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REVIEW ARTICLE

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Treatment of obstetric post-dural puncture headache. Part 1: conservative and pharmacological management

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ABSTRACT
The 2009–12 MBRRACE-UK report highlighted the deaths of two women in whom dural puncture had occurred during insertion of a labour epidural catheter. One woman received an epidural blood patch, the other did not, but both suffered with chronic headaches following discharge from hospital. Neither woman was adequately followed-up. Death resulted from a cerebral vein thrombosis in one case and a subdural haematoma in the other. Surveys of clinical practice in the UK have revealed significant variation in anaesthetic practice in the management of obstetric post-dural puncture headache. To help provide guidance on treatment, the Obstetric Anaesthetists' Association set up a working group to review the literature and produce evidence-based guidelines for management of obstetric post-dural puncture headache. These guidelines have been condensed into two review articles, the first of which covers conservative and pharmacological treatment.
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The guidelines on the treatment obstetric post-dural puncture headache (PDPH) have been produced by an Obstetric Anaesthetists' Association (OAA) working group and approved by the OAA Executive Committee. Recommendations have been made to assist clinicians and patients in making decisions about appropriate treatment for obstetric PDPH. The recommendations are not intended to dictate an exclusive course of treatment; rather they should be used to guide management to meet individual patient needs.

Introduction

Post-dural puncture headache (PDPH) was first described by Bier in 1899.[1] Having undergone dural puncture, Bier developed a postural headache 24 hours later, the severity of which forced him to remain in bed for nine days.[2] Post-dural puncture headache remains one of the more common complications of neuraxial blockade and a significant cause of postnatal morbidity.

The International Headache Society (IHS) now defines PDPH as, "Headache occurring within 5 days of a lumbar puncture, caused by cerebrospinal fluid (CSF) leakage through the dural puncture. It is usually accompanied by neck stiffness and/or subjective hearing symptoms. It remits spontaneously within 2 weeks, or after sealing of the leak with autologous epidural lumbar patch."[3] Although no longer included in the IHS description, the headache is typically positional and may follow spinal anaesthesia or dural puncture with an epidural needle. Up to 5% of patients may present with an atypical headache that has no postural element.[4]

Over 50% of women experience PDPH following dural puncture with 16 to 18-gauge epidural needles.[5] The incidence of headache after spinal anaesthesia depends on needle size and design, with reported rates of between 1.5% and 11.2%.[5] Data on headache duration are difficult to interpret due to differing forms of management and length of follow-up.

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There are several differential diagnoses to consider both before PDPH is diagnosed, and during ongoing management if the nature of headache changes or therapeutic interventions prove ineffective.[6,7] Primary headaches such as migraine and tension headaches are common and their incidence may increase in pregnancy. Preeclampsia and hypertensive diseases of pregnancy can present with a headache. Vascular causes, both haemorrhagic and ischaemic, must be considered and excluded. While the occurrence of a recognised dural puncture makes the diagnosis of PDPH more likely, up to a third of PDPHs occur following unrecognised dural puncture.[8,9] It is important to assess thoroughly any woman who presents with postnatal headache and establish the correct diagnosis.[6,7]

The pathophysiology of PDPH is uncertain. Dural puncture causes CSF leakage which results in radiologically demonstrable 'sagging' of intracranial structures. Sagging may be exacerbated by the upright position and is postulated to be the cause of the postural nature of the headache. Concurrent intracranial hypotension may lead to cerebral and meningeal vasodilation which of itself may cause or contribute to the headache.[10,11] Post-dural puncture headache is more common in younger patients and increases in severity and frequency as needle size increases, making the obstetric population particularly vulnerable.[5] While bed rest may relieve symptoms, it is a poor option for a new mother in the immediate postpartum period, busy with a new-born baby and in a relatively hypercoagulable state. As a result, obstetric anaesthetists are keen to find effective therapies.

Symptoms may not be limited to headache and back pain as dural puncture with a reduction in CSF volume can cause other neurological complications – ocular and auditory problems in particular. Rarely, PDPH has been associated with severe morbidity and even mortality caused by cerebral haemorrhage or cerebral venous thrombosis.[12] Although the IHS definition states that PDPH resolves within two weeks, headaches occasionally persist for longer.[13] Furthermore, it has been suggested that sufferers are more likely to develop chronic headaches or back pain.[14,15]

The epidural blood patch (EBP) is considered the definitive management for obstetric PDPH. Aspects of EBP management are considered in the accompanying review article.[16] A number of other therapeutic modalities have been described and are assessed below. Unfortunately, although initial reports have often been encouraging, no convincing alternative management options have so far emerged. When examining the evidence to inform this guideline, numerous publications – reviews in particular – simply describe opinions from previous reviews without critically appraising original scientific investigations or evidence. In summary, much of the existing advice on the management of PDPH is based on very little robust scientific evidence.

Identification and assessment of evidence

To facilitate development of evidenced-based guidelines on the treatment of obstetric PDPH, a narrative review was undertaken. A literature search of English language articles in PubMed, EMBASE, Ovid Medline and the Cochrane Databases was conducted in April 2017 to identify relevant published clinical trials, case reports and case series, clinical audits, systematic reviews and meta-analyses from 1960 to 2017 inclusive. Various search terms including 'post-dural puncture headache', 'post-lumbar puncture headache', 'spinal headache', 'epidural headache' and 'blood patch' were used. In addition, guidelines from national societies of obstetric anaesthesia and the National Guideline Clearinghouse were studied. Following completion of the draft guideline, a further literature search was performed in April 2018.

The literature search was limited to the treatment of PDPH and not prophylaxis. The effects of intrathecal catheters, various drugs regimens and the use of a prophylactic EBP in the prevention of PDPH are not included in the guidelines and in this review.

Papers identified during the literature search were reviewed by the authors. The literature search, study selection, data extraction and analysis followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[17] Interpretation of the findings of many studies was limited by a number of factors including:

- The majority of randomised trials included small numbers of patients.
- The process of randomisation and blinding was often unclear.
- Outcome measures between trials were variable.
- Many articles did not distinguish between males or females, or between obstetric and non-obstetric patients.
- Many articles did not separate PDPH following epidural from PDPH following spinal injections.
- Epidural blood patches were variably used for prophylaxis or treatment, sometimes without a clear distinction, in the same study.

Information was extracted from each publication regarding study design, population, intervention and primary (and secondary where available) outcome measures. All articles were retrieved and reviewed by at least two members of the working group to determine suitability for inclusion. Any disagreement was resolved through consensus or, if necessary, by discussion with a third member of the working group.

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Recommendations for each treatment are based on the strength of supporting evidence and were agreed by members of the working group. In areas where evidence was lacking, the working group produced good practice points based on consensus. Opinions were sought from various groups including representatives from obstetrics, midwifery, neurology, neuroradiology, general practice and the lay public.

Conservative treatment

Bed rest

Although most women with PDPH gain some symptomatic relief in the supine position, the effects may be transient.[9] There are no published randomised trials examining the effect of bed rest in the treatment of PDPH and bed rest has not been shown to speed its resolution. Furthermore, a meta-analysis has demonstrated little benefit of prophylactic bed rest in prevention of PDPH.[18] Whilst many women with PDPH prefer to remain supine, prolonged bed rest should not be encouraged as it may increase the risk of thromboembolic complications. When women feel confined to bed for longer than 24 hours because of PDPH, thromboprophylaxis should be considered and discussed with the obstetric team. If pharmacological thromboprophylaxis is used and an EBP is to be performed, adequate time between the last dose of anticoagulant and the EBP must have elapsed to reduce the risk of vascular complications.[19]

Although most women gain some relief from obstetric PDPH when supine, the effects may be transient. Prolonged bed rest is not recommended as it may increase the risk of thromboembolic complications.

Oral fluids

It has been suggested that when treating PDPH, fluid therapy may help by increasing the production of CSF. There are no randomised studies examining the effect of oral fluid intake on recovery from PDPH. Dehydration may worsen headache but excess fluid intake appears to be ineffective and, potentially, may be of harm. Therefore, normal hydration should be maintained; benefit from encouraging excessive fluid administration is unlikely.

Normal hydration should be maintained but there is no evidence of benefit from excessive fluid administration in the treatment of obstetric PDPH.

Intravenous fluids

As with oral fluids, there are no studies demonstrating benefit of intravenous fluid therapy in the treatment of PDPH. When PDPH is diagnosed, intravenous fluids need only be used to prevent dehydration when adequate fluid cannot be taken orally.

In the treatment of obstetric PDPH, intravenous fluids need only be used to prevent dehydration when adequate fluid cannot be taken orally.

Abdominal binders

Abdominal binders are thought to work by increasing pressure within the spinal canal, pushing CSF cephalad, thereby reducing headache. Although one study looked at the role of abdominal binders in prophylaxis of PDPH,[20] there are no randomised trials looking at their effect in the treatment of PDPH. They are cumbersome and usually unacceptable to postnatal women with observational studies highlighting poor compliance.[21]

There is currently insufficient evidence to recommend the use of abdominal binders in the treatment of obstetric PDPH.

Pharmacological management

Simple oral analgesia

Simple oral analgesic medication such as paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and weak opioids including codeine or tramadol are frequently prescribed following childbirth. They are used for postnatal headaches of all causes. However, they are often of limited efficacy when treating obstetric PDPH.[9] There are no placebo-controlled trials examining the benefit of simple oral analgesia in obstetric PDPH, although they are usually included in the control group when other therapies are investigated. Regular analgesia should be offered to all women with postnatal headache and maximum daily doses should not be exceeded.

Regular oral analgesia should be offered to women with postnatal headache.

Opioid analgesia

Stronger opioid medication such as morphine or oxycodone is often given to women with PDPH when simple oral analgesia is ineffective. There are no randomised studies examining the efficacy of opioids in the treatment of obstetric PDPH. Whilst the use of strong opioids may be of some temporary benefit, long-term therapy (>72 hours) is not recommended due to their recognised side effects.

Opioid analgesia may be offered to women with obstetric PDPH if simple oral analgesia is ineffective but long-term therapy is not recommended.

Caffeine

The proposed mechanism of action of caffeine in PDPH is by cerebral vasoconstriction and increased CSF production. Despite its widespread use, only two randomised studies have investigated the efficacy of

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caffeine in the treatment of PDPH,[22,23] with both finding some short-term improvement in symptoms.

Sechzer and Abel compared intravenous caffeine 500 mg with placebo in 41 patients with PDPH, finding significant improvement in headache two hours after caffeine administration.[22] Long-term outcome was not reported. Camann et al. randomised 40 obstetric patients with PDPH following epidural or spinal blocks, to receive either oral caffeine 300 mg or placebo.[23] The severity of headache was significantly better after four hours in the caffeine group but there was no difference between groups at 24 hours and no difference in the number of women receiving an EBP. There are no comparisons of oral with intravenous caffeine in the obstetric population. The optimum dose has not been established. The benefit of caffeine in PDPH is supported in observational studies and case reports.[24,25] Unfortunately, these reports and the two randomised studies have methodological flaws, leading some authors to suggest that the endorsement of caffeine in PDPH is unwarranted.[26]

Ingestion of large amounts of caffeine has a number of recognised side effects including maternal restlessness and insomnia. Furthermore, it is transferred into breast milk and may have effects on the infant.[27] Of concern are cases of maternal seizures following the use of caffeine to treat PDPH.[28–32] Whether this represents causation or an association is unknown. Seizures have occurred after large doses of caffeine were administered ($\geq$1 g). Decreased metabolism of caffeine during pregnancy more than doubles its half-life (up to 16 hours), leading to increased levels of active theophylline metabolites.[33,34] Values usually return to normal within a month of delivery.

Based on current evidence, it is recommended that treatment of obstetric PDPH with caffeine should not exceed 24 hours, because it has only been shown to provide short-term benefit (up to four hours) and repeated administration may increase the risk of side effects. Intravenous administration has not been shown to improve efficacy. Oral doses of caffeine should not exceed 300 mg, with a maximum of 900 mg in 24 hours. A lower maximum dose of 200 mg in 24 hours is recommended by the National Health Service for women who are breastfeeding, and is particularly relevant to those with low birth weight or premature infants.[27] The intake of caffeinated drinks should be monitored in those women prescribed caffeine for PDPH. Commercially available coffees and high-energy drinks typically contain 100–200 mg of caffeine.

There is limited evidence to support the use of caffeine in the treatment of obstetric PDPH. If used, treatment with caffeine should not exceed 24 hours, oral therapy is preferred, and doses should not exceed 300 mg, with a maximum of 900 mg in 24 hours. A lower maximum dose of 200 mg in 24 hours should be considered for women who are breastfeeding, particularly those with low birth weight or premature infants. Women receiving caffeine therapy should have their intake of caffeinated drinks monitored and the recommended daily dose should not be exceeded.

Other theophyllines

There have been three randomised studies[35–37] and two observational studies[38–39] investigating the use of theophylline in PDPH. Two of the three randomised studies contained no obstetric patients,[35,37] and the third provided no details regarding pregnancy.[36] Control groups were treated with a variety of medications including paracetamol, NSAIDs, opioids and caffeine. The manuscripts contain insufficient methodological details to exclude a significant risk of observer bias and their findings should be interpreted with caution. All studies investigated headaches after spinal anaesthesia or diagnostic lumbar puncture. Consequently, even though statistically significant improvements in visual analogue scale (VAS) pain scores were reported, extrapolation to obstetric PDPH, especially after dural puncture with an epidural needle, may not be justified.

In an observational study, Wu et al. reported a reduction in VAS pain scores in non-obstetric patients with PDPH treated with intravenous aminophylline 250 mg.[40] With no control group, the significance of these findings is unclear. In a follow-up study by the same authors, 124 patients with PDPH, of whom 31 were obstetric, were randomised to receive either intravenous aminophylline 250 mg or placebo within three hours of developing headache.[41] No other medications were administered. Headaches followed either spinal or epidural blocks but relative numbers were not stated. Reduction in VAS pain scores was significantly greater in the aminophylline group. In view of heterogeneity within the study groups, caution should be exercised when attempting to extrapolate these findings to the obstetric population.

ACTH and analogues

Adrenocorticotropic hormone (ACTH) and its synthetic analogues tetracosactrin (Synacthen) and cosyntropin are thought to act by elevating endogenous aldosterone levels, thereby increasing circulating volume. They may also increase CSF production and stimulate beta-endorphin release.

Rucklidge et al. compared intramuscular Synacthen Depot with saline in 18 obstetric patients with PDPH and found no difference between groups in headache severity or EBP requirement.[42] In 33 non-obstetric patients, Zeeger et al. compared intravenous cosyntropin 0.75 mg with caffeine 1 g.[43] The study was due to recruit 270 patients but was terminated after only 37 had been enrolled due to feasibility issues. Both therapies reduced pain scores with no significant differences

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between groups. Hanling et al. compared intravenous cosyntropin 0.5 mg with an EBP.[44] Of the 34 patients recruited, six were obstetric. Headaches followed both spinal anaesthesia and dural puncture with an epidural needle. Pain scores over the seven-day study period were lower in the EBP group, although statistical significance was achieved only on day one. These results may reflect an inadequate sample size and that PDPH symptoms improve over time regardless of treatment.

Other publications on ACTH and its analogues are limited to observational studies with no control groups. Of note, Oliver and White reported three cases of unexplained seizures following administration of Synacthen to obstetric patients with PDPH.[45]

Steroids

Three randomised studies have investigated the use of hydrocortisone in the treatment of PDPH,[46–48] and all reported statistically significant improvement in the severity of headache. All three studies included headaches after spinal anaesthesia, but none included obstetric patients. Hydrocortisone was added to pethidine and paracetamol in one study,[46] to caffeine and simple analgesia in another,[47] and compared with 20% mannitol in the third.[48] The use of other medications and insufficient methodological detail make interpretation of the findings difficult. The successful use of hydrocortisone and methylprednisolone has also been reported in small case series and abstracts.[49–51] Prophylactic dexamethasone has not been shown to reduce the incidence of PDPH.[52]

Triptans

Triptans are serotonin type-1 receptor antagonists used in the treatment of headache. There is only one randomised trial looking at the efficacy of triptans in treating PDPH: this study contained 10 obstetric patients who received either subcutaneous sumatriptan 6 mg or saline.[53] There was no significant difference in outcome, although with such small numbers the possibility of a type-2 error cannot be ignored. Other studies investigating triptans have not been randomised.[54,55] The remainder of the evidence is from individual case reports.[56–59]

Gabapentinoids

The gabapentinoids, gabapentin and pregabalin, are anticonvulsant drugs that have gained increasing popularity in the treatment of neuropathic pain and migraine prophylaxis. In addition, they are increasingly used for postoperative analgesia. Their exact mechanism of action is unclear.

There are two randomised studies investigating the efficacy of gabapentin in PDPH following both spinal and epidural anaesthesia.[60,61] Both are written by the same single author. Gabapentin (300 mg eight-hourly) was compared to placebo in one study,[60] and with caffeine and ergotamine in the other.[61] Although both studies reported statistically significant reductions in VAS pain scores, there was no mention of whether obstetric patients were included in either. In both manuscripts, the conduct of the study was not described in sufficient detail to exclude the possibility of significant observer bias.

An observational study by Wagner et al. of 17 obstetric patients with PDPH following both spinal and epidural blocks, treated with gabapentin (maximum dose 300 mg daily for up to 30 days), reported significant improvement in headache in 53% of patients.[62]

Pregabalin (100 mg eight-hourly) has been compared to gabapentin (300 mg 8-hourly) and to paracetamol (500 mg eight-hourly) in a non-obstetric population with PDPH after spinal anaesthesia.[63] As with the gabapentin studies, the methodology was not described in sufficient detail to eliminate a significant risk of bias. From 24 to 72 hours after administration, pregabalin was significantly more effective than gabapentin, which was significantly more effective than paracetamol.

In a single-blinded randomised study comparing pregabalin (150 mg/day for three days followed by 300 mg/day for two days) with placebo in 40 patients by Huseyinoglu et al., VAS pain scores were significantly lower in the pregabalin group.[64] Although the authors stated that obstetric patients were included, exact numbers were not reported.

Sedation is a recognised side effect of gabapentin and pregabalin and is undesirable in the postnatal period. The effects of gabapentinoids on the baby in breastfeeding mothers have been reviewed.[65] Although no adverse effects were observed, the lack of data was highlighted. The United Kingdom (UK) National Institute for Health and Care Excellence (NICE) recommends that gabapentin should be used with caution in breastfeeding mothers and only prescribed when benefit clearly outweighs risk.[66]

In summary, all published studies on gabapentinoids in the treatment of obstetric PDPH have methodological flaws. More research is required to establish their efficacy and safety in the treatment of obstetric PDPH.

Other medications

A number of other medications have been suggested to be beneficial in the management of PDPH, although most have not been put through the rigor of well-conducted randomised trials.[67] Desmopressin (DDAVP), an anti-diuretic hormone analogue, produces fluid retention and vasoconstriction. Although, it has been tried in the prophylaxis of PDPH, there are no studies of its use in treatment. Despite the lack of evidence, intramuscular and subcutaneous desmopressin are listed as treatments for PDPH in the British National Formulary.[68]

Methylergonovine (methylergometrine) is an alpha-adrenergic agonist causing cerebral vasoconstriction.

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Its efficacy in obstetric PDPH has only been reported in one observational study, although few details were presented.[69]

There is one randomised study in obstetric patients comparing ondansetron with saline in the prophylaxis of PDPH. Fewer of those in the ondansetron group developed a headache.[70] There are no studies investigating treatment of obstetric PDPH with ondansetron.

Mannitol infusion was compared to hydrocortisone in one non-obstetric PDPH study. Its proposed mechanism of action is by plasma expansion, decreasing viscosity and improving regional microvascular cerebral blood flow.[48] The effects of mannitol on PDPH intensity were less marked than those of hydrocortisone.

A randomised study of 85 obstetric patients with PDPH following spinal anaesthesia for caesarean section examined the effect of intravenous eight-hourly neostigmine (20 μg/kg) and atropine (10 μg/kg) for up to 72 h.[71] Compared to placebo, VAS pain scores were significantly lower in the treatment group at all time points. Further studies are required to investigate the efficacy of safety of neostigmine and atropine in obstetric PDPH.

There is currently insufficient evidence to recommend the use of aminophylline, theophylline, ACTH and its analogues, hydrocortisone, dexamethasone, methylprednisolone, triptans, gabapentinoids, desmopressin, methylergonovine, ondansetron, mannitol or neostigmine and atropine in the treatment of obstetric PDPH.

Invasive procedures

Acupuncture

Acupuncture has been used in the treatment of headache. Its mechanism of action is unclear but it may promote release of endorphins and relieve muscle spasm. There are several case reports and case series indicating benefit in obstetric PDPH,[72–74] but no randomised trials.

There is currently insufficient evidence to recommend the use of acupuncture in the treatment of obstetric PDPH.

Greater occipital nerve blocks

Greater occipital nerve blocks (GONBs) have been reported to be beneficial in the treatment of headaches. It has been suggested that they block pain transmission to the trigeminal nucleus caudalis, reducing central sensitisation, which 'switches-off' the headache.

A randomised study comparing GONBs with bed rest, hydration and simple analgesia in 47 patients (both obstetric and non-obstetric) with PDPH, following spinal anaesthesia with a 27-gauge Quincke-point needle, demonstrated a statistically significant reduction in VAS pain scores on days 1–6.[75] The GONBs were performed using a mixture of lidocaine, adrenaline, bupivacaine, fentanyl and clonidine. Other publications of GONBs are observational studies and case reports and consequently are not free of the risk of reporting bias.[76–79] More evidence on the role of GONBs in obstetric PDPH is required.

There is currently insufficient evidence to recommend the use of greater occipital nerve blocks in the treatment of obstetric PDPH.

Sphenopalatine ganglion blocks

The potential benefits of sphenopalatine ganglion blocks (SPGBs) have been suggested in one unrandomised retrospective study[80] and a number of case series.[81–88] Sphenopalatine ganglion blocks are thought to work by blocking parasympathetic flow to cerebral vasculature, reducing cerebral vasodilatation. Blocks may need to be repeated on more than one occasion. To date, there are no randomised trials investigating the efficacy of SPGBs in PDPH, and more evidence is required.

There is currently insufficient evidence to recommend the use of SPGBs in the treatment of obstetric PDPH.

Epidural morphine

The successful use of epidural morphine in preventing PDPH has been described in one randomised study and a number of case series.[89,90] There are two published reports of the successful use of epidural morphine in the treatment of PDPH, both from the same authors.[91,92] It is unclear whether these reports were in obstetric patients. More evidence is required.

There is currently insufficient evidence to recommend the use of epidural morphine in the treatment of obstetric PDPH.

Epidural fluid administration

Epidural crystalloids

Epidural saline injections are thought to work by increasing intracranial pressure (ICP) thereby reducing traction on pain-sensitive structures which cause PDPH. The increase in ICP is, however, relatively short-lived, providing only temporary relief of symptoms.

Prophylactic epidural infusions of Hartmann's solution 1–1.5 L do not appear to decrease the incidence of PDPH, although its severity may be reduced.[8,93] Epidural crystalloid infusions are associated with back pain[93] and are no longer in widespread use in the UK.[94] In a retrospective study, Che et al. found that an epidural saline infusion of 6 mL/h for up to seven days significantly reduced the incidence and duration of PDPH in Chinese women following dural puncture during either epidural or combined spinal-epidural anaesthesia.[95]

A randomised study by Kakinohana et al. investigated the effect of epidural saline administration in the

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treatment of PDPH.[96] Of the 16 patients recruited, two were obstetric. All suffered PDPH following spinal anaesthesia. Patients were randomised to receive either an epidural saline bolus of 15–20 mL, followed by an infusion of 20 mL/h for three hours or an EBP. No details were presented on other forms of treatment. Visual analogue scale pain scores were similar between groups at 15 minutes, but significantly higher in the saline group at three hours. There was no significant difference in VAS pain scores at 24 hours.

Usubiaga et al. observed immediate relief of PDPH resulting from spinal anaesthesia in 10 of 11 non-obstetric patients given 10–30 mL of epidural saline. Eight patients had no further headache.[97] Few details were given on other forms of treatment. In an observational study, Bart et al. found an epidural saline bolus of 30 mL effective in the treatment of obstetric PDPH at 24 hours in 60% of patients in whom dural puncture was with a 25-gauge spinal needle.[98] However, in those women in whom the dura had been punctured with a 17-gauge needle, saline was universally ineffective at 24 hours.

Abdullah et al. reported the effects of repeated caudal boluses of saline (100–220 mL over 20 minutes) in the treatment of PDPH in 56 non-obstetric patients.[99] Most patients required three or four injections but only four patients ultimately received an EBP. In a literature review published in 2005, Gill et al. reported 12 cases of retinal haemorrhage resulting from large-volume epidural fluid injection.[100]

There is currently insufficient evidence to recommend the use of epidural crystalloid infusions in the treatment of obstetric PDPH. Epidural saline bolus administration may improve symptoms but the effect is usually transient.

Dextran

Successful treatment of PDPH with an epidural infusion of dextran in obstetric and non-obstetric patients has been documented in case reports.[101–103] The number of reports in obstetric patients is small and there are no randomised trials. There is a lack of safety data on the use of epidural dextran.

Hydroxyethyl starch

Two case series containing nine obstetric patients have been published on the successful use of epidural hydroxyethyl starch (HES) in the management of PDPH.[104,105] There are no randomised studies. Safety data on the use of epidural HES are lacking.

Gelatin

The use of epidural gelatin, either as fluid or reconstituted powder has been demonstrated in three obstetric patients.[106,107] There are no randomised studies and limited safety data.

Fibrin glue

The successful use of fibrin glue 3–5 mL injected through an epidural needle in the treatment of PDPH and headache associated with spontaneous intracranial hypotension has been reported.[108–111] There are no case reports in obstetric patients. Cases of allergic reactions to fibrin glue have been reported.[112] Further investigation is required regarding its efficacy and safety in the management of obstetric PDPH.

There is currently insufficient evidence to recommend the use of epidural dextran, HES, gelatin or fibrin glue in the treatment of obstetric PDPH.

Summary

High-quality evidence supporting many widely used forms of conservative and pharmacological methods of treatment of obstetric PDPH is lacking. Based on available evidence, a proposed outline for treatment of obstetric PDPH is presented in the Appendix.

All women who experience dural puncture with an epidural needle or PDPH after a spinal block should be reviewed daily by a member of the anaesthetic team. When a woman experiences PDPH, follow-up should continue until the headache resolves. Furthermore, any case of suspected obstetric PDPH should be referred to the anaesthetic team for assessment and this should take place within 24 hours. Before hospital discharge, women who have experienced dural puncture with an epidural needle or PDPH should be given information about symptoms that require further medical assessment and about whom they should contact. Appropriate follow-up after discharge from hospital should be arranged for any woman who experiences dural puncture with an epidural needle or has an obstetric PDPH.

Bed rest may provide temporary relief and hydration should be maintained. Thromboprophylaxis should be considered. Simple analgesia should be offered to all women with postnatal headache while the diagnosis is established. Stronger opioids may be offered but treatment should be limited to 72 hours. Caffeine may be tried but evidence is limited to short-term benefit and treatment should be limited to 24 hours. Other pharmacological and non-pharmacological interventions have shown limited benefit, with evidence confined to case reports, small observational series, non-obstetric data, or studies with methodological flaws.

Further investigation of the use of steroids, gabapentinoids, greater occipital nerve blocks and sphenopalatine ganglion blocks in obstetric PDPH would be helpful. The epidural injection of fibrin glue has been reported to be successful but, as with other inventions, further work is necessary to confirm its efficacy and safety. Indications and management of an EBP are considered in the second review.[16]

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Declarations of interests

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Appendix. Guide for treatment of obstetric postdural puncture headache

All women who experience dural puncture with an epidural needle or PDPH after a spinal block should be reviewed daily by a member of the anaesthetic team whilst still in hospital. Furthermore, any woman suspected of having PDPH should be referred for anaesthetic assessment and reviewed by the anaesthetic team within 24 hours. A medical history should be taken and a physical examination performed to exclude other potential causes of postnatal headache. When a woman experiences PDPH, follow-up should continue until the headache resolves.

Whether or not an EBP is performed, an appropriate follow-up after discharge from hospital must be arranged for any woman who experiences obstetric PDPH.

When PDPH is diagnosed the following treatment options should be considered:

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1. Bed rest may reduce the intensity of symptoms, but prolonged bed rest is not recommended as it may increase the risk of thromboembolic complications.
2. Thromboprophylaxis should be considered for women whose mobility is reduced due to PDPH.
3. Encourage fluid intake to maintain adequate hydration.
4. Offer simple oral analgesia such as paracetamol, weak opioids and NSAIDs if not contraindicated.
5. Stronger opioids such as morphine or oxycodone may be offered but treatment should usually be limited to <72 h duration.
6. Caffeine may be offered but limited to 24 h duration, with a maximum dose of 900 mg (200 mg maximum in breastfeeding women).
7. Offer an epidural blood patch (EBP) when symptoms affect daily living and care of the baby (a guide for EBP management is provided in part 2).
8. Before hospital discharge, women who have experienced dural puncture with an epidural needle or PDPH should be given information on symptoms that require further medical assessment and on whom they should contact.
9. Arrangements should be made for appropriate follow-up after discharge from hospital for women who have experienced dural puncture with an epidural needle or PDPH.
10. When women experience dural puncture with an epidural needle or PDPH, the general practitioner (GP) and community midwife should be informed of treatment received and arrangements for further follow-up.

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