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Dexmedetomidine as an Adjuvant to Spinal Hyperbaric Bupivacaine in Surgical Procedures

Thesis Submitted for Partial Fulfilment of Master Degree in Anaesthesia

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Mahmoud Abdul Rafie Al Shafie

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List of Abbreviations

µg	microgram
C7	The seventh cervical vertebra
S2	The second sacral vertebra
L1	The first lumber vertebra
L3	The third lumber vertebra
T12	The twelve thoracic vertebra
L4	The fourth lumber vertebra
CSF	Cerebrospinal fluid
L	litre
CNS	Central nervous system
AR	Adrenergic receptor
FDA	Food and Drug Administration
h	hour
I.V.	Intravenous
kg	kilogram
VLPO	ventrolateral preoptic nucleus
GABA	γ -amino butyric acid
TMN	Tuberomamillary nucleus
ASA	American Society of Anesthesiologists
cm	centimetre
ECG	Electro cardio gram
min	minute
MAP	Mean arterial pressure
HR	Heart rate
VAS	Visual Analogue Scale

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Abstract

Spinal anaesthesia is used commonly intra operatively. However, local anaesthetics are associated with relatively short duration of action. A number of adjuvants have been used to prolong the postoperative analgesia.

Objectives: To evaluate role of dexmedetomidine added to heavy bupivacaine 0.5% intrathecally for lower abdominal surgeries.

patients and methods: This double-blind study included eighty ASA I or II patients, aged between 20 and 50 years old, scheduled for lower abdominal operations. They were randomly divided into two groups:

- Group d (G_d) (n=40): received 3 ml volume of 0.5% hyperbaric bupivacaine (15 mg) and 5 μg dexmedetomidine in 0.5 ml of normal saline as intrathecal injection, dexmedetomidine (100 μg/ml) was diluted in normal saline, to make a total volume of 3.5 ml intrathecal solution.
- Group b (G_b) (n=40): received 3 ml volume of 0.5% hyperbaric bupivacaine (15 mg) and 0.5 ml of normal saline, to make a total volume of 3.5 ml intrathecal solution.

The onset time , duration of sensory and motor blocks, the total duration of analgesia and associated side effects were recorded.

Results: The study showed that the onset of sensory and motor blocks were significantly earlier in G_d than $\mathbf{G_b}$ (p value < 0.05) and the duration of sensory block , motor block and total duration of analgesia were significantly longer in G_d than G_b(p value < 0.05)**.** Also the incidence of occurrence of bradycardia was

significantly higher in G_d than G_b(p value < 0.05)**.** There were no statistically significant differences in occurrence of hypotension , nausea and vomiting between two groups . No other complications were recorded in the study.

Conclusion: Addition of dexmedetomidine to intrathecal bupivacaine seems enhance onset and prolong duration of sensory and motor blocks and prolong postoperative analgesia compared with intrathecal bupivacaine alone.

Keywords:(Dexmedetomidine -l Hyperbaric Bupivacaine – AR-VLPO)

Aim of work

This study is an attempt to evaluate the effectiveness of using intrathecal dexmedetomidine (5µg) with hyperbaric bupivacaine on the characteristics of sensory and motor blocks in patients undergoing lower abdominal surgeries .

Introduction

Spinal anaesthesia is the most commonly used anaesthetic technique for wide variety of elective and emergency surgical procedures below the level of umbilicus. It is very economical, safe and easy to administer [1] .

The common problems with lower abdominal surgeries under spinal anaesthesia are visceral pain, nausea and vomiting [1]. This can be overcome by the addition of some adjuvants to local anaesthetics for spinal anaesthesia. Various adjuvants like clonidine, dexmedetomidine, morphine, tramadol, fentanyl, buprenorphine and magnesium are added to increase the duration of sensory and motor blocks, to improve intraoperative analgesia, to delay the regression of sensory block and to postpone the time to first analgesic request [2]. But there are certain advantages and disadvantages with each adjuvant [1].

Dexmedetomidine a novel drug is being used in anaesthetic practice for its sedative, anxiolytic, analgesic, neuroprotective and anaesthetic sparing effect. It has additional advantages like minimal respiratory depression, cardioprotection, neuroprotection and renoprotection [3]. Dexmedetomidine prolongs motor and sensory blocks when used as adjuvant to local anaesthetic with the dose of 3 to 15 µg. for spinal anaesthesia [4,5].

Hence this study is an attempt to evaluate the effectiveness of using intrathecal dexmedetomidine (5µg) with hyperbaric bupivacaine on postoperative pain relief in patients undergoing lower abdominal surgeries .

Anatomy

Functional Anatomy of Spinal Block:

In reviewing the functional anatomy of spinal block, an intimate knowledge of the spinal column, spinal cord, and spinal nerves must be present. This chapter reviews briefly the curves of the vertebral column, the ligaments of the spinal column, membranes and length of the spinal cord and passage of the spinal nerves from the spinal cord [6].

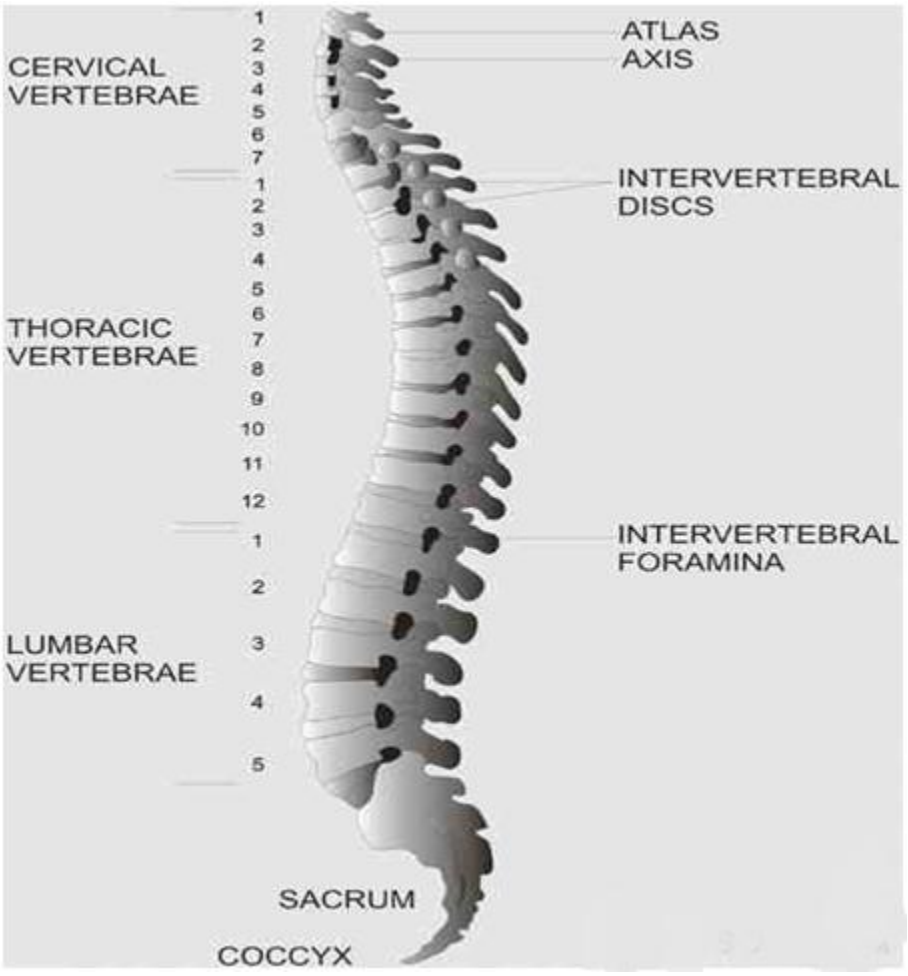

Figure 1: The spinal column is seen from a lateral view. All of the vertebrae, intervertebral discs, and intervertebral foraminae are shown. Adapted from www.NYSORA.com [9].

The vertebral column consists of 33 vertebrae: 7 cervical, 12 thoracic, 5 lumbar, 5 sacral and 4 coccygeal segments. The vertebral column usually contains three curves. The cervical and lumbar curves are convex anteriorly and the thoracic curve is convex posteriorly. The vertebral column curves, along with gravity, baricity of local anaesthetic and patient position influence the spread of local anesthetics in the subarachnoid space [6] (Figure 1).

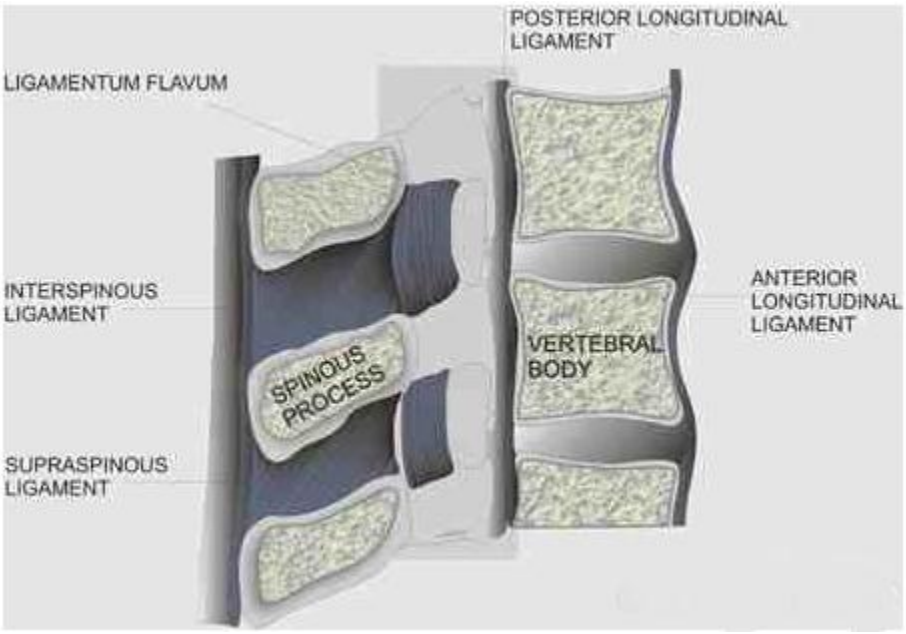

Figure 2: A cross section of the spinal canal is shown with the ligaments, vertebral body, and spinous processes. Adapted from www.NYSORA.com [9].

Five ligaments hold the spinal column together. The supraspinous ligaments connect the apices of the spinous processes from the seventh cervical vertebra (C7) to the sacrum. The interspinous ligaments connect the spinous processes together. The ligamentum flavum, or yellow ligament connects the laminae above and below together. Finally, the posterior and anterior longitudinal ligaments bind the vertebral bodies together [6] (Figure 2).

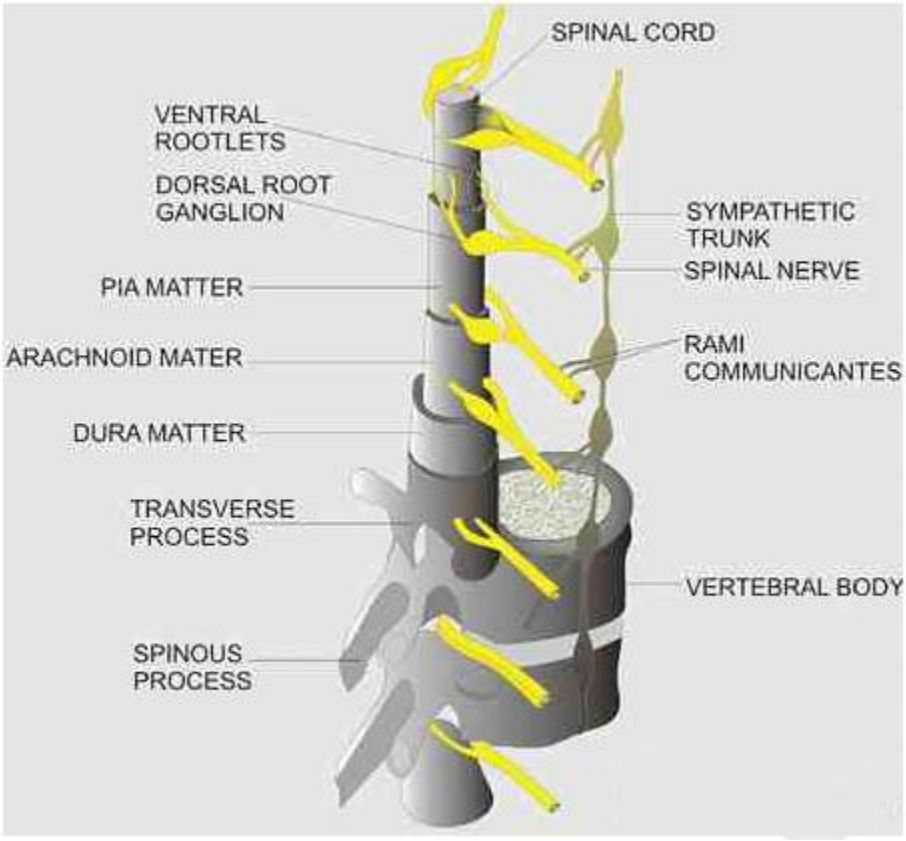

Figure 3: The spinal cord is shown along with the dorsal root ganglia and ventral rootlets, spinal nerves, sympathetic trunk, rami communicantes, and pia, arachnoid, and dura mater. Adapted from www.NYSORA.com [9].

The three membranes that protect the spinal cord are the dura mater, arachnoid mater and pia mater. The dura mater or tough mother is the outermost layer. The dural sac extends to the second sacral vertebra (S2). The arachnoid mater is the middle layer and the subdural space lies between the dural mater and arachnoid mater. The arachnoid mater or cobweb mother, also ends at S2, like the dural sac. The pia mater or soft mother clings to the surface of the spinal cord and ends in the filum terminale, which helps to hold the spinal cord to the sacrum.

The space between the arachnoid and pia mater is known as the subarachnoid space [6] (Figure 3).