDPH) is quite high with the use of large bore Touhy needles of 17 or 18 G sizes. Headache occurs normally after 24 hours up to 7 days causing severe morbidity ***(Spencer Liu et al., 2001).***

This headache is usually a severe, dull, nonthrobbing pain, often fronto-occipital, which is aggrevated in upright and diminished in supine position. It may be accompanied by nausea, vomiting, or visual disturbances ***(Rabiul et al., 2011).***

Cerebrospinal fluid (CSF) leakage following dural puncture is the most accepted mechanism of this headache. Reduction in CSF pressure lessens the cushioning effect of brain, allowing it to sag within the intracranial vault, and stimulates dural pain receptors especially in upright position. Headache continues until dural hole repairs and it is relieved when CSF volume and pressure return to normal ***(Munnur and Suresh, 2003).***

Current conventional and symptomatic treatments for PDPH include bed rest, hydration, analgesics, caffeine, sumatriptan, aminophyline, and ACTH. But none of these therapeutic approaches can relive this headache completely and just help the patients to withstand it ***(Turnbull and Shepherd, 2003).***

The only known definitive treatment is the invasive epidural blood patch which has its own limitations. Other invasive modes of treatment that have been reported are fibrin glue, colloids, and saline injections ***(Murthy et al., 2005).***

Anatomy of the Spine and its Surrounding Meninges

Anatomy of vertebral column (V.C.):

Seven cervical, 12 thoracic, 5 lumbar, 5 fused sacral vertebrae and the coccyx compose the vertebral column. The vertebral column has four characteristic curvatures: the cervical lordosis, thoracic kyphosis, lumbar lordosis and the anterior convexity of the sacrum. In the supine position, the lumbar spine has its highest point at L4 and the thoracic spine has its lowest point at T4 ***(Ranger et al., 2008)***.

In the lumbar area, the spinous processes project directly posteriorly whereas in the thoracic area, the spinous processes project directly posteriorly and more inferiorly until they reach their steepest downward angulation at the midthoracic level where they overlap with the lamina of the vertebra immediately inferior. This overlap can make the midline approach to the epidural space difficult or impossible at the T5-T9 levels ***(Hogan, 2002).***

At higher thoracic levels, the spinous processes become nearly horizontal at C7. The spinal canal is

enclosed by the vertebral bodies anteriorly, the pedicles laterally, ligamentum flavum and the laminae posteriorly **(figs. 1 & 2)**. The canal ends superiorly in the foramen magnum and inferiorly in the sacral hiatus ***(Bridenbaugh et al., 1998).***

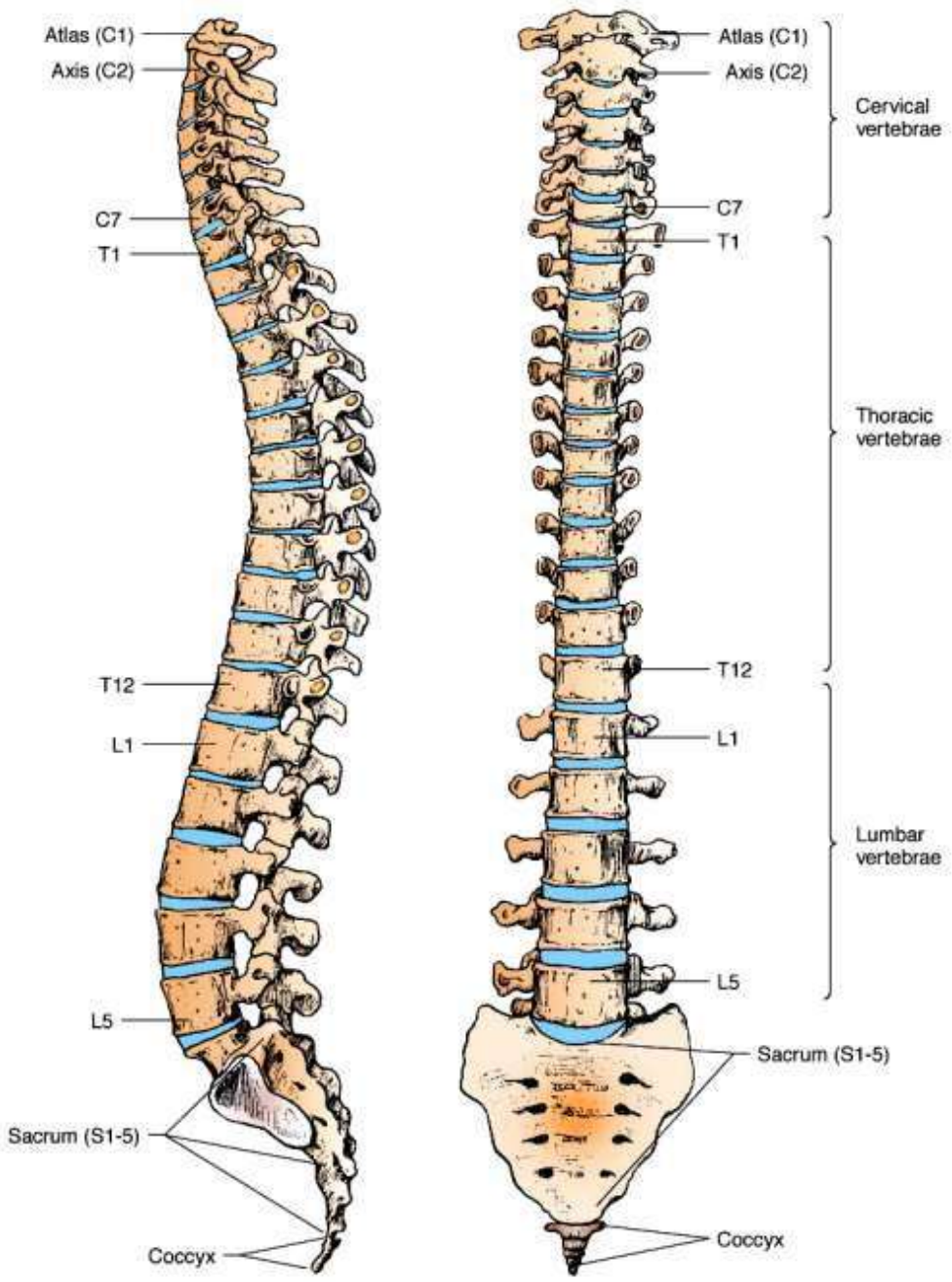

Figure (1): Regions of the spinal column ***(Longnecker et al., 2008).***

Anatomy of the vertebra:

Typical vertebra has an anterior body and a posterior neural arch which forms the boundaries of the vertebral canal.

As the column descends, the bodies increase in size to accommodate the proportional increase in body weight.

The vertebrae are separated from each other by the intervertebral discs ***(Bridenbaugh et al., 1998).***

The neural arch of the vertebra is connected anteriorly to the body via 2 stout bars of bones called pedicles. These pedicles tend to be attached towards the superior poles of the bodies resulting in 2 notches of uneven depth. When two vertebrae articulate with each other, an intervertebral foramen is formed through which passes the roots of the spinal nerves and the vascular structures supplying the spinal cord.

The neural arch has a single midline spinous process which projects posteriorly, and paired transverse processes which passes laterally. These processes are connected by laminae ***(Bridenbaugh et al., 1998).***

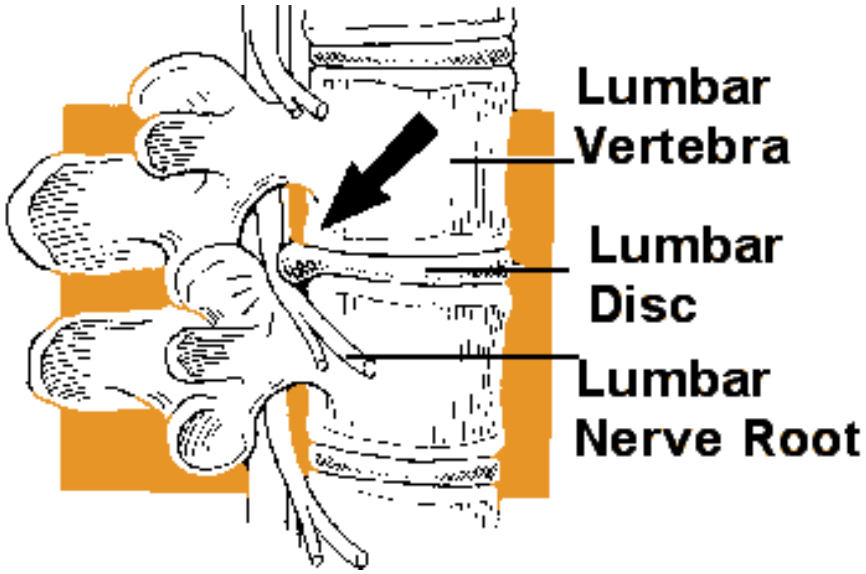

Figure (2): Midline saggital view of the lumbar spine ***(Reina et al., 2000).***

- ***Ligaments:***

The supraspinous ligament runs along the tips of the spinous processes and blends with the ligamentum nuchae at its superior end. In elderly individuals, the ligament can become ossified, making a midline approach of the regional anaesthesia difficult. The interspinous ligament stretches vertically from the inferior border of each spinous process to the superior border of the spinous process below, except in the cervical spine, where it is absent **(fig. 3).** Dorsally, the interspinous ligament blends with the supraspinous

ligament. Ventrally, it fuses with the ligamentum flavum and the laminae. The laminae slope posteriorly and inferiorly so that their ventral surfaces are in close contact with the dura ***(Lin et al., 2007).***

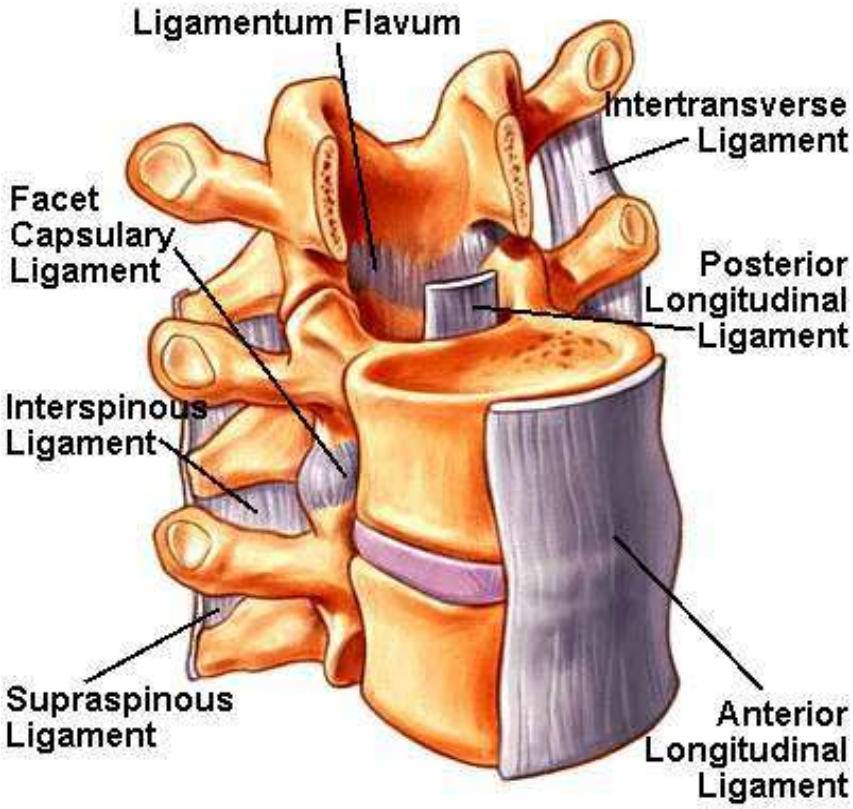

Figure (3): Ligaments of vertebral column ***(Ranger et al., 2008).***