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ORIGINAL ARTICLE

# Intracranial subdural haematoma following neuraxial anaesthesia in the obstetric population: a literature review with analysis of 56 reported cases

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## ABSTRACT

**Background:** Intracranial subdural haematoma is a rare but serious complication of neuraxial anaesthesia. With early diagnosis and treatment, severe neurological sequelae can be avoided. A literature search of intracranial subdural haematoma following neuraxial anaesthesia in obstetric patients was performed. Based on the findings, a flow chart on how to assess postpartum headache following a neuraxial procedure is proposed.

**Methods:** Medline, Embase and Cochrane databases were searched for cases of intracranial subdural haematoma following neuraxial anaesthesia in obstetric patients. Epidemiological factors, clinical symptoms and signs, treatment, outcome and the effect of performing an epidural blood patch were assessed.

**Results:** Review of the literature identified 56 cases following neuraxial procedures (epidural  $n=34$ , spinal  $n=20$ , combined spinal-epidural  $n=2$ ). Predisposing risk factors were present in only a minority of patients. Persistent headache that stopped responding to postural change was the most important symptom with occurrence in 83% of patients. Focal neurological signs were present in 69% of women. Eleven percent of women were left with residual neurological deficits; the mortality rate was 7%.

**Conclusion:** Intracranial subdural haematoma following neuraxial anaesthesia in obstetric patients is rare but serious complications may result. Vigilance is required whenever a headache becomes non-postural, prolonged and/or whenever focal neurological signs occur.

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**Keywords:** Intracranial subdural haematoma; Neuraxial block; Obstetrics

## Introduction

Intracranial subdural haematoma is a rare but serious complication of dural puncture following epidural and spinal anaesthesia. Consequences may be devastating, especially when dealing with obstetric neuraxial anaesthesia in young healthy women.

Post-dural puncture headache (PDPH) is a recognised complication of neuraxial blockade.<sup>1</sup> The International Headache Society's diagnostic criterion for PDPH is a postural headache that appears or intensifies after 15 minutes of standing which improves on lying down.<sup>2</sup> Headache results from loss of cerebrospinal fluid (CSF) through the dural puncture, causing a decrease in CSF pressure with shifts of intracranial contents and

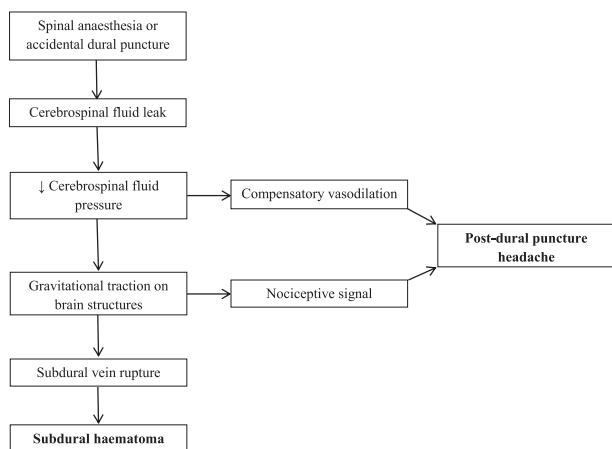
gravitational traction on pain-sensitive structures, which worsens when the patient is upright and is relieved on lying down.<sup>3</sup> The second mechanism is compensatory vasodilatation in response to the low intracranial pressure which again causes headache.<sup>4</sup> Associated symptoms occur in more than 50% of patients and include nausea, tinnitus, vertigo and photophobia.<sup>5</sup> Symptoms often resolve spontaneously within five days or when treated with analgesics and bed rest. More than 85% of PDPH resolve within six weeks.<sup>6</sup>

A subdural haematoma can develop as a rare complication of dural puncture; the loss of CSF may shift the brain caudally and cause intracranial subdural veins to tear. Yamashima and Friede reported that the thinnest parts of a bridging vein's wall are in the subdural space, this area being more fragile than the subarachnoid portion. When veins are put under sufficient traction, they may rupture and bleed into the subdural space.<sup>7</sup> Symptoms of subdural haematoma are linked to the mass effect and displacement of structures. **Figure 1**

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**Fig. 1** Pathophysiological mechanism of post-dural puncture headache and intracranial subdural haematoma

depicts the potential pathophysiology of PDPH and intracranial subdural haematoma.

The differential diagnosis of PDPH in the obstetric population includes cerebral venous sinus thrombosis, preeclamptic headache, migraine, posterior reversible encephalopathy, subdural or subarachnoid haemorrhage and undiagnosed Arnold Chiari malformation.<sup>8</sup> The most common reasons for persistent headache after delivery are tension-type and migrainous headache.<sup>9</sup> Investigation of PDPH requires a stepwise approach and might necessitate multidisciplinary evaluation. Refractory or recurrent PDPH, especially when associated with neurological signs, requires neurological or neurosurgical advice and cerebral neuroimaging.

The goal of the current review was to identify cases of intracranial subdural haematoma following neuraxial anaesthesia in obstetric patients, to summarize the results and identify risk factors.

## Methods

A computerized search of the international medical literature from 1979 through 2015 using Medline, Embase and Cochrane databases was performed. Search terms used were: “dural puncture”, “spinal anaesthesia”, “epidural anaesthesia”, “epidural analgesia”, “subdural haematoma” and “intracranial haemorrhage”. Inclusion criteria for eligibility were case reports of intracranial subdural haematoma after a neuraxial procedure (spinal, epidural or combined spinal-epidural (CSE)) in obstetric patients. Each article was then obtained in complete form and analysed. A hand-search of reference lists of retrieved reports and review articles was also conducted to search for additional cases which could have been missed by the computer assisted search. No full-text available articles and papers written in languages other than English, French and German were excluded. We did not contact authors for additional information.

Information extracted from case reports included age, mode of delivery, neuraxial injection details, time until diagnosis, clinical symptoms and signs, treatment and outcome. The presence of predisposing risk factors such as coagulation disorders, aneurysms or arterio-venous malformations, brain atrophy and head trauma was also evaluated.

## Results

In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines,<sup>10</sup> a flow diagram of the selection procedure results is shown in Fig. 2. Based on database searches and citation review, a total of 1208 articles (1202 from databases, six additional records) were identified, and the abstracts were assessed by the first author. After screening based on title, abstract and keywords, a total of 66 articles were selected for full-length review. After a comprehensive review, two authors identified 56 unique articles that met inclusion criteria. Thirty-four cases followed epidural procedures,<sup>11–44</sup> 20 cases followed spinal anaesthesia,<sup>45–64</sup> and two cases followed CSE techniques.<sup>65,66</sup> The results in these three different procedures were grouped and analysed separately. A summary of the records in the epidural and spinal group is presented in Table 1.

### Intracranial subdural haematoma following epidural

Mean [range] age of patients suffering an intracranial subdural haematoma following an epidural was 29 [15–46] years. Epidural blocks were performed in 30 patients for vaginal delivery, whilst caesarean section was the indication in four patients. A witnessed dural tap occurred in 24 out of 34 patients (71%). In two cases no details of the procedure were reported. In eight cases there was no visible CSF leak or any other clinical signs of dural puncture (24%), although in one of these cases the procedure was difficult and multiple injection attempts were needed. Risk factors described in the pathogenesis of a subdural haematoma were present in two patients: one patient was diagnosed with HELLP syndrome,<sup>24</sup> and one patient had a basal ganglia arterio-venous malformation.<sup>21</sup> No predisposing risk factors were identified in the other 32 patients.

Post-dural puncture headache was the first symptom in 91% of cases, with evolution to persistent non-postural headache in 84%. In three patients, a non-postural headache was the first symptom, not preceded by typical postural features. Focal neurological signs appeared in 71% of the patients. A summary of symptoms and signs is listed in Table 2. In all but one case, diagnosis was confirmed by neuroimaging: 18 patients had a computerised tomography (CT) scan; 12 patients had a magnetic resonance imaging (MRI) scan. In the oldest three cases, diagnosis was confirmed by carotid

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