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Case report

Improved spinal MRI findings after epidural blood patch administration: A pediatric case

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ABSTRACT

Orthostatic headache is the leading clinical manifestation of CSF leakage. Anatomic changes due to low CSF pressure can be detected by cranial and spinal magnetic resonance imaging (MRI). We report improved spinal MRI findings in a pediatric case of post-dural puncture headache treated by epidural blood patch administration.

In this case, a 7-year-old girl with a history of recurrent lumbar punctures and orthostatic headache for three months is presented. Cerebrospinal fluid (CSF) leak was reported at the level of T5-L1 by magnetic resonance imaging (MRI). An autologous epidural blood patch was performed under sedation with a blood volume of 6 ml. Five days after the procedure MRI showed no CSF signal in the extradural space and dural infolding was found to be disappeared. On the seventh day of the procedure, headache recurred and the procedure was repeated using same amount of blood. After seven months of follow-up, the patient reported no recurrence of headache.

To the best of our knowledge, this is the first pediatric case report that presents improved spinal MRI findings following an epidural blood patch. Although MR findings show improvement, it is not a definitive proof of the adequacy of the treatment.

1. Introduction

The leakage of cerebrospinal fluid (CSF) into the extradural space may spontaneously occur or develop following spinal surgery, neuroaxial anesthesia, lumbar puncture or myelography. The clinical signs and symptoms due to leakage of CSF were first described by Schaltenbrand in 1938 [1]. Orthostatic headache is the leading clinical manifestation of CSF leakage. Anatomic changes due to low CSF pressure can be detected by cranial and spinal magnetic resonance imaging (MRI). Cranial MRI findings that may support the diagnosis of CSF leakage include typical pachymeningeal contrast enhancement, subdural fluid collection, venous distention, hypophyseal hyperemia and brain sagging [2]. Dural thickening, extradural CSF collection and retrospinal fluid collection may be found in spinal MRI [3,4]. Supportive treatment may be sufficient in many cases, however some patients may need steroid, theophylline, aminophylline, corticotropin, sumatriptan or intravenous caffeine administration [5–7]. In cases that are resistant to medical treatment, invasive procedures including epidural saline infusion, epidural fibrin patch and autologous epidural blood patch administration may be useful [7,8].

Post-dural puncture headache is rare in pediatric population, compared to adults. The incidence of post-dural puncture headache is reported to be 2–15% in children [9]. The treatment options are the same as for adult patients. However, there is limited data on the administration of epidural blood patch in children. In this paper, we report improved spinal MRI findings in a pediatric case of post-dural puncture headache treated by epidural blood patch administration.

2. Case report

A 7-year-old girl referred to Algology Department for persistent headache for three months. She had been diagnosed with autoimmune encephalitis and drug-resistant epilepsy approximately 19 months ago and lumbar puncture (LP) was performed for three times with the last one being performed 10 days before the admission to Algology Department. During the last LP, CSF pressure was measured as 68 mmH_2O and culture was negative. Thoracolumbar MRI showed CSF signals in the extradural space from T5 to L1, anteriorly displaced

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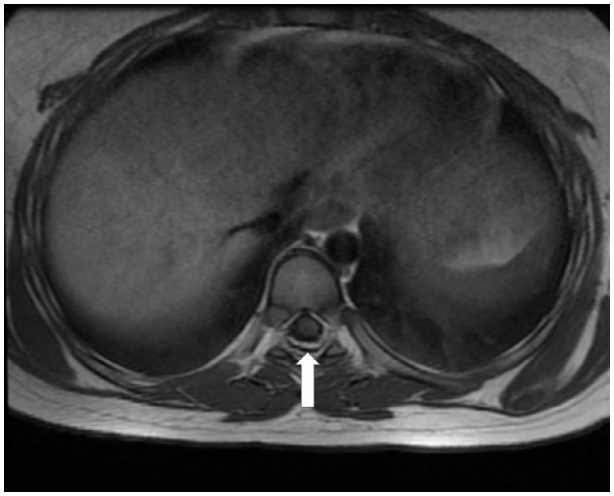

Fig. 1. CSF signal in the extradural space in the cross-sectional plane (White arrow: CSF signal).

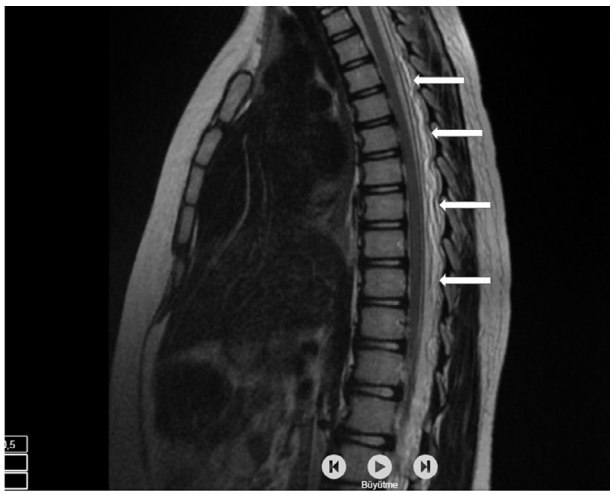

Fig. 2. CSF signal and dural infoldings in the extradural space in the sagittal plane (White arrow: dural infolding).

medulla spinalis and dural infolding (Figs. 1 and 2). The patient was receiving, paracetamol (250 mg/day), propifenazone (150 mg/day), and caffeine (50 mg/day) before she was referred to Algology Department. The medical history revealed that the headache starts from the back of her neck and radiates to the left temporal region, worsens in upright position and improves when she lies down and was accompanied by nausea, dizziness, tinnitus, and double vision. Her Visual Analog Scale (VAS) value was 7 while upright position. Neurological examination was normal. The routine laboratory tests showed normal biochemical data. We started theophylline infusion at a dose of 3 mg/kg over an hour. Following theophylline treatment, the VAS value reduced to 2. However, headache recurred 12 h after treatment. Autologous epidural blood patch administration was planned. Following sedation, a needle was inserted into the epidural space at L3-L4 level with fluoroscopic guidance and contrast material was injected to confirm the placement of the needle in the epidural space. Ten milliliters of blood was taken from the basilic vein and only six milliliters could be injected into epidural space due to resistance to injection. The VAS value decreased to 2 and mobilization of the patient increased. Seven days after the administration of the epidural blood patch, the patient's post-dural headache recurred. The control thoracolumbar MRI revealed no CSF signals in the extradural space and the dural infolding was found to be disappeared (Fig. 3). But the headache was a post-dural character. For

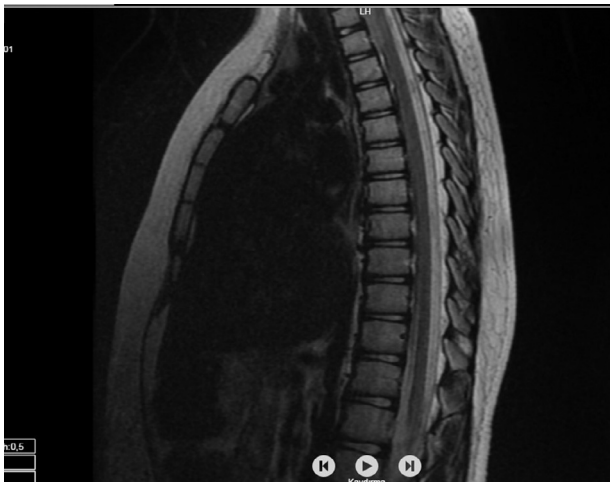

Fig. 3. Control MRI revealing no CSF signal or dural infolding.

this reason, the procedure was repeated with the same amount of blood. There was no complication in the follow-up and the VAS value was 2. The patient reported no headache at the follow-up visits in the outpatient clinic for two months. On the seventh month of the procedure, the patient was contacted by phone and reported no recurrence of headache.

3. Discussion

To the best of our knowledge, this is the first pediatric case report that presents improved spinal MRI findings following an epidural blood patch.

According to the International Classification of Headache Disorders (ICHD-3 BETA), the diagnostic criteria for headache due to a dural puncture are the history of a dural puncture and the development of the headache within 5 days after the dural puncture. This classification also includes the absence of a better explanation of clinical symptoms by other headache criteria [10]. In pediatric cases, in addition to orthostatic headache, nuchal rigidity, horizontal diplopia, facial weakness, vestibule-cochlear nerve abnormalities, radicular findings, cerebellar ataxia, encephalopathy, seizures and coma may be seen [9]. In the current case, the headache was worsens in upright position and improves when she lies down and was accompanied by nausea, dizziness, tinnitus, and double vision.

The normal opening pressure of CSF measured by lumbar puncture ranges from 65 to 195 mmH_20 in adults and is approximately 20–30 mmH_20 higher in children [11]. In the current case, the the pressure of CSF (68 mmH_20) was lower than normally observed in children.

The blood volume to be used in an epidural blood patch varies between 15 and 20 ml in adults [12]. However, no volume has been defined for pediatric cases. Ylonen et al. performed an epidural blood patch on five children aged 6–11 years presenting with a post-dural puncture headache. The authors used a blood volume ranging from 0.13 ml/kg to 0.46 ml/kg and suggested that the effective range for the treatment of headaches was 0.2–0.3 ml/kg [13]. In a series of 41 cases aged 3–18 years, Kokki et al. found no correlation between the blood volume injected and clinical success; however, they reported that the efficiency of treatment was higher in cases that had been injected with more than 0.25 ml/kg blood [14]. In a case of a four-year-old child with a headache caused by dural puncture, Borges et al. collected 10 ml blood from the basilic vein and injected only 7 ml (0.41 ml/kg) into the epidural space due to injection resistance [15]. Two days after this procedure, because of continuing headache, the authors repeated blood patch administration using 13 ml blood (0.76 ml/kg) and reported that the symptoms of the patient were relieved. In the same paper, the

authors recommended to use a maximum volume of 15 ml blood. In the case of resistance to injection, they suggested stopping the procedure and injecting a blood volume of 0.25–0.5 ml/kg, and repeating this procedure if the symptoms persist. In the current case, the first epidural blood patch was administered under sedation at a relatively lower dose of 0.2 ml/kg (total volume 6 cc). The recurrence of headache after the first attempt of blood patch and the improvement of the findings after the second patch (using the same amount of blood) suggest that the initial blood volume was not sufficient. However, it should also be noted that increasing the volume in the presence of resistance may lead to undesirable complications under sedation/general anesthesia or in patients who are not able to communicate.

Since the first description of clinical symptoms by Schaltenbrand, intracranial hypotension has been widely diagnosed using imaging methods [1–4]. In the literature, case studies have mostly focused on cranial MRI findings [16]. In three patients, Moore and colleagues showed extradural CSF and retrospinal fluid collection by spinal MRI. However, these patients do not have spinal MRI images after treatment [17]. In this paper, we have reported the presence of extradural CSF signals and dural infolding in the spinal MRI before the blood patch procedure. The post-treatment follow-up MRI showed improved findings.

4. Conclusion

In pediatric cases, the epidural blood patch procedure is a controversial topic regarding the required blood volume due to the lack of data apart from case reports and the possibility of severe complications caused by sedation. We believe that in cases where intracranial hypotension is considered to be due to a CSF leak, undertaking spinal MRI before a blood patch would assist the diagnosis, procedure, and evaluation of treatment efficacy.

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