



Case report

Management of pseudomeningocele following posterior fossa tumor surgery with absence of hydrocephalus: A case report

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ABSTRACT

Background: The management of pseudomeningocele can be challenging and treatment options vary in the literature. There is currently no algorithm or standard protocol regarding the type and timing of treatment. Until now, there has been a little literature and no case report that used puncture techniques as a conservative treatment. We reported the effectiveness of fluid puncture and pressure dressing as an aggressive nonsurgical management of pseudomeningocele.

Case presentation: A 5-year-old boy with posterior fossa tumor underwent midline suboccipital craniotomy tumor removal and decompression. A week after the surgery, the patient developed bulging in the operation region. Head CT scan showed pseudomeningocele in suboccipital region, a residual calcified tumor was seen, and no enlargement of ventricle. Conservative management was taken and the patient was managed with fluid puncture and pressure dressing. The reduction in size of the pseudomeningocele appeared within 14 days.

Conclusion: Pseudomeningocele is a common complication of posterior fossa surgery. Nonsurgical treatment is the management of choice to reduce the symptoms. Fluid puncture and pressure dressing are effective in reducing symptoms. Surgical intervention is recommended when conservative treatment fails.

1. Introduction and importance

Pseudomeningocele is the abnormal extradural accumulation of CSF at the operative site following cranial or spinal surgery [1–3]. It may be due to poor surgical closure of the dura or when CSF fills the potential space created during the surgery [2]. Hydrocephalus and subarachnoid scarring have all been implicated as potential contributing factors [3].

The incidence of pseudomeningocele formation after posterior fossa surgery occurs at a rate of about 4 to 23 % in the literature [2,4]. It may cause complication, such as pain, cosmetic deformities, positional headache, chronic meningitis, and impingement on vital structures, resulting in neurological deficits [2,4,5]. A small portion of the pseudomeningocele becomes persistent or recurrent and poses the risk of wound dehiscence, CSF fistula formation, intracranial hypotension, meningitis, and rarely death [2,6]. Although pseudomeningocele is not an uncommon complication, there is currently no consensus or standard protocol regarding the type and timing of treatment [1,2,4,6]. There has been little literature which reported the uses of puncture techniques as a conservative treatment. This work has been reported in line with the

SCARE criteria [7]. Hence, the purpose of the study is to evaluate the effectiveness of fluid puncture and pressure dressing as aggressive conservative management of pseudomeningocele following posterior fossa surgery.

2. Case presentation

We present a 5-year-old boy with a headache and vomiting in the last three days before admission. The patient had a history of frequent falls and salivating since the age of 2.5 years. There was no previous history of tumors and no family history with similar complaints. Physical examination demonstrated convergent strabismus, left facial palsy, dysphagia, gait ataxia, nystagmus, and positive finger to nose examination. Magnetic Resonance Imaging (MRI) showed a $7 \times 6 \times 6$ cm exophytic, cystic, and solid dominant mass in the posterior fossa that appeared hypointense in T1, hyperintense in T2 within the cystic region (Fig. 1), and restricted in Diffusion Weighted Imaging (DWI), suspected to be a pontine glioma. Magnetic Resonance (MR) Spectroscopy showed increased choline/creatine.

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Midline suboccipital craniotomy tumor excision and decompression were performed. The tumor was partially removed and duraplasty was done using periosteum. The pathological anatomy examination result was ganglioglioma WHO grade 1. The patient developed bulging in the operation region a week after the surgery (Fig. 3A). There was no nausea, vomiting, headache, or neurological deficit associated with the new complaint. The CT scan of the patient showed pseudomeningocele in suboccipital region, a residual calcified tumor was seen, no leptomeningeal enhancement due to meningitis, and no ventricle enlargement (Fig. 2).

An elective decision of conservative management was made and the patient was managed with fluid puncture, bed rest, and pressure dressing. The lump was punctured in a sterile procedure using BD Venflon iv cannula catheter 22G. Within a course of 14 days after surgery, the swelling was still the same size (Fig. 3B). Fluid puncture and pressure dressing were maintained. The reduction in size of the pseudomeningocele appeared within 21 days after surgery or a week after punctured (Fig. 3C). The patient did not have any complaints in 21 days after punctured (Fig. 3D).

3. Clinical discussion

Pseudomeningocele is a common complication of posterior fossa surgery. It may cause cosmetic deformities, positional headache, chronic meningitis, impingement on vital structures with neurological deficits and rare complications such as spontaneous intracerebral migration of a pseudomeningocele and posterior fossa cyst formation with brain stem compression [2,5].

Although the pathophysiology of this lesion has been proposed, none has been definitively proven. Postoperative pseudomeningocele can result either from leakage of fluid through a surgical wound or from altered CSF dynamics. Normally, CSF circulating in the cranial vault lies underneath the duramater, skull, and myocutaneous tissue. During surgery, all these barriers are dissected, which creates a potential pathway for CSF leakage into more superficial tissue [6]. Arachnoid herniation due to incomplete closure of the dura can occur. On the other hand, if left intact, it results in layered pseudomeningocele [8]. The

literature suggests that CSF that accumulates in the postoperative space inhibits healing or that CSF can escape through a dural defect, and become trapped in an intact dural layer [3]. Most pseudomeningoceles appear for days or weeks and then disappear rapidly over 1 or 2 days. This may indicate an abnormality of the CSF circulation, which then after this circulation returns to normal, the fluid in the pseudomeningocele is then rapidly absorbed. The formation or failure of resolution of a pseudomeningocele is influenced by overlying scar tissue, infection, radiation treatment, poor healing potential, and increased CSF pressure [8].

The management of pseudomeningocele can be challenging and treatment options vary in the literature, and there is no consensus on the optimal management strategy. An international survey was conducted on the management of postoperative pseudomeningocele and concluded that initial observation is appropriate for cranial pseudo-meningoceles. The usual treatment algorithm usually consists of non-operative measures including pressure dressing, bed rest, and lumbar drainage, which lead to the settlement of pseudomeningocele in the majority of cases [3–5,9]. If these conservative measures fail, surgical intervention may be required for condition like posterior fossa syndrome after lumbar drainage, migrating pseudomeningocele, or post-operative ventriculomegaly [2,4,6].

When presented with a pseudomeningocele in the absence of hydrocephalus, observation or nonoperative intervention is preferred and the surgeon tends to observe long term with conservative management. The incidence of clinically or radiographically visible cranial pseudomeningocele is 30.4 % after posterior fossa surgery and of these cases, 73.5 % resolve spontaneously, and the remainder, improve with transient CSF diversion [10]. On the assumption that the pathophysiology of pseudomeningocele is self-limiting, aggressive management is contraindicated as initial treatment [3].

The next question arises, how long should we wait before surgical therapy? How long should a surgeon endure conservative treatment? Some surgeons perform conservative therapy for 7–14 days before exploring a posterior fossa pseudomeningocele following tumor resection [1,3]. However, there are other factors that must be considered including the burden on the patient while the pseudomeningocele is

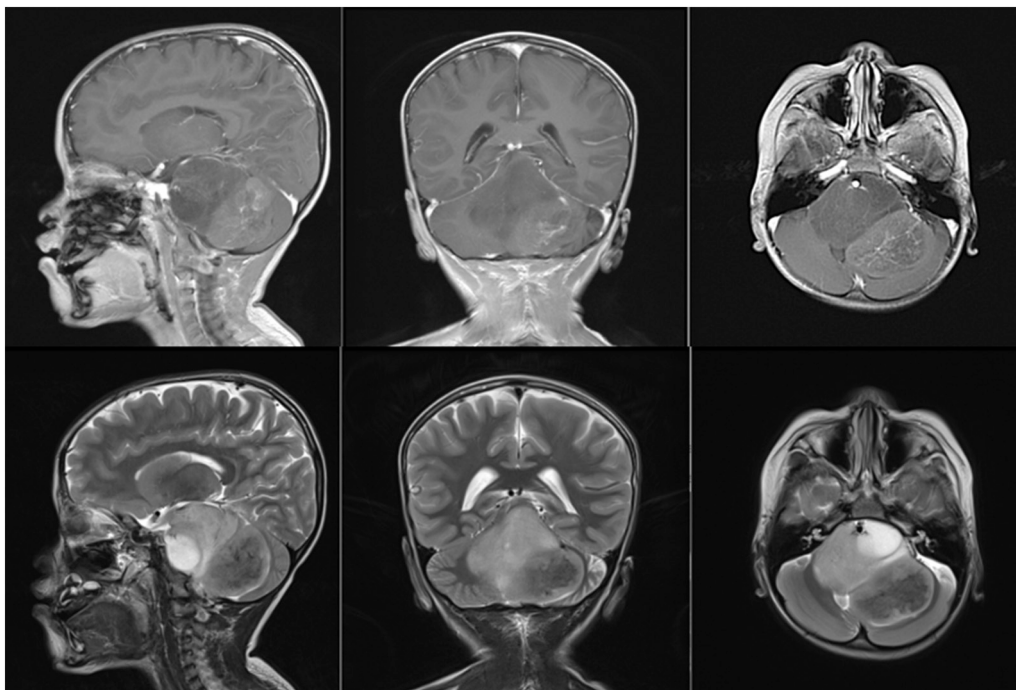


Fig. 1. Imaging showed the exophytic, cystic, and solid dominant mass in posterior fossa and appeared hypointense in T1 (upper), hyperintense in T2 (lower) within the cystic region.

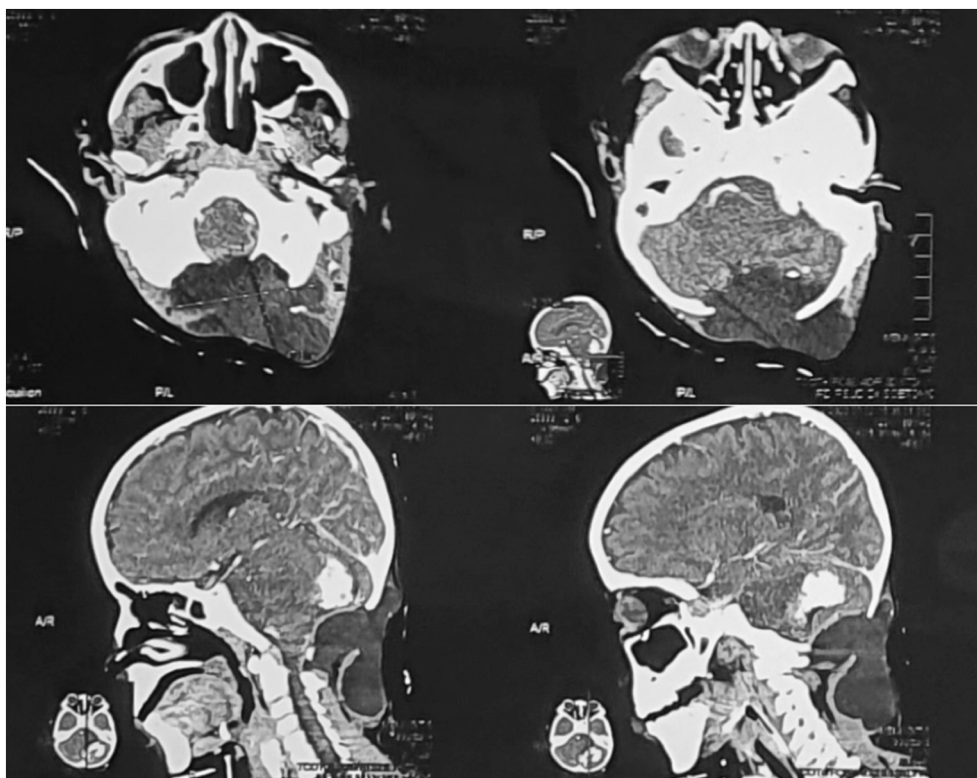


Fig. 2. The CT scan of the patient showed pseudomeningocele in suboccipital region, a residual calcified tumor was seen, no ventricle enlargement.

present, as well as its evolution. If the patient begins to experience complaints such as feeling pain, cannot lie comfortably, or is very depressed by the lesion, it is a consideration to immediately revise the wound. Fluid leakage or an increase in the size of the pseudomeningocele indicates failed conservative treatment [11].

In particular, pseudomeningocele with hydrocephalus represents a unique pathological condition. In such cases, the surgeon will usually intervene immediately. Cases like this show that, pseudomeningocele occurs as a result of hydrocephalus and will not improve unless the hydrocephalus is treated immediately [11,12]. Several studies have shown that this is in line with this assumption, cases of pseudomeningocele with hydrocephalus urgent surgery is highly favoured, and if conservative management is carried out it must be done in a short period of time [3].

According to a review by Altaf et al., conservative measures failed to resolve the pseudomeningocele in all the eight cases that they were employed in. Dural rent repair, and in the case of hydrocephalus, VP shunt led to the settlement of pseudomeningocele. They conclude that it would be beneficial to take an aggressive attitude toward this condition and to consider the possibility of early surgical intervention more seriously [4].

In our case, pseudomeningocele appeared on the 7th postoperative day. A puncture was performed on the lump and then a pressure dressing was applied. The patient was observed for 7 days, initially showing no change, but the mass reduced significantly on day 14. Although some authors suggest that the timing of surgery must be performed within 14 days if the lump does not subside or there are even authors who suggest immediate reconstruction, conservative treatment with fluid puncture and pressure dressing can provide good results for this complication. Thus, conservative treatment with puncture and pressure dressing was advocated for the first management of pseudomeningocele, especially in the absence of hydrocephalus.

Prevention is an important point that is often overlooked in the treatment of pseudomeningocele. Water-tight closure of the dura should always be attempted, and keep bleeding to a minimum so as not to

interfere with CSF flow [13]. The use of certain materials and techniques for suturing the dura showed inconsistent results. Steinbok et al. found that the incidence of pseudomeningocele after posterior fossa tumor resection was 30 %, and that the use of tissue glue, dural grafts, and external ventricular drainage was not associated with a lower rate of clinically or radiologically diagnosed pseudomeningocele formation [10]. On the other hand, a study showed that the leak occurred through the hole where the needle was inserted. Dural tension also plays an important role and duraplasty gives good results [14]. There are also studies like the study on augmented autologous pericranium duraplasty in posterior fossa surgeries by Lam et al., suggesting that autologous pericranium with dural sealant augmentation is an effective way to repair durotomy in posterior fossa surgeries with reduced complications [15]. The study on complications of posterior fossa surgery by Dubey et al., shows the incidence of pseudomeningocele as 27.27 %. This relative higher incidence than other studies may be due to non-usage of sealant and/or dural graft [16]. Combination of dural sutures with muscle has also been reported to reduce the incidence of pseudomeningocele in the posterior fossa, and craniectomy is known to cause more pseudomeningocele than craniotomy procedures [6,17].

4. Conclusion

Pseudomeningocele is a common complication of posterior fossa surgery. Conservative treatment is the management of choice to reduce the symptoms. Fluid puncture and pressure dressing can provide good results for this complication. Surgical intervention should be reserved for failure of conservative treatment.

Submission statement

This manuscript is original and has not been submitted elsewhere in part or in whole.



Fig. 3. A 5-year-old patient who developed a large pseudomeningocele after a posterior fossa tumor resection 7 days after surgery (A), 14 days after surgery (B). The size of pseudomeningocele was decrease within a week after punctured (C), and 21 days after punctured (D).

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Ethical approval

Not required.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Conceptualization – MAP, SD,WS; Data curation – SD,MAP,WS; Materials – SD,MAP; Formal Analysis – SD,MAP,WS; Investigation – SD, MAP,WS; Methodology – MAP,WS; Supervision – MAP,WS; Writing original draft – SD,WS; Writing, review and editing – SD,WS.

Registration of research studies

None.

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Declaration of competing interest

No conflict of interest in this study.

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