COMPLETE SPINAL BLOCK FOLLOWING SPINAL ANAESTHESIA
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QUESTIONS

Before continuing, try to answer the following questions. The answers can be found at the end of the article, together with an explanation.

True or False?

1. Complete spinal block is relatively common, occurring in ~1% of spinal anaesthetics
2. Complete spinal block is more common following labour epidural.
3. Increased intra-abdominal pressure has been associated with high spinal block.
4. Hypotension from high or complete spinal block should be managed with trendelenberg (head down) positioning.
5. Spine imaging (to look for anatomical abnormalities) should be performed following a complete spinal block event.

INTRODUCTION

This article aims to describe the epidemiology, mechanism, risk factors and management of complete spinal block following spinal anaesthesia (SA). High or complete spinal block is a known complication of SA. Defining what constitutes a high spinal is difficult. Clinical block well above the level required for surgical anaesthesia could constitute 'high' block, however, in the absence of significant sequelae (such as respiratory compromise or bradycardia) this would be considered an acceptable result. Complete spinal block is not well defined in the literature. The terms "complete' or "total" imply anaesthetic block involving the cervical spine and above (such as brain stem and cranial nerves). The clinical manifestations of complete spinal block include some or all of the following:

Table 1: Clinical manifestations of complete spinal block

CARDIO-RESPIRATORY	NEUROLOGICAL
Hypotension*	Nausea and anxiety*
Bradycardia*	Arm/hand dysaesthesia or paralysis*
Respiratory compromise*	High sensory level BLOCK
Apnoea*	Cranial nerve involvement
Reduced oxygen saturation	Loss of consciousness*
Difficulty speaking/coughing	
Cardiac arrest (asystole)	

*Commonly reported or "classical"

Symptoms and signs usually occur within minutes of SA placement, however, delay up to 30 minutes has been reported. Clinical progression usually occurs over the subsequent several minutes. Nausea and high sensory level block (>T1) may be early indicators.

EPIDEMIOLOGY

The incidence of complete spinal block is unknown. There are numerous case reports and limited case series of this complication following SA. A recent Danish retrospective cohort study reviewing a total of 636 spinal anaesthestics for cesarean section did not record any instance of complete spinal block requiring general anaesthesia.[1] This study included 128 spinal anaesthetics following the presence of a labour epidural. "High spinal block" (which was not clearly defined) had an incidence of ~1%. There was no statistical difference in the incidence of high spinal block between those with or without prior labour epidural.

A large 2009 central neuraxial complication audit in the United Kingdom did not include complete or high spinal as a "major"complication.[2] Similarly, Swedish and French surveys on central neuraxial complications in the 1990's did not include separate incidence data on complete or high spinal events.[3,4] The UK and French studies included limited data on fatal cardio-respiratory collapse following spinal anaesthesia. If complete spinal were assumed to be the cause of all these events then extrapolation of this data would suggest the incidence of complete spinal being <1/100,000 up to 27/100,000 (0.001-0.027%).

MECHANISM & RISK FACTORS

Complete spinal block is caused by local anaesthetic interfering with the normal neuronal function in the cervical spinal cord and brain stem. The mechanism(s) behind this apparent effect are largely unknown and open to speculation. The numerous case reports and uncontrolled studies do not demonstrate a clear pattern. Complete spinal block occurring following labour epidural is suggested by a number of authors to be a more common event, however, there is a substantial publication bias in this type of case report evidence.[6,7,9,10,11,12,13,14,15,16] In addition, there are several other studies that do not demonstrate an increased risk of complete spinal block following labour epidural.[5,8] In general the following factors need to be considered in order to minimise the risk of high or complete spinal block:

1. Drug factors
    a. Block height more dependent on dose than volume (higher dose gives higher risk)
    b. Baricity – cephalad spread easier to control with hyperbaric solution
    c. Prior drug administration – such as epidural local anaesthetic diffusion (unrecognised/sub-clinical block gives higher risk)
2. Patient factors
    a. Body morphology – higher BMI or abdominal girth (including pregnancy) may reduce thecal volume and increase the risk of high block
    b. Anatomical or pathological factors – compressed thecal sack (epidural fluid & dilated vessels), spinal canal abnormality can give higher risk
3. Technique factors
    a. Higher lumbar insertion may increase final block height
    b. Position at and following injection – sitting may minimise cephalad spread
    c. Spinal needle – finer gauge and cephalad direction of needle hole may increase risk of higher block

Anecdotal evidence suggests the following are patient risk factors associated with high or complete spinal block.[6,7,9,10,11,12,13,14,15,16]

Table 2: Patient risk factors for high or complete spinal block

1. Prior epidural (especially recent "top-up")
2. Large local anaesthetic dose
3. Immediate supine positioning
4. Increased intra-abdominal pressure (including pregnancy and truncal obesity)

Specifically, in the obstetric population with SA following labour epidural some authors have suggested that avoiding epidural top-ups in the 30minutes prior, reducing local anaesthetic dose by 20% and delaying the supine position for ~60 seconds following intrathecal injection reduces the risk of high or complete spinal block.[5,13,16]

MANAGEMENT

Management is supportive and dependent on degree and height of block. Early recognition is vital as block progression may be mitigated (reverse trendelenberg/head raised) or serious cardio-respiratory compromise avoided. Typical features can be managed as follows:

Table 2: Management of typical features

FEATURE	MANAGEMENT
Bradycardia	Vagolytics eg. atropine Sympathomimetics eg. ephedrine, adrenaline
Hypotension	Vasopressors eg. metaraminol, phenylephrine Fluid boluses Leg elevation
Respiratory dysfunction	Oxygenation Intubation and ventilation
Loss of consciousness	Secure airway Supportive measures

Severe respiratory dysfunction or apnoea may occur without loss of consciousness. Appropriate psychological reassurance must be provided and an induction agent administered before intubation to minimise distress and the chance of awareness.

Sedation and mechanical ventilation needs to be continued until there is clear evidence of adequate spontaneous respiratory function. Haemodynamic changes should progressively improve as the block resolves.

Post-operative discussion with the patient is prudent. This provides the opportunity to assess the potential for psychological distress, provide an explanation of the event and answer any questions. Unless there is clinical suspicion of an anatomical abnormality there is no evidence further investigation is beneficial.

IMPORTANT POINTS

- Remember that drug factors, patient factors & technique factors contribute to the risk of complete spinal block
- Remember that management is supportive and may include induction of general anaesthesia and intubation
- Remember that early identification of symptoms & signs in vital

ANSWERS TO QUESTIONS

1. False – incidence unknown, but likely to be much less than 1%
2. False – there is no convincing evidence of this (just case series & audits)
3. True – due to possible reduction in thecal volume
4. False – head down position may increase block height
5. False – there is no evidence to support routine imaging following complete spinal

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