Ultrasound guided bilateral injection of lidocaine – dexamethasone mixture in suboccipital muscles for treatment of postdural puncture headache

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A Thesis study
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Abstract

In the study, all pregnant females, coming to Kasr Al-Ainy hospital, scheduled for elective cesarean section under spinal anesthesia were eligible to participate. All women were randomly divided into 2 groups of equal size 45 women for each . Patients in group A received single injection of lidocaine 40 mg and dexamethazone 8mg in a total volume of 4 mL . Patients in group B received the same volume of saline. In both groups suboccipital muscle injection was done by ultrasound using the linear probe 10_13 HZ Women who refued the procedure, those with any medical complications eg. hypertension , patients with pre spinal chronic headache or migraine or patients on steroids during pregnancy were excluded from the study In the study, results showed that bilateral ultrasound guided injection of dexamethasone-lidocaine mixture in suboccipital muscles is better than saline injection in reduction the severity of PDPH in partuirents undergoing CS under spinal anaesthesia.

Keywords:

PDPH- CSF- NSAIDS- ACTH-ASA

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Ahmed Elsaeed Abd ElFattah

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LIST OF ABBREVIATIONS

PDPH	Post dural puncture headache
EBP	Epidural blood patch
ACTH	Adrenocorticotrophic hormone
NSAIDS	Non-steroidal anti inflammatory drugs
CSF	Cerebro-spinal fluid
VAS	Visual Analogue Scale
G	Gauge
Mm	Millimeter
MRI	Magnetic resonance imaging
Ml	Milliliter
IV	Intravenous
5-HT1D	5-Hydroxytryptamine (subtype D) receptor
H(s)	Hour(s)
Min	Minute
Mg	Milligram
CS	Cesarean section
Yr	Year
TNC	Trigeminal nucleus caudalis
ASA	American society of anesthesiologists
N	Number
HZ	Hertz
SD	Standard deviation
SPSS	Statistical Package for the Social Science
P-value	Probability value
GON	Greater occipital nerve
GONB	Greater occipital nerve block
μg	Microgram
TID	"ter in die" which in Latin means three times a day

Introduction

The first post dural puncture headache (PDPH) was described by German surgeon Bier [(1)] . It is considered one of commonest causes of morbidity following neuraxial anesthesia that may increase the duration of hospital stay [(2) (3)] , often interferes with maternal infant interaction, and is considered a significant cause of increased anesthetic work load.[(83)]

Post dural puncture headache (PDPH) is usually benign and self-limited, but if left untreated , it may lead to more serious complications [(2)]

Once PDPH happens, conservative measures such as hydration and bed rest should be started immediately, but these measures have a history of not being very effective[(4)], so intervention treatment should not be delayed in order to avoid suffering.[(2)]

There are several modalities available for treatment of PDPH. One of these is epidural blood patch (EBP) which has shown to be very effective as an interventional treatment, [(5)] but it is more or less invasive and not accepted by many patients. There are many drugs used for treatment of PDPH such as gabapentin[(58)], hydrocortisone[(60)] , cosyntropin (ACTH)[(59)], sumatriptan[(56)] , caffeine[(51)] , NSAIDS[(85)] and morphine[(63)]

The mechanism of PDPH is still unclear. Leakage of CSF theory through dural puncture appears to be the main cause of PDPH. However, this theory is not totally accepted but still majority of investigations favour this "leakage theory" as an explanation for PDPH[24].

Post dural puncture headache (PDPH) is characteristically distributed over the occipital and the frontal region, frequently radiating to the neck and shoulders [37]. The headache may be associated with other symptoms such as nausea, vomiting and hearing loss[37] . Neck stiffness and muscle spasm are one of the most important characteristics of PDPH following spinal anesthesia[6]Although remains speculative, traction on connective tissue link (myodural band) between the spinal dura mater and suboccipital muscles[7] in the back of neck may aggravate the headache

Aim of the work

The purpose of this study is to compare the effectiveness of ultrasound guided bilateral injection of dexamethasone- lidocaine mixture versus injection of saline in suboccipital muscles for treatment of PDPH in patients undergoing cesarean section under spinal anesthesia by dividing the patients into two groups: Patients in group A will receive bilateral injection of lidocaine 40 mg and dexamethasone 8mg in a total volume of 4 mL (2 ml at each side). Patients in group B will receive the same volume of saline. In both groups, suboccipital muscle injection will be done by ultrasound using the linear probe 10_13 HZ . Severity of headache will be assessed subjectively using Visual Analog Scale (VAS) where zero means no pain and ten is worst possible pain . The headache will be assessed before and 1, 6, 12, and 24 hours following injection.

Anatomy

The brain and spinal cord are surrounded by three layers , the meninges , which are from outside inwards dura mater, arachnoid mater and pia mater .

1.Anatomy of dura mater

Dural covering of the brain is a double layer , between the walls of which lie the cerebral venous sinuses, while dural covering of the spinal cord consists of a continuation of the inner (meningeal) layer of the cerebral dura, which is made up of dense fibrous tissue; the outer (endosteal) layer of the cerebral dura terminates at the foramen magnum, where it merges with the periosteum enclosing the skull, and is thereafter represented by the periosteal lining of the vertebral canal. The dural sac usually extends to the level of the 2nd segment of the sacrum (S2) as in (Figure. 1), but occasionally ends as high as fifth lumbar segment (L5), at other times it extends to S3. The dural sheath then continues as the covering of the filum terminale to end by adhering to the periosteum on the back of the coccyx. The sac widens out in both the cervical and lumbar regions, corresponding to the cervical and lumbar enlargements of the spinal cord as shown in (Figure.1). The dura lies rather loosely within the spinal canal, buffered in the epidural fat, but it is attached at the following points to its bony surroundings[8]

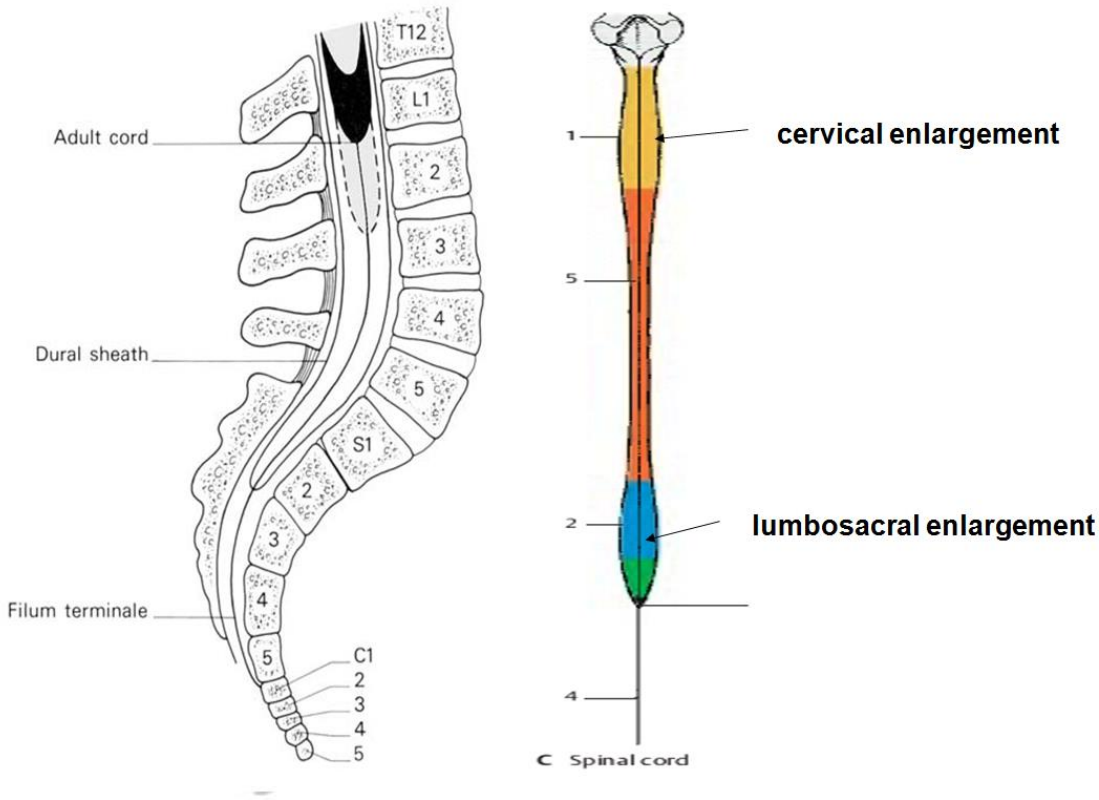
1 Superiorly, to the edges of the foramen magnum and to the posterior aspects of the bodies of the 2nd and 3rd cervical vertebrae.

2 Inferiorly, by the filum terminale to the coccyx. (Figure. 1)

3 Laterally, by prolongations along the dorsal and ventral nerve roots, which fuse into a common sheath and then blend with the epineurium of the resultant spinal nerves.

4 Anteriorly, by slender filaments of fibrous tissue to the posterior longitudinal ligament.

5 posteriorly, the dural sac is completely free. (8)



(Figure . 1) End of spinal dura & cervical and lumbar enlargments

Other meninges and relation with dura

Spinal arachnoid mater, the intermediate meningeal layer, is a delicate membrane that is continuous with the cerebral arachnoid. It lines the dural sheath and sends prolongations along each nerve root(8) .

Pia mater, the innermost layer of meninges, is a vascular connective tissue sheath that closely invests the brain and spinal cord. Inferiorly, the pia is continued downwards as the filum terminal, which pierces the

lower end of the dural sac and then continues to the coccyx with a covering sheath of dura. [8]

compartments related to the spinal meninges

there are three compartments ; the subarachnoid, subdural and epidural spaces.[8]

In the subarachnoid space are the CSF, spinal nerves, a trabecular network between the pia and arachnoid membranes, blood vessels that supply the spinal cord, and the lateral extensions of the pia mater, the dentate ligaments. These dentate ligaments supply lateral support from the spinal cord to the dura mater and may become important when unilateral or patchy spinal anesthesia results from what appears to be a technically adequate block.[8]

The subdural space is a potential space ; the arachnoid is in close contact with the dural sheath and is separated from it only by a thin film of serous fluid. Rarely, accidental catheter placement occurs during attempted epidural analgesia or anaesthesia. Subdural injection of local anaesthetic is thought to be associated with patchy anaesthesia, often unilateral and often extensive. [8]

The epidural space extends from the foramen magnum to end by the fusion of its lining membranes at the sacrococcygeal membrane. It contains fat, nerve roots, blood vessels and lymphatics .Through catheter placement in this space , anesthetists can deliver epidural anaesthesia and analgesia . [8]

2.Anatomy of suboccipital muscles

The suboccipital muscles are group of four muscles located on each side of the back of the neck just below the base of the skull. The muscles connect the skull with the top two vertebrae of the neck . The four muscles comprising this group are the rectus capitis posterior major, the rectus capitis posterior minor, the obliquus capitis superior, and the obliquus capitis inferior. [9] (Figure. 2)

The rectus capitis posterior major arises by a pointed tendon from the spinous process of the axis, and, becoming broader as it ascends, is inserted into the lateral part of the inferior nuchal line of the occipital bone and the surface of the bone immediately below the line. As the muscles of the two sides pass upward and lateralward, they leave between them a triangular space, in which the recti capitis posteriores minores are seen..[9]

The rectus capitis posterior minor arises by a narrow pointed tendon from the tubercle on the posterior arch of the atlas and, widening as it ascends, is inserted into the medial part of the inferior nuchal line of the occipital bone and the surface between it and the foramen magnum.[9]

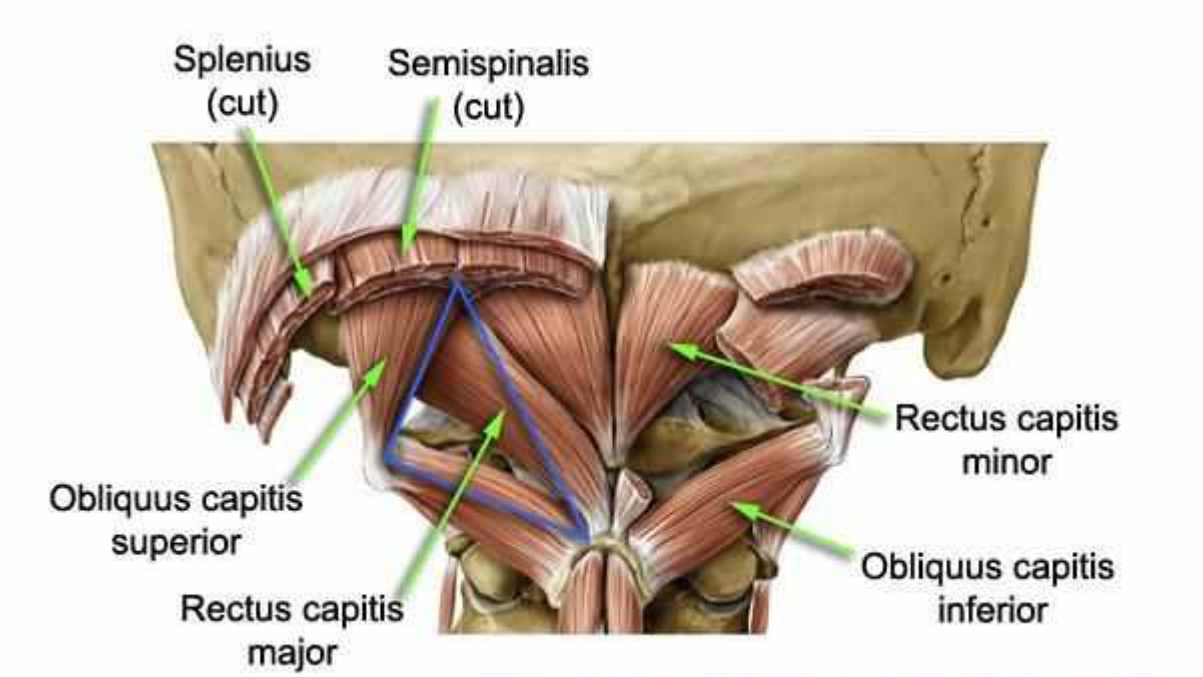
The obliquus capitis inferior ,the larger of the two Oblique muscles, arises from the apex of the spinous process of the axis and passes lateralward and slightly upward, to be inserted into the lower and back part of the transverse process of the atlas.[9]

The obliquus capitis superior , narrow below, wide and expanded above, arises by tendinous fibers from the upper surface of the transverse process of the atlas,

joining with the insertion of the preceding. It passes upward and medialward, and is inserted into the occipital bone, between the superior and inferior nuchal lines, lateral to the Semispinalis capitis.[9]

3.Relation between dura and suboccipital muscles:

Anatomical soft tissue connections , discovered in 1995 , cross the cervical epidural space linking suboccipital muscle fascia and dura. These myodural bridges provide passive and active anchoring of the spinal cord**.**[10]



(Figure . 2) Suboccipital group of muscles