

## RISK FACTORS, CLINICAL MANIFESTATION AND PREVENTION OF POST-DURAL PUNCTURE HEADACHE IN THE OBSTETRIC FIELD

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**Keywords:** analgesia, post-dural puncture headache, obstetrical anesthesia.

### Summary

**Introduction:** Over the past decades, the number of women choosing to have epidural analgesia or undergoing spinal anesthesia during labor is steadily increasing. Consequently, a risk for complications is increasing. Post-dural puncture headache (PDPH) is considered one of the most common complication following accidental dural puncture (ADP).

**Sources and a method:** A literature overview were conducted via search engine "PubMed (Medline)" and "Google Scholar". Randomized controlled trials, meta – analysis, retrospective, prospective trials and systemic reviews on PDPH were selected.

**Aim of the review:** To evaluate the most commonly described risk factors, clinical presentation and prevention of PDPH in the obstetric field.

**Results:** The occurrence of ADP during neuraxial anesthesia reported in the literature is relatively small – 0,1 – 1,5%. PDPH is a potentially expected complication after any lumbar puncture. It presents as a headache within five days of the puncture due to low cerebrospinal fluid pressure. The pain is often bilateral, located in the frontal or occipital areas. Symptoms, such as vision and hearing impairment, neck pain and nausea might follow. Usually, the symptoms fade out spontaneously within two weeks. Risk factors for PDPH are modifiable (technique of the injection and anesthesiologist's skills) and non-modifiable (pregnancy, low body mass index (BMI), dehydration, history of PDPH). The goal of preventing PDPH is to identify and correct the risk factors associated with this condition. Main described means being equipment and experience, conservative measures, administration of epidural morphine, intravenous dexamethasone or cosyntropin, epidural blood patch and intrathecal catheter. **Conclusions:** 1. PDPH manifests as an orthostatic headache with or without ocular, neural, hearing and other

symptoms. 2. Young pregnant women with low BMI are more likely to suffer from PDPH. 3. PDPH prevention consists of risk factor correction and proper medical techniques.

### Introduction

Epidural analgesia and spinal anesthesia are frequently used in obstetric practice – over the past few decades, the number of women choosing to have epidurals during labor is steadily increasing [1]. It is suggested, that up to 80% of the women in Europe and North America give birth with neuraxial block [2]. Post-dural puncture headache (PDPH), also known as lumbar puncture headache (LPH) is one of the most commonly occurring complication following epidural or spinal anesthesia [3]. Most often the cause of PDPH is iatrogenic, although it may occur spontaneously [2]. It is proven, that PDPH is a cause for longer hospitalization, maternal distress, increased drug consumption, additional medical interventions and impaired capability to nurture the baby [4]. Past research shows, that spinal anesthesia has played a major role in the decrease of maternal mortality rates compared to endotracheal anesthesia [5].

**The aim of this review** is to evaluate the most commonly described risk factors, clinical presentation and prevention of PDPH in the obstetric field.

### Sources and a method

This is a literature overview. Randomized controlled trials, meta – analysis, retrospective, prospective trials and systemic reviews on post-dural puncture headache were selected using search engine PubMed (Medline), using the keywords: "post-dural puncture headache", "obstetrics", "incidence", "risk factors", "prevention".

### Results

**Incidence.** The occurrence of accidental dural puncture (ADP) during neuraxial anesthesia reported in the literature is relatively small – 0,1 – 1,5% [6, 7]. A large retrospective analysis of 43434 women, who had epidural analgesia du-

ring labor, was done in order to determine the prevalence of PDPH. Out of all the patients, 63 events were identified and associated with PDPH – 0,15% occurrence. ADP was witnessed in 38 women, out of those 24 developed PDPH afterwards [4]. Costa et al [5] conducted a ten-year retrospective analysis of women, who received neuraxial anesthetic for labor and delivery. A total of 32655 women had neuraxial analgesia, only 298 (0,9%) were diagnosed with PDPH afterwards. 21795 (66,7%) received epidural anesthesia and 10249 (31,4%) received spinal anesthesia. PDPH incidence was witnessed in epidural and spinal anesthesia, respectfully 224 (1%) and 70 (0,7%). 611 patients received a combination of these two methods, which showed a higher rate of PDPH 1,3%. Sprigge et al [8] conducted a survey of 18337 patients, who received epidural analgesia over the course of 23 years. There was an incidence of 167 (0,91%) ADP's and 147 (88%) patients developed PDPH.

**Clinical manifestations.** PDPH is a potentially expected complication after any lumbar puncture. It presents as an orthostatic headache – meaning it is provoked by a vertical position [9]. PDPH occurs within five days of the puncture due to low cerebrospinal fluid (CSF) pressure following a CSF leak through the puncture [2]. The pain is often bilateral, located in the frontal or occipital areas [3]. Usually, symptoms, such as vision and hearing impairment, photophobia, tinnitus, neck pain and nausea follow the headache [2, 3]

Normally, symptoms fade out within 10-14 days without any medical interventions [2]. However, a possibility of complications, such as chronic headaches, cerebral venous thrombosis, reversible cerebral vasoconstriction syndrome or subdural hematoma from traction in dural veins should be taken into consideration at any time [3,5].

**Risk factors.** Once the spinal injection has occurred, there are various risk factors that contribute to the higher incidence of PDPH, they can be broadly categorized as modifiable and non-modifiable [10].

Modifiable factors mostly include the technique of the injection and anesthesiologist's skills. Needle parameters - shape, size (i.e., larger bore spinal needles are more likely to be the cause of PDPH) and the insertion angle as well as the stylet replacement, multiple attempts and inexperience of the person who's performing the injection have previously shown to increase the rates of PDPH [2, 3, 10].

Pregnancy and younger age have been regarded as one of the most important non-modifiable risk factors for PDPH – however, this consideration might reflect the high incidence of spinal or epidural injection in a fertile women's cohort [7, 10]. Although controversial, the risk of ADP is directly increased by the stage of labor, to be precise, women at a greater degree of cervical dilatation are more likely to feel

uncomfortable and not to be able to remain still at the time of injection, hence increasing the chance of ADP and PDPH [2]. As mentioned before, young pregnant women, especially the ones with low BMI, seem to be of the greatest risk for experiencing PDPH [7]. In addition, some authors suggest that multiparous and obese women might also be more likely to suffer PDPH [5]. History of PDPH, dehydration and history of migraines also influence the rates of PDPH [3, 11, 12].

**Prevention.** The goal to preventing PDPH is to identify and correct the risk factors associated with this condition. There are several studies reporting on prevention of PDPH. However, the results of which measures are the best to this day remain inconclusive [11].

1. Equipment and experience. According to literature, needle size may be the most important risk factor associated with PDPH. Bezov et al. [10] recommends to use 25 – 27 G needles for epidural anesthesia, because 22G is more often associated with PDPH. Bigger needles leave a larger opening in the dura mater, as a result of that more CSF is lost. Furthermore, a higher incidence of PDPH was noted with less experienced residents: number of epidurals administered (PDPH incidence) – <10 (2,5%) vs >60 (1,2 – 1,3%).

2. Conservative measures. Arevalo-Rodriguez et al [12] systematic review of 24 trials concluded that bed rest showed no benefits compared to immediate mobilization for the prevalence of severe PDPH (low quality evidence). Furthermore, bed rest was associated with a probable increase of PDPH compared to mobilization. Fluid supplementation was also analyzed in the review. The authors concluded that in the presence of severe PDPH fluid supplementation showed an absence of benefits (low quality evidence). The effect of oral caffeine was researched in Ona et al [13] systematic review. Oral caffeine was not associated with decreased prevalence of PDPH and showed a negative effect of insomnia to patients.

3. Epidural morphine. Administering a dose of epidural morphine after a witnessed dural puncture is an effective prevention for PDPH [11]. In a systematic review morphine administration was associated with a positive effect in reducing the number of women affected by PDPH. However, adverse events, such as vomiting and nausea were higher in participants who were given morphine [13]. Bradbury et al [14] conducted a systematic review and meta – analysis and stated that epidural morphine reduced the incidence of PDPH ( $p=0,014$ ). A recent randomized double – blind controlled trial evaluated prophylactic intrathecal morphine injection for prevention of PDPH. The authors found that a single prophylactic morphine injection does not decrease the incidence or severity of PDPH [15]. Brinser et al [14] reviewed 80 cases where 38 women were given neuraxial

morphine and 42 were not. There was no statistically significant difference found between the two groups for incidence and severity of headache.

4. Dexamethasone. There is conflicted information regarding the use of intravenous dexamethasone for PDPH prevention. A study of patients who underwent spinal anesthesia concluded that dexamethasone did not have any benefits for headache incidence [16]. A recent randomized double-blinded placebo-controlled trial, in which 96 patients were given 8mg of dexamethasone and 96 patients were given normal saline after spinal anesthesia. The incidence of PDPH and nausea were significantly lower in the dexamethasone group, respectfully  $p=0.002$  and  $p=0.015$  [17]. However, Yang et al [18] study of 307 participants who were given dexamethasone and 309 who were given placebo found no difference between the two groups for protective effect against PDPH ( $p=0.054$ ). On the contrary. Dexamethasone increased the incidence of PDPH in the first 24 hours ( $p=0.016$ ).

5. Cosyntropin. According to the literature, cosyntropin can reduce the number of women with PDPH [13]. A randomized controlled trial by Hakim et al [19], where 45 patients received 1 mg of cosyntropin and 45 received placebo, showed that PDPH was significantly lower in cosyntropin group ( $p=0.001$ ).

6. Epidural blood patch (EBP). Prophylactic EBP is one of the preventive possibilities if an ADP occurs. It involves an injection of about 20 ml of autologous blood in the epidural space prior to removing the catheter. A randomized controlled trial with 116 patients was done to determine the effect of prophylactic and therapeutic blood patch. 60 patients were included in the prophylactic group and 56 in therapeutic. The incidence of PDPH in the prophylactic group was 18.3%, while in therapeutic group PDPH was 79.6% [20]. A retrospective analysis of 298 patients that developed PDPH showed that 49.7% did not receive EBP, 42.9% received one EBP and 7.4% received two or more [5]. For patients with a difficult catheter placement, EBP may be a reasonable choice for prevention of PDPH. Although, a risk of infection has to be weighted [11].

7. Intrathecal catheter. After ADP leaving an intrathecal catheter is a viable option to prevent CSF loss. The risk of re-puncturing dura mater is less than 10% according to the literature [7]. It is recommended that an intrathecal catheter should be in place at least for 24 hours. The results of this method showed a significant decrease in PDPH (91.9% vs 6.2%) [11]. Russell et al [21] conducted a randomized controlled trial of 97 patients with ADP, where 47 women received a repeated epidural and 50 were converted to spinal analgesia. There was no difference between the two groups for incidence of PDPH ( $p=0.2$ ). 2021 ADP management

guidelines suggest inserting an intrathecal catheter after dura mater puncture to decrease the chances of PDPH and decrease the need for EBP [22].

## Conclusions

PDPH manifests as an orthostatic headache with or without ocular, neural, hearing and other symptoms. It is caused by low CSF pressure. PDPH should always be mentioned as a possible complication of epidural analgesia or spinal anesthesia. Young pregnant women with low BMI are more likely to suffer from PDPH, other risk factors include dehydration, obesity and staff inexperience. PDPH prevention consists of risk factor correction and proper medical techniques.

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## **POPUNKCINIŲ GALVOS SKAUSMŲ RIZIKOS VEIKSNIAI, KLINIKINĖ IŠRAIŠKA IR PREVENCIJA AKUŠERIJOJE**

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Raktažodžiai: analgezija, galvos skausmas po epidurinės nejauros, galvos skausmas po spinalinės injekcijos, akušerinė anestezija. Santrauka

Įvadas. Pastaraisiais dešimtmečiais daugėja moterų, kurios gimdymui renkasi epidurinę arba spinalinę nejaurą. Kartu didėja ir komplikacijų po procedūros rizika. Popunkciniai galvos skausmai (PPGS) yra viena iš dažniausių komplikacijų po netyčinio kietojo dangalo pradūrimo.

Darbo tikslas – apžvelgti PPGS dažniausius rizikos veiksnius, klinikinę išraišką ir prevenciją akušerijos skyriuje.

Tyrimo medžiaga ir metodai. Literatūros šaltinių paieška atlikta tarptautinėse medicinos duomenų bazėse PubMed, Google Scholar. Į apžvalgą įtraukti anglų kalba publikuoti atsitiktinių imčių tyrimai, metaanalizės, retrospektyviniai, prospektyviniai tyrimai ir sisteminės literatūros apžvalgos, susijusios su PPGS.

Rezultatai. Netyčinio dangalo pradūrimo atvejų per neuroakšialinę anesteziją literatūroje pateikiama sąlyginai nedaug – 0,1-1,5 procento. PPGS yra tikėtina komplikacija po lumbalinės punkcijos. Jie pasireiškia galvos skausmu per 5 dienas po punkcijos dėl žemo smegenų skysčio slėgio. Skausmas dažnai apima abu galvos šonus, lokalizuojasi kaktinėje ir pakaušinėje srityse. Gali pasireikšti tokie simptomai, kaip regėjimo ar klausos sutrikimas, kaklo skausmas ar pykinimas. Įprastai simptomai praeina savaime per dvi savaites. Rizikos veiksniai PPGS yra koreguojami (injekcijos technika ir anesteziologo patirtis) ir nekoreguojami (nėštumas, mažas kūno masės indeksas, dehidratacija, anamnezėje PPGS). PPGS prevencijos tikslas yra nustatyti su šia būkle susijusius rizikos veiksnius ir juos koreguoti. Pagrindiniai būdai tą padaryti yra tinkama įranga ir patirtis, konservatyvūs būdai, morfino suleidimas į epidurinę tarpą, intraveninis deksametazonas arba kosintropinas, epidurinis kraujo pleistras ir intratekalinis kateteris.

Išvados. 1. PPGS pasireiškia ortostatiniu galvos skausmu. Galimi regėjimo, neurologiniai, klausos ir kiti simptomai. 2. Jaunos nėščiosios, turinčios žemą KMI, labiau linkusios į PPGS. 3. PPGS prevenciją sudaro rizikos veiksnių koregavimas ir tinkamas medicinos metodų taikymas.

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