Case Report

Post-dural puncture headache following lumbar spinal drain: an atypical presentation with cognitive symptoms

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Summary

Post-dural puncture headache is a consequence of cerebrospinal fluid loss, leading to reduced intracranial pressure. Its classical symptoms include a frontal-occipital headache which is worse on standing, neck stiffness, nausea, hearing loss and photophobia. In this report, we describe an atypical presentation of post-dural puncture headache in a 72-year-old woman following an endovascular repair of an aortic aneurysm, before which a lumbar spinal drain was placed to reduce the risk of spinal cord ischemia. Following drain removal, the patient developed hypoactive delirium, challenges with both depth perception and fine motor skills and a mild headache. An epidural blood patch was performed, which resulted in the complete resolution of her symptoms. This case highlights an atypical presentation of post-dural puncture headache in an older patient, in whom the major symptoms were cognitive. Cerebrospinal fluid leakage should be considered as a cause of postoperative delirium in patients who have undergone neuraxial anaesthesia.

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Accepted: 28 June 2021
Keywords: blood patch; cerebrospinal fluid leak; delirium; epidural; post-dural puncture headache

Introduction

Post-dural puncture headache (PDPH) is a complication of the accidental or deliberate drainage of cerebrospinal fluid, leading to reduced intracranial pressure and traction on the meninges. Some of the risk-factors for PDPH include young age, female sex, use of larger gauge needles and 'cutting' needle tip types, and pregnancy and labour [1, 2]. The current International Headache Society describes PDPH as: "*Headache occurring within five 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 two weeks, or after sealing of the leak with autologous epidural lumbar patch*" [3]. Other symptoms include nausea, vomiting, vertigo, paraesthesia of the scalp and upper or lower limb pain. Treatment of PDPH include conservative measures and epidural blood patch. Once the patient has failed conservative management, epidural blood patch is considered. The success of this procedure ranges from 61% to 75%, and among those patients in whom the procedure is successful, more than 90% experience immediate relief of the symptoms [4].

In this report, we describe the case of a patient who presented with unusual features of altered mental status and possible hypoactive delirium, without evidence of classic PDPH symptomatology other than a mild headache.

Report

A 72-year-old woman with a past medical history of atrial fibrillation, chronic obstructive pulmonary disease and asthma presented for an elective endovascular aneurysm repair of a thoracic aortic aneurysm. Prior to the procedure a 4.5-Fr lumbar

Figure 1 (a) Clock drawing before epidural blood patch; (b) Clock drawing after epidural blood patch.

drain was placed at the level of L3–L4 to reduce the risk of spinal cord ischemia. One hundred millilitres of CSF was drained during the surgery. Subsequently, 142, 234 and 70 ml was drained on postoperative days zero, one and two. On postoperative day three, the spinal drain was removed. Three days after removal of the spinal drain (postoperative day six), the patient described a mild occipital headache. The acute pain management service was consulted for evaluation of the possibility of a PDPH. The patient reported that her headache was intermittent and did not limit her ability to ambulate. However, she also noted a perceived lack of depth perception and difficulty with fine motor movement, such as the inability to hold utensils while eating, but denied other symptoms.

Given the mild intensity of the patient's headache and the absence of correlation with posture, the recommendation of the acute pain management service was for conservative management with close follow-up. Of note, the options for conservative management were limited as the patient had developed atrial fibrillation with a rapid ventricular rate postoperatively. Echocardiography demonstrated severe pulmonary hypertension and severe tricuspid regurgitation associated with right atrial enlargement. Based on the cardiologist's assessment that the patient was hypervolemic, treatment with furosemide was started. Hence, increasing fluid intake and caffeine consumption were not considered appropriate.

The following day, it was noted that the patient's affect was more blunted, and she demonstrated difficulty articulating her thoughts. The headache was now persistent with a slight increase in severity, but she was able to ambulate. The decision was made to pursue an epidural blood patch procedure with the presumptive diagnosis of PDPH. The risks, benefits and alternatives of the procedure were discussed with the patient and her daughter. When a consent form was provided to her however, she was unable to sign appropriately. Consequently, a confusion assessment method for ICU (CAM-ICU) and clock-drawing test (Fig. 1a) were performed. Both were positive for delirium, which, given her blunted affect, was likely of the hypoactive subtype. Given this subacute change in her mental status, assent for the epidural blood patch was provided by her daughter. An epidural blood patch was performed at the level of L3–L4 with 20 ml of sterile blood drawn via venepuncture. The patient was re-assessed an hour after the procedure with rapid improvement in her symptoms and a return to her baseline level of mental functioning. A repeat CAM-ICU and clock-drawing test conducted at this time were negative (Fig. 1b) and improvement in her signature was noted. The patient was discharged home on the following day.

Discussion

In this case, the symptoms were atypical for PDPH, comprising an insidious onset of mild headache, poor hand-eye coordination, challenges with depth perception and hypoactive delirium. The literature on describing PDPH, its associated symptoms and the use and efficacy of epidural blood patch in elderly patients is insufficient, although there is abundance of information available from the obstetric literature. Among obstetric patients, the incidence of PDPH following accidental dural puncture during attempted epidural insertion is estimated at 80%, the time of onset is within 48 h of the dural puncture and nearly all patients report prompt relief of the symptoms following epidural blood patch [5]. In a retrospective study by Sjövall et al. the use and safety of epidural blood patch in elderly patients (age range 65–82 years) was reviewed over a period of 12 years. Besides headache, the associated symptoms reported were nausea and/or vomiting; photophobia; dizziness; abdominal pain; decreased mood; and altered smell. The data indicated the success rate of epidural blood patch was 85% with no persistent complications [6].

One of the symptoms that improved after epidural blood patch in this patient was delirium. It should be noted that uncontrolled pain and the use of opioids and sedatives are factors which can lead to cognitive impairment postoperatively. During her postoperative course, the patient experienced episodes of mild to moderate back pain, which was a chronic issue for her, and was treated with small doses of intravenous opioids on postoperative days two and three. At home, she did not take any opioids for her back pain, therefore narcotic withdrawal was not considered a contributing factor for the headache or cognitive symptoms.

Delirium is a condition characterised by "*acute changes from baseline in a patient's ability to maintain attention and awareness, accompanied by other disturbances in cognition and tend to fluctuate in severity*" [7]. Specifically, hypoactive delirium accounts for half of all delirium cases and is characterised by drowsiness and low activity compared with a patient's baseline, making it harder to identify and treat than the hyperactive form. Multiple factors are associated with delirium, including metabolic disturbance; prior cognitive impairment; dehydration; older age; sensory and sleep deprivation; polypharmacy; and severe illness. However, CSF derangement does not appear to have been identified in the literature as a contributing risk-factor. Additionally, the symptoms of spontaneous CSF leak are not equivalent to PDPH, although the mechanism is similar; Morki describes the non-headache manifestations of spontaneous CSF leak and CSF hypovolemia as gait unsteadiness, cognitive difficulties and stupor, but not delirium [8, 9].

The CAM-ICU is a validated test for delirium with studies demonstrating a 100% sensitivity and 93% specificity. When a CAM-ICU was performed on the patient, she tested positive. Specifically, she demonstrated an acute fluctuation of her mental status (poor memory with failure of three-word recall, which she was able to perform in the days prior), inattention with the letters attention test (four errors during questioning with 'S-A-V-E-A-H-A-A-R-T'), and disorganised thinking (unable to answer the questions 'will a stone float on water?' and 'can you use a hammer to pound a nail?'). Furthermore, a clock drawing test was performed on the patient with an inaccurate result (Fig. 1). Within an hour of performing the epidural blood patch the patient's mental status returned to baseline as evidenced by a negative CAM-ICU, accurate clock drawing and there was improvement in her signature.

The patient's rapid improvement following epidural blood patch treatment is consistent with the time onset of symptom relief in obstetric patients who receive epidural blood patch for treatment of PDPH. The expected time course for improvement of PDPH symptoms following epidural blood patch in elderly versus young patients is not well known. However, in Gideon et al.'s magnetic resonance imaging-based study, it was found that aging does not have significant impacts on CSF dynamics. It may therefore be reasonable to expect that the improvement of symptoms following epidural blood patch will be similar among elderly and young patients [10].

It was unclear in this case when the patient's cognitive symptoms first started. The patient was commenced on diuretics before the worsening of her mental status and additionally experienced tachycardia, which, in the setting of severe pulmonary hypertension, could cause low cardiac output and contribute to her mental status changes. Likewise, although the CSF output was measured while the drain was in situ, it could not be assessed following removal. Therefore, while we presume that the symptoms were caused by CSF leak based on their rapid resolution following epidural blood patch, we are not able to exclude other contributory factors.

As far as we are aware, this is the first report of a PDPH presenting with this cluster of cognitive symptoms. We would like to highlight that the presentation of PDPH may deviate from the classical description and, among older patients in particular, could be misdiagnosed as delirium related to advanced age, polypharmacy or other underlying illnesses. Cerebrospinal fluid leakage should be considered as a cause of postoperative delirium in patients who have undergone neuraxial anaesthesia.

Acknowledgements

Published with the written consent of the patient. No external funding or competing interests declared.

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