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Case Report

Epidural blood patch for treatment of a large suboccipital pseudomeningocele

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ABSTRACT

Pseudomeningocele complication is a challenging and common neurosurgical problem. Posterior cranial fossa surgery is reported to have higher pseudomeningocele postoperative complication rates compared to supratentorial surgery. Treatment of posterior fossa pseudomeningoceles can be cumbersome and various techniques have been described ranging from conservative measures to re-operation. We describe a case of a 27 year old woman who developed a large symptomatic suboccipital pseudomeningocele following posterior fossa decompression surgery; this was successfully treated by an epidural blood patch. The current body of literature regarding the treatment of posterior fossa pseudomeningocele is limited. Whilst the use of an epidural blood patch for pseudomeningocele treatment is not novel, this is the first case of standard epidural blood patch, performed in the lumbar region, for treatment of a posterior fossa pseudomeningocele. Epidural blood patch is a minimally invasive technique that is underutilized. This paper demonstrates the use of epidural blood patch as an alternative method for treatment of a large suboccipital pseudomeningocele and summarizes the current literature. It is hoped this paper will highlight the epidural blood patch as a potentially effective treatment option that should be considered when managing posterior fossa pseudomeningocele complications prior to escalation to surgical revision.

Keywords: Epidural blood patch, Pseudomeningocele, Posterior fossa

INTRODUCTION

A pseudomeningocele (PMC) is a subcutaneous collection of cerebrospinal fluid (CSF) which can be palpated clinically and confirmed radiologically.[1] PMC is the most common postoperative complication of posterior fossa decompression (PFD) surgery.[2,3] A symptomatic PMC refers to a noticeable incisional fluid collection with potential for CSF leak and significant high or low pressure headaches.[3] This frequent postoperative complication puts the patient at risk for wound infection and meningitis. Further, symptomatic PMCs are associated with worse outcomes in terms of pain, disability and quality of life.[4]

Posterior fossa surgery has a higher incidence of PMC complication compared to supratentorial surgery.[5] The development of a clinically relevant or symptomatic posterior fossa PMC is reported to range from 4-23% of cases in the literature.[5] Treatment usually follows a conservative approach initially, then progresses to trial of CSF diversion procedures, followed by surgical revision when conservative treatment has failed or if active CSF leak is present.[6] Re-operation can be cumbersome, requires a general anaesthetic and carries perioperative risks for the patient.

A less invasive option for posterior fossa PMC management which has been scarcely reported on is

autologous epidural blood patch (EBP). We found only one reported case in the English literature where a modified EBP had been implemented in the treatment of a posterior fossa PMC.[7] This resulted in resolution of the PMC, avoiding further operative intervention. EBP is the gold standard treatment for orthostatic and post lumbar puncture (LP) headache related to intracranial hypotension.[7] EBP has also been used for the treatment of PMC post spinal surgery with good effect.[8]

Given the paucity of publications in the English literature regarding the utility of EBP for treatment of posterior fossa PMC, we share our experience treating a large symptomatic suboccipital PMC by autologous EBP, after traditional conservative management failed. The goal of our paper is to highlight epidural blood patch as an alternative treatment option that should be considered when managing posterior fossa PMC complications. This technique could prevent unnecessary surgical revision.

CASE REPORT

We describe a case of a 27 year old woman who developed a symptomatic suboccipital PMC following PFD surgery for hydrocephalus and syringomyelia secondary to fourth ventricular outlet obstruction. The suboccipital PMC was successfully treated with an EBP.

The patient initially presented acutely with headaches for 9 days prior to admission. These headaches were global in nature and were exacerbated by bending down, coughing and straining. There was associated neck pain, blurred vision, photophobia and nausea. The patient had a past medical history of migraine, depression and was an active smoker.

On examination cranial nerves, upper and lower limb neurology was largely unremarkable. Pertinent findings included pale optic discs on fundoscopy, unsteady/ataxic gait and painful/stiff neck. The patient was initially investigated with a CT brain which showed hydrocephalus and an upper cervical syrinx.

The CT findings prompted further investigation with an MRI brain which showed marked dilatation of the lateral, third and fourth ventricles, near complete effacement of cerebral sulci, radiological papilloedema and cerebellar tonsillar herniation of 4.3mm. The hydrocephalus was thought to be secondary to fourth ventricular outlet obstruction due to symmetrical enlargement of the ventricular system and ballooning of the fourth ventral caudally (Figure 1A). MRI spine (Figure 1B) highlighted an extensive cervicothoracic syrinx extending from C1-T6.

Initial management was placement of an external ventricular drain (EVD) for treatment of hydrocephalus causing headaches refractory to analgesia. Intra-operative findings were that of CSF under high pressure. The patient clinically improved following EVD insertion.

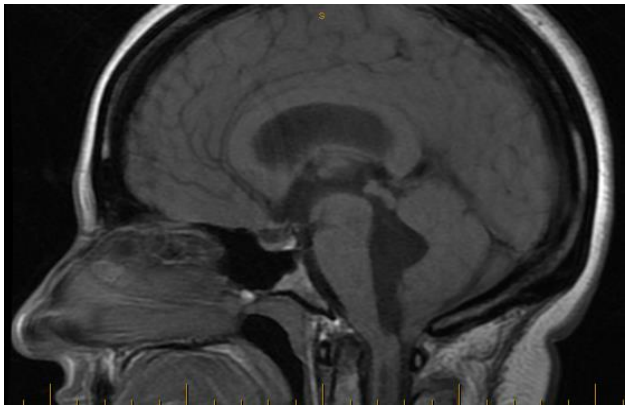

Figure 1A: MRI brain- T1 sagittal image shows enlarged ventricular system, ballooning effect of caudal aspect of fourth ventricle due to outflow obstruction and borderline Chiari 1 malformation.

Figure 1B: MRI cervicothoracic spine- T2 sagittal image demonstrates extensive syrinx from C1-T6. maximal width of syrinx measures 13mm at C7 level.

The decision was made for definitive management with PFD achieved by suboccipital craniectomy, partial removal of C1 lamina and duroplasty with harvested pericranium. The duroplasty was reinforced by synthetic dural substitute, watertight dural closure was tested by Valsava and wound closure was achieved in layers. Intraoperatively the obstruction was noted to be due to an arachnoid membrane found at the level of the foramen of Magendie which was removed allowing clear visualization of the fourth ventricle.

The patient initially progressed well post-surgery, the EVD was removed day 3 and the patient was considered safe for discharge home day 6 post-surgery. The patient represented 3 weeks later with significant suboccipital cephalgia and neck pain. Clinically there was no focal

neurological deficits, however a large palpable suboccipital PMC was appreciated. The wound was healthy, the PMC was not tense and there was no CSF leak.

An MRI brain and spine was performed (Figure 2A and 2B) confirming a large 80x40mm suboccipital collection of CSF. The preoperative hydrocephalus had resolved and there was significant improvement noted in the cervicothoracic syrinx. Initial management was conservative, the patient was encouraged to be in a non-recumbent position, and she was placed on a short course of steroids and acetazolamide. She was reviewed on a frequent basis as an outpatient. Six weeks post-surgery she was re-admitted due to fever in the context of increasing suboccipital cephalgia and neck pain. The pseudomeningocele was aspirated under sterile conditions with 35ml of haemoserous fluid obtained. The lab confirmed the specimen contained CSF and there was no organisms on microbiology and culture. The diagnosis was that of chemical meningitis which improved with a short course of steroids.

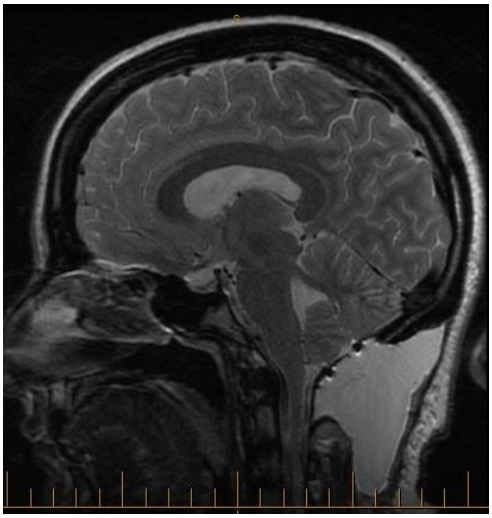

Figure 2A: MRI brain and cervicothoracic spine - T2 sagittal brain shows large suboccipital pseudomeningocele and reduced ventricular caliber compared to preoperative scans.

Again the patient was readmitted with ongoing headaches and neck pain 10 weeks post initial surgery. At this stage we considered traditional conservative management was unsuccessful for treatment of the PMC and the decision was to trial an EBP. The patient was consented for LP and EBP. The procedure was performed by a trained anaesthetist in a sterile environment. A standard LP was performed at the L2/3 level and then EBP performed with 18 gauge Tuohy needle introduced to the epidural space at the L2/3 interspace with 16ml of autologous blood injected. The blood patch was well tolerated by the patient with no complications.

Figure 2B: MRI brain and cervicothoracic spine- T2 sagittal spine demonstrates the large suboccipital pseudomeningocele and shows dramatic interval improvement in the appearance of the preoperative syrinx.

At subsequent follow up the patient had subjective improvement in headache and neck pain and objectively there was no clinically palpable pseudomeningocele. A repeat MRI (Figure 3A) demonstrated significant reduction in the size of the pseudomeningocele less than 3 weeks post the EBP. Further a surveillance MRI (Figure 3B) performed 6 months post EBP demonstrated complete resolution of the PMC. Despite complete resolution of the PMC our patient continues to suffer debilitating suboccipital cephalgia and neck pain 18 months post-surgery and is currently treated by our chronic pain team.

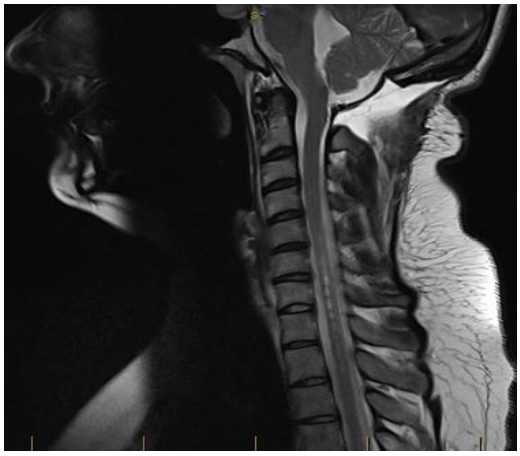

Figure 3A: MRI spine- T2 sagittal spine performed 3 weeks post EBP, showing significant subtotal resolution of the postoperative suboccipital PMC.

Figure 3B: MRI spine- Surveillance scan 6 months post EBP showing complete resolution of PMC.

DISCUSSION

There is much debate in the current literature regarding modification of surgical techniques to avoid PMC development in posterior fossa surgery; performing a craniotomy verse craniectomy, performing a duroplasty verse bony decompression alone, the use of autologous verse synthetic dural grafts and using synthetic sealants.[1,9] Regardless of modification to technique, the panacea to watertight dural closure remains elusive. Further, PMC development in posterior fossa surgery is theorized to be multifactorial and may be driven not only by surgical technique; but also patient factors, increasing age, hydrocephalus, large adjacent CSF cisterns, the effects of gravity causing dural strain in the recumbent position and increased subcutaneous dead space after striping attachments from the occipital bone.[1-5,9]

Despite the frequency of PMC complication there is no consensus for treatment and little advancement in terms of optimal management and the timing for intervention for PMCs.[2,6] Traditionally, conservative management is trialed and management proceeds to operative intervention in the form of CSF diversion procedures or revision surgery in patients with non-resolution of the PMC.[6]

Non-invasive conservative methods include monitoring for PMC resolution as many patients experience a self-limiting natural history. Simple measures such as elevation of the head, application of a compression dressing, and medications can also be of benefit.[2,4,10] If there is active CSF leak this should be initially closed by resuturing.[4] Cappabianca et al. described a minimally invasive technique of repeated percutaneous injection of fibrin glue into the PMC collection cavity after aspiration of the CSF; this technique was extrapolated and modified to use in conjunction with an autologous EBP for the successful treatment of a suboccipital PMC by Paternoster et al.[7,11] Paternoster and colleagues described the first case of posterior fossa PMC treated by a modified EBP. They described aspiration of the CSF subcutaneous collection and local injection of autologous EBP combined with fibrin glue into the residual suboccipital pouch in 2012.[7] Aspiration of the PMC has a risk of introduction of infection.[10]

EBP has been used to treat lumbar PMC and low pressure headaches caused by CSF leak post LP with reported success rates of up to 90%.[7] Despite this, EBP has been underutilized in the treatment of posterior fossa PMC. EBP is a safe, minimally invasive procedure when performed by appropriately trained physicians. The protocol varies in the literature however the standard accepted approach is injection of up to 20ml of autologous blood into the epidural space at either 1 or 2 sites, the patient is then placed in the Trendelenburg position either supine, prone of lateral for up to 1 hour to allow distribution of the blood toward the expected leak site.[7,12,13] Single injection may be curative, as demonstrated in our case, although repeated injections are often required with minimum of 5 days between procedures advised.[7,12] It is postulated that EBP works through clot formation or a dural tamponade type effect to seal the site of dural defect.[7,12,13] If autologous EBP alone is unsuccessful, addition of fibrin sealant is recommended.[13]

This technique could be implemented for patients with persisting PMC or active CSF leak to avoid progression to operative management. In the literature, patients with persisting PMC or CSF leak typically progress to CSF diversion procedures and may require permanent CSF drainage.[4,6,10] Tu et al. performed a survey of 241 neurosurgeons and found a general consensus that in the absence of hydrocephalus, PMC of the posterior fossa should be managed non-operatively on average for 7-14 days.[6] If conservative management fails or CSF leak persists, escalation to revision surgery is performed to enable direct exploration and repair of the dural defect with repeat layered closure, importantly upfront surgical revision is not favoured and conservative measures should be trialed first.[2,6]

While the literature covers the utility of EBP in the treatment of spinal PMC, orthostatic and post LP headaches in depth, we found a paucity in the English literature in regards to the use of EBP for suboccipital PMC. For this reason we share our experience of successful treatment of a large suboccipital PMC by EBP. Our paper describes the first case of autologous EBP without addition of fibrin sealants performed in the lumbar spine to successfully treat a large suboccipital pseudomeningocele. EBP represents a safe and potentially effective option for the treatment of PMC when traditional management techniques have failed.[7]

EBP should be considered as a further strategy to prevent unnecessary re-operation

CONCLUSION

PMC development is a frequent complication of posterior fossa surgery and can have a detrimental effect on patient recovery and quality of life. Traditionally, initial treatment has been conservative management, with stepwise progression to CSF diversion procedures or surgical revision when conservative measures fail. EBP has been underutilized and to our knowledge our case demonstrates the first successful treatment of a large suboccipital pseudomeningocele with a safe and minimally invasive standard EBP performed in the lumbar region. This resulted in the patient avoiding revision surgery. It is hoped this paper facilitates consideration of an EBP as an alternative method of treatment for suboccipital PMC prior to revision surgery.

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