Failed Spinal Anesthesia Mechanisms, Management, And Prevention

Essay

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gratefulness to my supervisors.

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Magdy Hussein Elsawy Omran

List of Contents

List of Table

Table No.	Title	Page No.

List of Figure

List of Figure **(Cont…..)**

Figure No.	Title	Page No.

List Of Abbreviations

CNS:	Central nervous system
CSA:	Continuous spinal anaesthesia
CSF:	Cerebrospinal fluid
CVS:	Cardiovascular system
ECG:	Electrocardiogram
FDA:	Food and drug Administration
MRI:	Magnetic resonance imaging
(3-OH ROP):	3-hydroxyropivacaine
(4-OH ROP):	4-hydroxyropivacaine
OR:	Operative room
PABA:	Para-amino benzoic acid
PACO2:	Arterial partial pressure of carbon dioxide
PDPH:	Post-dural puncture headache
Pka value:	The dissociution constant
PPX:	pipecolaxylidide
R1:	Lipophilic aromatic group
R2:	hydrophilic secondary amine group
UV:M:	Umbilical vein: Maternal blood

INTRODUCTION

Spinal (intrathecal) anaesthesia is generally regarded as one of the most reliable regional block methods: the needle insertion technique is relatively straightforward, with cerebrospinal fluid (CSF) providing both a clear indication of successful needle placement and a medium through which local anaesthetic solution usually spreads readily. However, the possibility of failure has long been recognized.

The word failure implies that a spinal anaesthetsia was attempted, but that no block resulted; this happens, but perhaps a commoner outcome is that a block results, but is inadequate for the proposed surgery. Such inadequacy may relate to three components of the block: the extent, quality, or duration of local anaesthetic action, often with more than one of these being inadequate. This review will consider all three eventualities within the definition of 'failure' ***(Fettes et al., 2009).***

Most experienced practitioners would consider the incidence of failure with spinal anaesthesia to be extremely low, perhaps less than 1%. However, a figure as high as 17% has been reported in other studies ***(Levy et al., 1985) (Manchikanti et al., 1987).***

Minimizing the incidence of failure is obviously a pre-requisite for gaining the benefits of spinal anaesthesia, and

prevention must start with full recognition of the potential pitfalls so that clinical practice can be tailored to their avoidance ***(Fettes et al., 2009).***

In general terms, block failure is usually ascribed to one of three aspects:

1- Clinical technique.

2- Lack of clinical experience.

3- Failure to select a meticulous approach ***(Charlton, 2003).***

Although technical problems seem to account for the majority of the spinal block failures, anatomical causes of failed spinal anaesthesia may be commoner than thought ***(Popham, 2009), (Hoppe and Popham, 2007).***

AIM OF THE WORK

To standerize systemic approach to prevent failed spinal anaesthesia by understanding the cause, management, and proper steps to prevent its failure.

ANATOMY OF THE VERTEBRAL COLUMN

The vertebrae

There are seven cervical, twelve thoracic and five lumbar vertebrae. The sacrum comprises five, and the coccyx four, fused segments.

The adult spine presents four curvatures: those of the cervical and lumbar zones are convex forwards (lordosis), those of the thoracic and sacral regions are concave (kyphosis). In the fetus, there is only a single concave-forward curvature; the cervical compensatory curve develops when the newborn infant holds up its head and the lumbar curve follows later،when the child sits and then stands ***(Ellis et al., 2004).***

Although the individual vertebrae have their own features, they are constructed on a basic pattern as represented by the mid-thoracic vertebrae (Fig. 1): the body، through which the weight of the subject is transmitted, and the vertebral (or neural) arch, which surrounds and protects the spinal cord lying in the vertebral foramen. The arch comprises a pedicle and a lamina on each side, and a dorsal spine.Each lamina, in turn, carries a transverse process and superior and inferior articular processes that bear the articular facets. The pedicles are notched; the notches of each adjacent pair together form an intervertebral foramen through which emerges a spinal nerve ***(Ellis et al., 2004).***

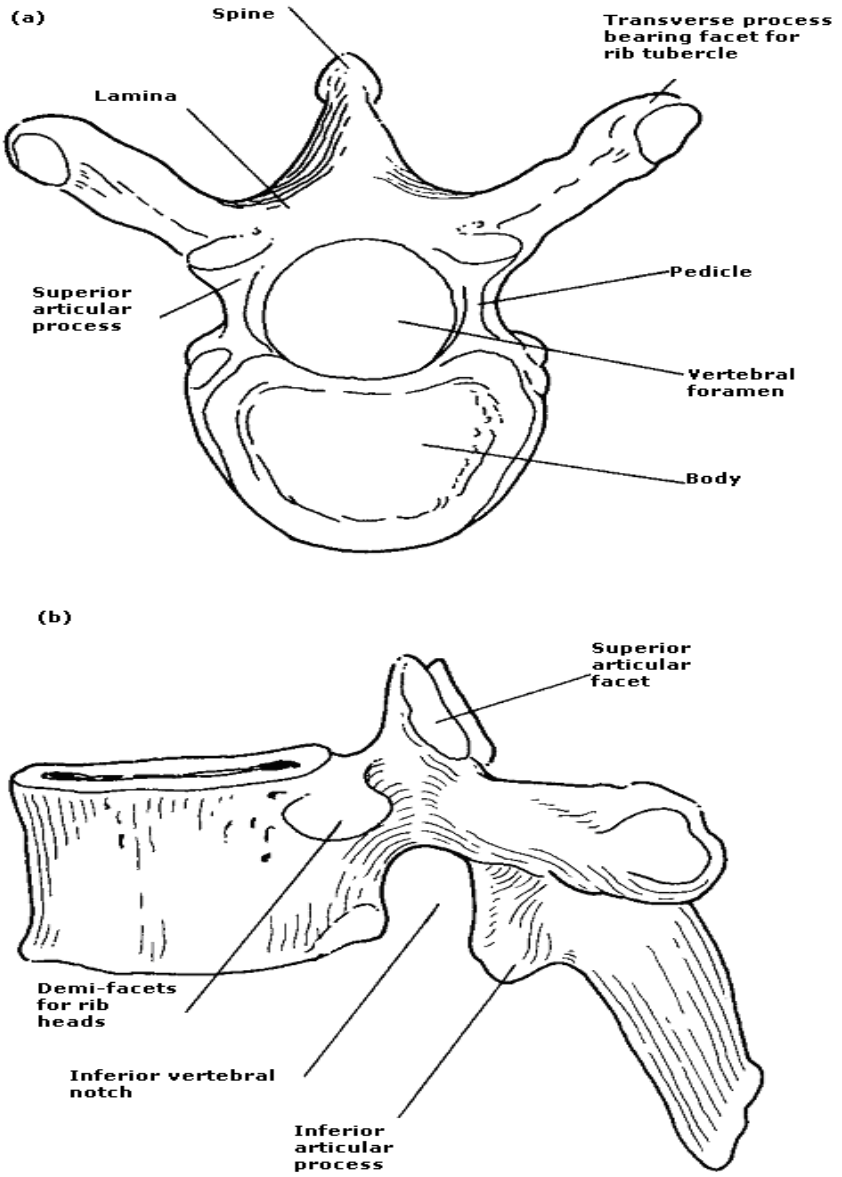

Fig. (1): A 'typical' vertebra:(a) superior and (b) lateral view of a mid-thoracic vertebra ***(Ellis et al., 2004)***.

The cervical vertebrae

Characteristics of Typical Cervical Vertebrae: *(Williams, 1995).*

1. The transverse processes possess a *foramen Transversarium* for the passage of the vertebral artery and veins. (Note that the vertebral artery passes through the transverse processes of C1-C6 and not through C7).
2. The Spines are small and bifid.
3. The body is small and broad from side to side.
4. The vertebral foramen is large and triangular.
5. The superior articular processes have facets that face backward and upward while the inferior processes have facets that face downward and forward.as shown in (fig.2).

Characteristics of Atypical cervical Vertebrae:

The first, second, and seventh cervical vertebrae are atypical.

a. The first cervical vertebra (Atlas): *(Popitz, 1997).*

1. Does not possess a body.
2. Does not have a spinous process.
3. Has an anterior and posterior arch, as shown in (fig.3).

b. The second cervical vertebra (Axis) .

Has a peg like odontoid process that projects from the superior surface of the body (representing the body of the atlas fused with the body of the axis)as shown in (fig.4) ***(Snell, 1995).***

c. The seventh cervical vertebra (vertebra prominens):

It is so named because it has the longest spinous process, and the process is not bifid. Its transverse process is also large, but the foramen transversarium is small and transmits the vertebral vein or veins ***(Snell, 1995).***

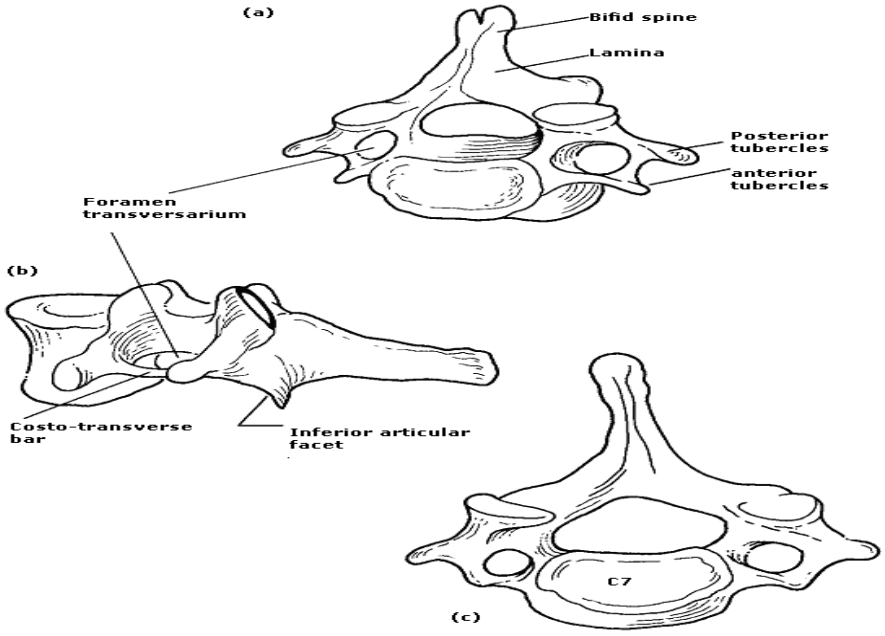

Fig. (2): Cervical vertebra in(a) superior and(b) lateral views. (c) The 7th cervical vertebra ***(Ellis et al., 2004)***.

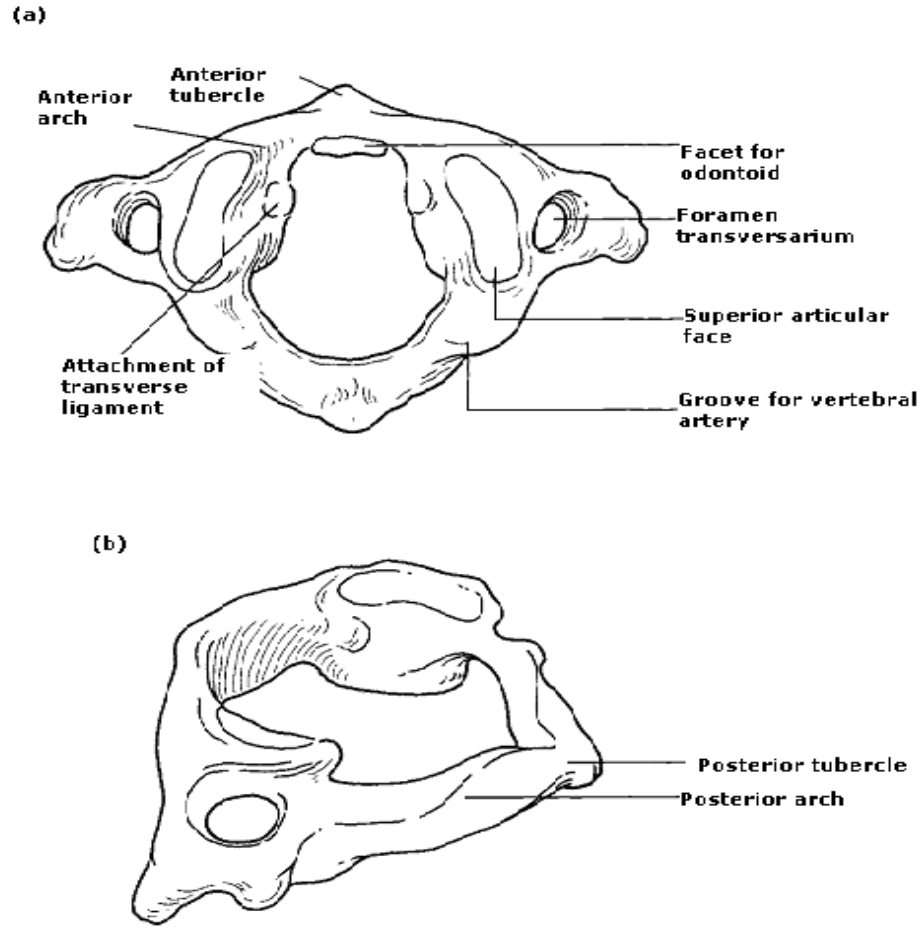

Fig. (3): The atlas in (a) superior and (b) oblique views***(Ellis et al., 2004)***.