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Post-Dural Puncture Headache: A Case Report

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Case Report

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ABSTRACT

The purpose of the study is to present a complicated case who present an unwanted severe headache which occur in a patient receiving a spinal or epidural injection. We report the case of a 64-year-old male patient who underwent skin transplantation, namely split-thickness skin graft (STSG) on the right instep using a 26 G Quincke spinal needle. After successful plastic surgery which lasts 90 minutes using spinal anesthesia, postoperatively, the patient was admitted to the recovery room and instructed to rest in bed for 12 hours, and also not to sit and lift the head. After the motoric strength of both legs is normal (Bromage scale 0) the patient may tilt left-right, given RL infusion 30 tpm, and ketorolac analgesic injection 30 mg IV. In the recovery room the patient allowed to drink and eat as usual. But just after four hours, the patient goes to the bathroom to urinate, and at that moment the patient felt a sudden severe headache. The patient had to be helped by his family to get back to bed and lie down and after 15 minutes, the complaints subsided. The doctor on duty who was reported by the nurse about this incident asked the patient to rest in bed for 24 hours until the complaint completely disappears. In the following day, the patient discharged from the hospital in good condition. Despite its frequency and impact, PDPH remains poorly understood, and further research is needed to elucidate its actual scope of the problem, its pathophysiology and optimal management.

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Keywords: Neuraxial block; severe; temporary; spinal needle; cranial hypotension; brain sagging; pathophysiology; management.

1. INTRODUCTION

A Subarachnoid block (SAB), also known as a spinal block, is a neuraxial technique (Olawin & Das, 2022) or sometime called spinal anesthesia technique that involves injecting a local anesthetic into the cerebrospinal fluid (CSF) within the subarachnoid space via the spinal column (Paliwal et al., 2024). The advantages of this techniques including: it is easy for the novice to learn and to perform (Ferede et al., 2020), the onset of action of the drug is fast (Agarwala & Morrison, 2022) and good effectivity in sensory and motor blockade (Parthasarathy et al., 2022). This technique is the choice of anesthesiologists for surgery in the region of lower abdominal to the lower legs (Balavenkatasubramanian et al., 2023; Pirie et al., 2020), as long as there are no relative and absolute contraindications.

Absolute contraindication for spinal anaesthesia are as follow: patient refusal (Rhee et al., 2010), infection at the injection side (Gimeno & Errando 2018), abnormalities in coagulation (coagulopathies) (Cekic & Besir, 2012) or patient on anticoagulant (allen et al., 2002), allergic reaction to the local anaesthesia (Olawin & Das, 2022), and increased intracranial pressure (Metterlein et al., 2010).

While on the other hand, relative contraindication for spinal anaesthesia: hemodynamic instability or hypovolemia (Lopes et al., 2023), aortic stenosis (Tabrizi et al., 2024), septicemia (Gimeno & Errando, 2018), brain related illness (Pozza et al., 2023), unchanging heart rate (Doelakeh & Chandak, 2023), cushing syndrome resistant to local anesthesia such as Ehlers-Danlos syndrome (Cesare et al., 2019). Other consideration to spinal anaesthesia include difficulty positioning of the patien (Knight & Mahajan, 2004) t, bacteremia (Gimeno & Errando, 2018), stenotic valvular disease (Paul & Das, 2017), degenerative lumbar spine disease (Lin et al., 2010), prior history of lumbar surgery (Lucas & Vose, 2015), or if the anesthesiologist predicted that the procedure is take longer than the duration of nerve block (Stewart et al., 2020).

Post-spinal anesthesia headache is another rare complication of neuraxial anesthesia techniques (Plewa & McAllister, 2023; Hyderally, 2002). due to leakage of cerebrospinal fluid as a result of a spinal needle tear to the dura mater (Kracoff & Kotlovker, 2016). Although this condition is never reported as life-threatening (Basurto et al., 2013), this complication is unpleasant for patients, their families, and the doctors and nurses who care for them (Harrop-Griffiths, 2013).

2. CASE PRESENTATION

The patient is a 64-year-old man, weighing 59 kg, and height 160 cm with a diagnosis of skin loss in the area of dorsum pedis dextra due to a traffic accident 1 week prior surgery. From the anamnesis, it was found that the patient had controlled hypertension and taking daily amlodipine 5 mg tablets single dose since one year ago. Routine blood and urine laboratory tests showed the results were all within normal limits.

Pre-anesthesia physical examination: vital signs consist of blood pressure, pulse, and oxygen saturation were within normal limits. Before spinal anesthesia was administered, the patient was given 500 ml of RL fluid loading within 20 minutes. The patient positioned seated, the head was slightly bent to the chest, L3-L4 was identified, then followed by asepsis/antisepsis in the area of injection, with a median approach, a 26 G Quincke spinal needle was inserted, CSF dripped out clear, then a mixed drug solution of 0.5% isobaric levobupivacaine 15 mg and 25 mcg fentanyl was inserted at a rate of 1 ml/20 seconds.

After 5 minutes, the effect of spinal anesthesia was complete so that the split-thickness skin graft (STSG) on the right dorsum pedis could be performed by taking the dermis layer from the right inguinal fold. The operation lasted 90 minutes, hemodynamics during the operation were within normal limits, and 700 ml of RL fluid was given.

Postoperatively, the patient was admitted to the recovery room and instructed to rest in bed for 12 hours, not to sit and lift the head. After the motoric strength of both legs is normal (Bromage scale 0) the patient may tilt left-right, given RL infusion 30 tpm, and ketorolac analgesic injection 30 mg IV. In the recovery room the patient allowed to drink and eat as usual.

Four hours after surgery, the patient went to the bathroom to urinate and in the bathroom, the

patient complained of severe headache and nausea, and the patient asked the family to help the patient to get out of the bathroom, after 15 minutes the patient lay on the bed the headache disappeared. Then the nurse reported to the doctor on duty about this incident and the patienr was advised to have extended bed rest for 24 hours.

The occurrence of PDPH headache in this patient most likely occurred due to rapid mobilization. After the patient was given instructions to rest in bed for 24 hours and drink 1.5-2L per day, the headache complaints subsided and the patient was discharged from the hospital in good condition.

3. DISCUSSION

In this case, due to the patient's non-compliance and impatience with the doctor's post-operative instructions causes the incidence of PDPH. The patient may feel happy because they are pain-free and supported by soon normal limb motor strength so they decide to go to the bathroom themselves without thinking first about the consequences and even worse is not asking permission first from the nurse in charge of the room.

PDPH headache is one of the complications that may occur after neural anesthesia for surgery, or lumbar puncture for diagnostic and therapeutic purposes (Plewa & McAllister, 2023). PDPH is defined as a headache that occurs in patients who quickly become active such as sitting or standing after a lumbar puncture due to CSF leakage (Plewa & McAllister, 2023; Kracoff & Kotlovker, 2016; Basurto Ona et al., 2013).

PDPH headache will worsen within 15 minutes after the patient sits or stands and will subside (reduce) after 15 minutes of the patient lying down. This severe but temporary postural headaches following interventions that disrupt meningeal integrity are most often considered a temporary inconvenience (Schyns-van den Berg et al., 2024) but unfortunately it can be can be debilitating in the short term and may probably last for days to weeks of period, making the condition more difficult to handle (Hasoon et al., 2024).

Epidemiologically, in a specific group of patient, spinal anesthesia may also result in a PDPH incidence of 0.8-5% in the highest pregnancy risk group (Guglielminotti et al., 2021). The headache often starts within the first 48 hours post epidural unintentional dural puncture (UDP) and if left untreated (Uppal et al., 2023), resolves spontaneously in about 2-weeks in most women but may last longer in some women (Kuczkowski, 2004).

The exact mechanism causing PDPH headache is not yet known for certain. There are several theories about the mechanism of PDPH after spinal anesthesia, but basically is due to a rapid but temporary decrease in cerebrospinal fluid (CSF) pressure (Schyns-van den Berg et al., 2024). This can lead to traction on pain-sensitive structures in the brain, causing a headache (Shahriari & Sheikh, 2016; Jabbari et al., 2013). Gadolinium-enhanced magnetic resonance imaging (MRI) in cases of PDPH customarily signifies the sagging of intracranial anatomical structures (Droby et al., 2020). MRI may also indicates the temporary meningeal enhancement, which could be affected by local immediate vasodilatation of segmented thin-walled vessels as a response to rapid onset of unwanted intracranial hypotension (Lee et al., 2021).

Because CSF leakage in PDPH will cause:

a. Cranial hypotension (Boczarska-Jedynak & Stompel, 2024) and soon followed by compensatory vasodilation of cerebral arteries and veins to maintain a constant intracranial volume (Lee et al., 2021), which will cause headaches and paralyze the cranial nerves VII (Facial), IX (Glossopharyngeus), and VIII (Vestibulocochlearis) so that the ears ring (Manici et al., 2024; Chambers & Bhatia, 2017).
b. The intracranial structure to loosen, the brain shifts (sagging) (Droby et al., 2020) which forced the meninges and other intracranial sensory nerve structures stretch, causing severe headaches (Shahriari & Sheikh, 2016; Jabbari et al., 2013).

Several other risk factors are thought to play a role in the occurrence of PDPH are as follows:

1. Age and gender, where study conducted by Wee et al found out that no cases of PDPH found in children under 10 years old (Wee et al., 1996) and also uncommon in adults over 60 years old (Sjövall et al., 2015). The peak incidence of PDPH is in

adolescents, young adults (14-40 years old) (DelPizzo et al., 2020). This is related to the elasticity properties of the dura mater which is less responsive to weak cerebral blood vessels against sudden cerebrospinal fluid hypotension, which narrowing the extradural vertebral space so that the possibility of CSF leakage accumulation is small and CSF leakage from the subarachnoid space becomes small (Shahriari & Sheikh, 2016). The incidence of PDPH in pregnant women is high, this is related to increased estrogen hormone levels that affect muscle tone which causes increased brain distension to CSF leakage (Kuczkowski, 2004). Low body mass index (BMI) is a risk factor PDPH (Birajdar et al., 2016). However, studies by Peralta et al have found that higher BMI may decrease the risk of PDPH (Peralta et al., 2015).

2. The diameter and shape of the tip of the spinal needle (Van der Auwera et al., 2023; Xu et al., 2017) The larger the diameter of the spinal needle used, the higher the risk of PDPH, the more severe and longer the headache (Arevalo-Rodriguez et al., 2017). Although the diameter of the tip of the spinal needle is the same, if the shape is different, e.g., blunt or sharp, the incidence of PDPH is higher among patient receiving neuraxial block using the sharp tip of the spinal needle (Quincke) compared to the blunt tip of the spinal needle (Whitacre) (Akyol et al 2024; Xu et al., 2017).

The incidence of PDPH headaches generally occurs slowly (delayed) (Kracoff & Kotlover, 2016), Posture related headaches (Arevalo-Rdriguez, 2016) specifically occur after the sufferer is active such as sitting or standing. PDPH headaches are usually felt as dull, throbbing, neck stiffness, nausea and vomiting, hearing loss, visual disturbance, tinnitus, paraesthesia, vertigo, and severe headache in the fronto-occipital area (Plewa & McAllister, 2023). The PDPH pain scale based on the numeric rating scale (NRS) can be divided into mild (1-3), moderate (4-6), and severe (7-10).

Various efforts have been made by anesthesiologists to suppress the incidence of PDPH, such as modifying the shape of the tip of the spinal needle to be blunt or sharp, reducing the diameter of the spinal needle so that the tearing of the dura mater fibers is as minimal as possible so that the incidence of brain fluid leakage is greatly reduced (Akyol et al., 2024). With the discovery of small diameter spinal needles 26 G, 27 G, and 29 G, the incidence of PDPH theoretically has decreased greatly so that spinal anesthesia techniques have become increasingly popular in recent decades.

Despite its frequency and impact, PDPH remains poorly understood (Simopoulos et al., 2016), and further research is needed to elucidate its pathophysiology in order to prevent it and if the condition exists, optimal management, in term of effectivity and efficiency, should be applied as soon as possible.

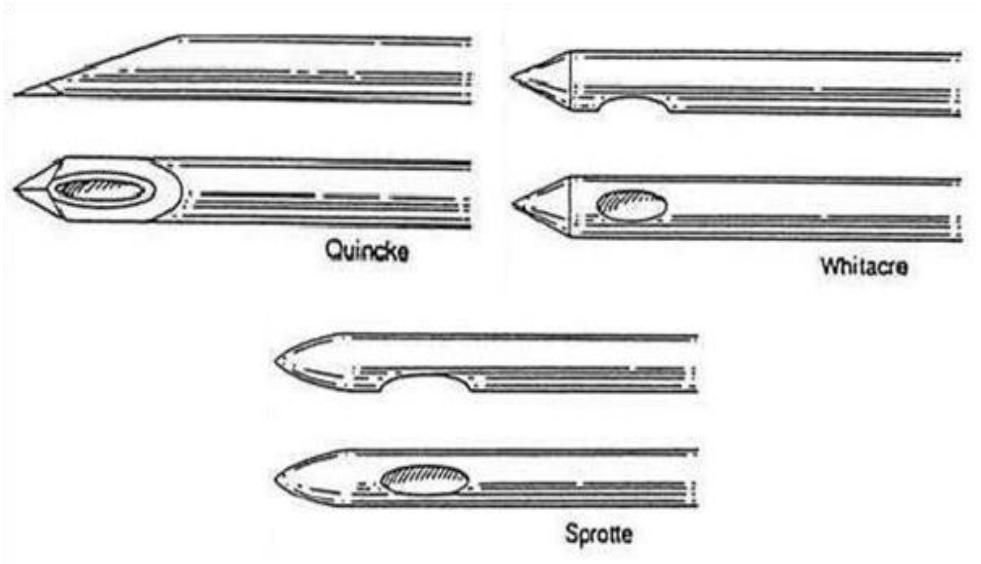

Fig. 1. Various types of the tip of the needle (Moghtaderi et al., 2012)

4. CONCLUSION

The prognosis of PDPH in this case is good. Very early mobilization is taught to be the cause. Extended bed rest until 24 hours and sufficient water intake seem to return the patient to the desired baseline state; The next day the patient was sent home from the hospital in good condition. Despite its frequency and impact, PDPH remains poorly understood, and further research is needed to elucidate its actual scope of the problem, its pathophysiology and optimal management.

CONSENT

"Author declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal."

ETHICAL APPROVAL

"Author hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki."

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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