

## Post-Spinal Anesthesia Headache Prevention and Management: A Brief Literature Review

Ian Caldeira Ruppen<sup>1\*</sup>, Raphael Ricardo de Oliveira<sup>1</sup>, Manuela Moreira Nascimento Durço Cozendey<sup>3</sup>, Vitor Augusto Olivari do Carmo<sup>1</sup>, Lara Beatriz Dallaqua Bitiati<sup>1</sup>, Luka Valcarengi Pannebecker<sup>1</sup>, Luhara Sechi Lorga Vieira<sup>1</sup>, Otávio Antigo Orlandini<sup>1</sup>, Ana Luiza Romitti<sup>1</sup>, Maria Rafaela Mahnic Colombo<sup>1</sup>, Pedro Henrique Barreto Costa<sup>1</sup>, Ana Julia Gomes<sup>1</sup>, Gustavo Henrique Rodrigues<sup>2</sup>, Lucas Drzeviechi Silva<sup>1</sup>

<sup>1</sup>Centro Universitário Ingá – Uningá, Maringá, PR, Brazil.

<sup>2</sup>Faculdade Cesumar – Unicesumar, Maringá, PR Brazil.

<sup>3</sup>Centro Universitário Redentor, Brazil.

**\*Corresponding author:** Ian Caldeira Ruppen, Centro Universitário Ingá - Uningá, Maringá, Paraná, Brazil. Email: Ian2ruppen@gmail.com; ORCID: <https://orcid.org/0000-0003-1706-1662>

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### Abstract

Post-spinal anesthesia headache (PSAH) is one of the most frequent complications following a subarachnoid puncture for anesthetic or diagnostic procedures. This painful condition is largely due to the leakage of cerebrospinal fluid (CSF) through the dural opening, leading to a drop in intracranial pressure and the typical presentation of pulsatile pain, which intensifies in an upright position and eases when lying down. In addition to headache, nausea, dizziness, and photophobia may occur, significantly impacting postoperative recovery, prolonging hospitalization, and straining the healthcare system. Prevention of PSAH involves the careful choice of needle gauge and type—preferably pencil-point needles with a smaller diameter—as well as technical care during the puncture, since cutting-tip needles of larger gauge increase the risk of extensive dural injury. Factors such as age, sex, the number of puncture attempts, and obstetric procedures (particularly in young women) also influence the incidence of headache. Regarding management, the initial approaches include conservative measures such as hydration, common analgesics (non-opioid analgesics or non-steroidal anti-inflammatory drugs), and relative bed rest.

**Keywords:** Post-spinal anesthesia headache; dural puncture; prevention; management; epidural blood patch.

### Introduction

Subarachnoid anesthesia, popularly known as spinal anesthesia, has transformed surgical practice by enabling interventions of varying complexity with effective sensory blocks and high-quality analgesia. However, as with any invasive technique, risks and complications accompany this procedure, with post-spinal anesthesia headache (PSAH) being one of the most frequent and significant. Described since the advent of local anesthetics for spinal use, PSAH continues to be a subject of study and refinement in the field of anesthesiology. Generally, PSAH is characterized by a pulsatile headache that worsens in the upright position and eases when lying down, often accompanied by symptoms such as nausea, vomiting, photophobia, and even neck stiffness. From a pathophysiological perspective, the condition is linked to the loss of CSF through the residual dural opening after the puncture, resulting in reduced intracranial pressure and traction on pain-sensitive structures within the cranium. The intensity of the headache varies according to individual characteristics and technical factors, which can significantly impair postoperative or postpartum recovery. Among the factors that increase the risk of PSAH, the type of needle used is prominent: needles with a cutting tip (such as the Quincke) and larger diameters favor a wider dural lesion and consequent CSF leakage. In contrast, pencil-point needles (e.g., Whitacre or Sprotte) produce smaller, less traumatic openings, thereby reducing the likelihood of headache. Additionally, the number of puncture attempts, the professional's experience, and patient positioning during the

procedure also influence the incidence of this complication. Regarding patient characteristics, young females, particularly parturients, are more susceptible to PSAH possibly due to anatomical features, hormonal influences, and the physiological changes inherent in pregnancy. In such cases, post-spinal anesthesia headache has a double impact, affecting both the well-being of the new mother and her ability to care for the newborn. Prevention consists of a combination of technical strategy and careful handling.

The appropriate choice of needle—considering both gauge and tip type—and correct positioning during the puncture are established measures to reduce the likelihood of extensive dural tears. Moreover, some guidelines suggest that aligning the bevel parallel to the dural fibers can decrease the incidence of PSAH, although the literature still shows heterogeneous results. Performing spinal anesthesia delicately, with as few puncture attempts as possible, and involving experienced professionals are additional protective factors. When PSAH occurs, the clinical diagnosis is primarily based on the recent history of spinal puncture and the classic presentation of headache that worsens when upright and eases when recumbent. Conservative measures such as relative bed rest, hydration, common analgesia, and caffeine comprise the first line of approach and may alleviate the painful condition. However, in cases of refractory or intense headache, the epidural blood patch (EBP) is considered the most effective intervention by promoting the formation of a clot that seals the dural opening and prevents further CSF leakage. Although the EBP has high therapeutic success rates, debate remains regarding the ideal timing for its application. Some authors advocate for its use 24 to 48 hours

after symptom onset, while others recommend early intervention to avoid prolonged suffering and associated emotional sequelae.

### Objectives

To review the literature regarding post-spinal anesthesia headache, addressing pathophysiological mechanisms, risk factors, prevention strategies, and treatment options, with the aim of supporting evidence-based clinical practice and enhancing anesthetic care.

### Materials and Methods

A bibliographic review was conducted using articles published in the PubMed, ScienceDirect, and SciELO databases to underpin this study.

### Discussion

Post-spinal anesthesia headache (PSAH) remains an important challenge in anesthetic practice, even after decades of technological and scientific advancement. Its significance lies not only in the debilitating pain that the patient experiences but also in its potential to prolong hospitalization and incur additional healthcare costs. Among the controllable elements, the choice of needle is crucial for the occurrence of PSAH. Comparative studies emphasize that pencil-point needles (such as Whitacre, Sprotte, among others) cause less damage to the dura mater, thereby reducing the risk of CSF leakage. Similarly, using needles with a smaller gauge is associated with a lower incidence of headache, although extremely thin gauges may necessitate several puncture attempts, paradoxically increasing the risk of dural trauma. Thus, the decision regarding which needle to use must balance the anesthesiologist's experience, the availability of materials, and the patient's clinical condition. Regarding bevel orientation, several authors suggest that positioning it parallel to the dural fibers mitigates the size of the dural opening, thereby decreasing CSF loss; however, conflicting results and methodological differences among studies have prevented a definitive consensus. Furthermore, the number of puncture attempts is crucial, as each failed attempt raises the likelihood of forming larger or irregular dural holes that facilitate CSF leakage. Young women of reproductive age, particularly parturients, are more susceptible to PSAH due to anatomical characteristics, hormonal changes, and increased pelvic blood flow during pregnancy. Given the frequency of obstetric procedures performed under spinal anesthesia, PSAH in this group has a significant impact on the childbirth experience and neonatal care, warranting special attention from healthcare providers. The initial management of PSAH typically involves conservative measures, such as relative bed rest, hydration, and analgesia with non-opioid medications, weak opioids, or non-steroidal anti-inflammatory drugs. Caffeine is often employed as an adjunct, as it promotes cerebral vasoconstriction and, consequently, alleviates pain in some patients. Although these measures may be beneficial for mild cases, the literature does not recognize them as effective for more severe cases since they do not directly address the primary cause the CSF loss.

Considered the gold standard for treating refractory or severe PSAH, the EBP demonstrates high efficacy, with success rates generally exceeding 90% for pain relief or remission. The procedure involves the injection of autologous blood into the

epidural space, which, upon clotting, seals the dural breach and normalizes intracranial pressure. Nonetheless, debates continue regarding the optimal timing for performing an EBP; while some experts advocate for early intervention immediately upon diagnosis to avoid prolonged patient suffering, others recommend waiting at least 24–48 hours after symptom onset to optimize efficacy and reduce the need for reintervention. The main complications associated with EBP include low back pain, infection risks, epidural hematoma, and very rarely, transient or permanent neurological complications. However, when performed by an experienced professional using proper sterile technique and after a careful patient evaluation, the procedure shows a satisfactory safety profile.

Advanced techniques, such as continuous spinal anesthesia and the use of fine subarachnoid catheters, have been investigated to reduce the incidence of PSAH by causing less dural trauma. In addition, prophylactic pharmacological strategies are being explored, although no consensus has yet been established for routine application. The variability of protocols across institutions and the lack of large-scale, high-evidence clinical studies make it difficult to standardize recommendations. Overall, the combination of a technically precise puncture, the appropriate selection of equipment, and the adoption of well-established protocols represent the most effective measures to reduce the occurrence of PSAH. When the headache manifests, an escalated approach from conservative measures to EBP when needed—stands as the safest and most validated practice today. It is essential that multidisciplinary teams are trained to recognize headache symptoms early, assess their severity, and propose prompt interventions, thereby reducing morbidity and enhancing patient satisfaction.

### Conclusion

Post-spinal anesthesia headache remains a persistent and highly relevant complication in contemporary anesthetic practice, demanding specialized attention from prevention to treatment. Despite extensive study, there remain gaps in understanding individual risk mechanisms and in standardizing protocols to address diverse clinical realities. From a preventive standpoint, using needles of smaller gauge with a pencil point and carefully aligning the bevel during the puncture are widely recommended measures to reduce extensive dural lesions. In addition, the professional's expertise and strict technical adherence—including minimizing the number of puncture attempts—are key determinants for procedural success and reducing PSAH incidence. Although controversies persist regarding the efficacy of practices such as absolute bed rest or forced hydration in the immediate postoperative period, most services continue to implement them due to ease of application and the minimal associated risks. When headache occurs, initial management includes conservative measures and symptomatic support via analgesia, hydration, and caffeine. However, in cases of incapacitating or refractory pain, the epidural blood patch stands out as the most effective strategy, with a high clinical success rate. While potential complications of the EBP exist, they are uncommon when the procedure is performed with appropriate technique, strict asepsis, and careful patient selection. The lack of methodologically rigorous studies comparing different prevention and management strategies hinders the establishment of universal clinical guidelines. In this context, evidence-based

practice must be continuously updated and adapted to the specificities of each service, considering factors such as patient profile (sex, age, gestational status), material availability, and team experience.

It is also essential that patients are properly informed about the signs and symptoms of PSAH and the available treatment options. Open dialogue and health education increase adherence to medical recommendations, favor early detection of complications, and improve patient satisfaction. Furthermore, well-trained and aware multidisciplinary teams can optimize diagnostic, treatment, and referral pathways for more complex interventions when necessary. In summary, clinical experience and scientific evidence converge on the need for an individualized approach where primary prevention, early identification, and prompt intervention are fundamental to minimizing the impact of post-spinal anesthesia headache. It is expected that, with the continuous progress of research and the adoption of more standardized protocols, the incidence and severity of this complication will be further reduced, enhancing patient comfort and safety during the perioperative period.

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