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## Complications of Regional Anaesthesia in Obstetrics

### Key Points

- Regional anaesthesia is a safe and widely utilised method of analgesia for labour.
- In the Western world, the majority of caesarean sections are managed using spinal (intrathecal), epidural or combined spinal / epidural (CSE) techniques.
- Although serious complications are uncommon with regional anaesthesia, they must be considered and should be discussed with the patient.

### Introduction

Over 100 years ago August Bier performed the first recorded spinal anaesthetic; and complications from the use of regional anaesthesia have been described over this same period of time. Bier also being the first to describe a 'spinal' or 'post dural-puncture headache' [1]. In Great Britain a number of high profile legal cases in the 1950s concerning major complications of neuraxial techniques led to its decline for more than two decades [2]. However, over the last thirty years the Confidential Enquiry into Maternal Deaths has been responsible for the increased use of regional anaesthesia for caesarean section due to its increased safety [3]. This has been accompanied by a very significant decrease in the death rate attributable to anaesthesia. General anaesthesia is now used in less than 5% of caesarean sections. However, there are still a number of important complications that are associated with regional anaesthesia and analgesia.

### Overview of complications of regional anaesthesia in obstetric cases

#### 1. Post Dural Puncture Headache (PDPH)

## 2. Neurological complications

Needle damage to spinal cord, cauda equina or nerve roots.  
Spinal haematoma  
Spinal abscess  
Meningitis and Arachnoiditis  
Neurotoxicity

## 3. Cardiovascular complications

Hypotension (can lead to cord ischaemia)  
Bradycardia

## 4. Miscellaneous

Venous puncture e.g. of dural veins  
Catheter breakage  
Extensive block (including unplanned blocks)  
Shivering  
Backache - Long-term backache is not a complication of neuraxial techniques although there will always be some local bruising.

## 5. Drug side effects

Nausea and vomiting (opiates)  
Respiratory depression (opiates)  
Anaphylaxis  
Toxicity (including intravascular injection of local anaesthetics)

## 6. Effects on the course of labour and on the fetus

### Complications of Subarachnoid (Spinal) Anaesthesia

POST-DURAL PUNCTURE HEADACHE: The incidence of PDPH varies between 0.5 – 2% depending on the type and gauge of spinal needle, and also with the operator's experience. There is a significantly lower incidence of PDPH associated with less traumatic pencil point needles (when compared to cutting needles) and with smaller needles such 25 or 27 gauge.

HYPOTENSION & BRADYCARDIA: Hypotension is common and occurs due to the blockade of sympathetic fibres leading to vasodilatation. Hypotension may be compounded by aorto-caval compression. Uterine blood flow is directly dependent on maternal blood pressure and therefore hypotension is detrimental to both mother and fetus. Bradycardia may be seen most commonly with a spinal anaesthetic, and may even progress to complete heart block or asystole. It is caused by the blockade of the preganglionic cardiac accelerator fibres (T1 to T4). It is also aggravated by a decrease in venous return leading to decreased action

of right atrial stretch receptors. Bradycardia usually responds to intravenous atropine or with ephedrine if there is associated hypotension. Cardiovascular side effects are often treated when the parameters vary more than 20% from their baseline, if the systolic blood pressure is less than 100mmHg or if the patient becomes symptomatic (e.g. nausea or faintness)

NAUSEA AND VOMITING: Nausea is associated with hypotension and is therefore more prevalent during spinal blockade. Nausea usually responds to treating the hypotension. Nausea may also be due to surgical stimuli, such as traction on the peritoneum or it may be associated with the use of opioids.

OPIOID SIDE-EFFECTS: Pruritus is a common side-effect of intrathecal opioids. Respiratory depression, which may occur up to 24 hours later, may be associated with the use of intrathecal morphine but this does not appear to be a problem with normal doses of intrathecal diamorphine

EXTENSIVE NEURAXIAL BLOCKADE: This is unusual with an intentional subarachnoid block unless there has been an inappropriately high dose of local anaesthetic or previous failed attempts at epidural placement. Increased pressure in the epidural space can compress the subarachnoid space thereby disseminating the local anaesthetic. Subdural or subarachnoid blocks can happen unintentionally during epidural placement causing an accidentally high block.

SHIVERING: Shivering occurs commonly but the cause is not certain. It is possible that shivering is due to differential inhibition of spinal cord afferent thermo receptors. Patients will often deny that they are cold and are at a loss to explain why they are shivering. If necessary, it may be treated by the use of warming blankets (IV opioids and midazolam have also been suggested).

## Complications of Extradural (Epidural) Anaesthesia

POST DURAL PUNCTURE HEADACHE (PDPH): Occurs at a rate of about 1% after epidural placement.

**Aetiology:** There are a number of theories, regarding the cause of PDPH. The most commonly held belief is that it is due to the CSF leaking through the dural puncture site, leading to intracranial hypotension. This causes settling of the brain and stretching of intracranial nerves, meninges and blood vessels. This theory is supported by the fact that the headache improves upon adoption of the supine position and by the decreased incidence of PDPH with the use of smaller needles with atraumatic points.

Neglected dural leak may lead to a chronic headache or even more seriously, it may lead to a number of neurological complications such as a cranial nerve palsy. Rarely it may lead to subdural haematoma, or even coning and death.

**Diagnosis:** A PDPHeadache is frequently described as a severe, disabling fronto-occipital headache with radiation to the neck and shoulders. It will often present 12 hours or more after the dural puncture. Classically the headache worsens on sitting and standing as the brain becomes unsupported by CSF within the cranium. It is relieved by lying down and abdominal compression, which increase the intra-cranial pressure.

There may be associated photophobia, vertigo, nausea and vomiting, diplopia (due to traction on the 6<sup>th</sup> cranial nerve) hearing loss and tinnitus. Other more serious signs have been described such as convulsions and visual field defects.

**Differential diagnosis of PDPH includes:** Eclampsia, migraine, tension headache, meningitis, pneumocephalus, cortical vein and sagittal sinus thrombosis, subdural haematoma and hypertensive encephalopathy.

### **Management of PDPH**

#### **Conservative:**

Bed rest

Encourage oral fluids and/or intravenous hydration

Caffeine - either i.v. (e.g. 500mg caffeine in 1litre of saline) or orally

Regular Analgesia

Reassurance

#### **Interventional:**

Epidural blood patch: This involves injecting approximately 20 ml of the patients own fresh blood (taken in a strict sterile fashion) into the epidural space near the site of the suspected puncture. It is successful in the majority of cases and the onset of relief from headache may be immediate (but occasionally takes up to twenty four hours). In patients in whom a blood patch is not successful, or where relief is temporary, it may be repeated, although the likelihood of improvement is reduced.

NEUROLOGICAL DAMAGE: Direct trauma to the spinal cord is very rare, as the epidural space is usually entered below L2. The conus medullaris, on the other hand, ends above the second lumbar vertebrae in 90% of adults. Nerve root trauma is often quoted as occurring in less than 0.1% of patients after epidural anaesthesia. Pain and/or paraesthesia during needle placement or on injection of medication, usually warn of risk for injury and should be heeded with withdrawal and redirection of the needle. Cauda equina syndrome and adhesive arachnoiditis are both due to chemical toxicity (including that of local anaesthetic toxicity). Thrombosis of the anterior spinal artery may very rarely occur leading to motor weakness, or paralysis and loss of pain and temperature sensation. It is due to prolonged hypotension and decreased arterial supply to spinal cord.

INFECTIVE COMPLICATIONS: Epidural abscess is a vanishingly rare occurrence in fit adults but has been reported subsequently to the siting of an epidural catheter. Meningitis has also been reported following neuraxial anaesthesia. It may be associated with the bacteraemia that not infrequently accompanies a normal vaginal delivery.

EPIDURAL HAEMATOMA: Epidural haematomata may occur spontaneously or in patients who have received regional anaesthesia. Risk factors include a low platelet count, international normalized ratio (INR) levels above 1.4, the use of anticoagulants and thromboprophylaxis with low molecular weight heparin. Other suggested risk factors include coagulation disorders, such as renal or liver failure, and HELLP syndrome (haemolysis, elevated liver enzymes, and low platelets) [4].

EXTENSIVE BLOCK: High epidural blocks may be associated with numbness and weakness of the hands, starting with numbness on the post-axial border of the limb (ulnar border and little finger). There is often an associated feeling of dyspnoea as the intercostal nerves (motor and sensory) are blocked. The nasal mucosa will become engorged due to unopposed parasympathetic activity. Respiratory problems are compounded by the limitations of the gravid uterus on the mother. Treatment requires instituting any resuscitative measures necessary (Airway and lateral tilt, Breathing, Circulation) and then reassurance as the block will usually recede in 15-30 minutes.

#### EFFECTS ON THE SECOND STAGE OF LABOUR AND INCIDENCE OF CAESAREAN SECTION:

Where epidural analgesia is common, there are two controversies. Firstly, whether or not it prolongs the second stage of labour and secondly whether it increases the need for operative delivery. Strong solutions of local anaesthetic (e.g. bupivacaine 0.5%) are inevitably associated with motor block and so compromise the parturient woman's ability to actively push. However, this effect is reduced by the use of a combined infusion of a weaker concentration of local anaesthetic and the addition of an opioid (e.g. bupivacaine 0.1% and fentanyl 2 micrograms per ml). Furthermore, it is feasible that women who request epidurals may be experiencing labours which are more painful, more prolonged and are therefore intrinsically more likely to require instrumental or operative delivery. The request for an epidural may be a symptom of the complication rather than the cause of it.

If epidural analgesia is available in a hospital, it would seem unreasonable to withhold it on this basis.

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