Postoperative CSF Leak: Blood Patch—A New Avenue

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Asian J Neurosurg 2023;18:761–763.

Abstract

Introduction Cerebrospinal fluid leak (CSF) after a neurosurgical procedure is a known complication that may result in bad outcomes (1). The incidence of CSF leak varies based on the site involved; it ranges from 4 to 32% for transsphenoidal to posterior fossa procedures. The costs involved in treating postoperative CSF leaks increases exponentially that becomes a barrier in continuing optimum treatment. There are many studies that compare the different treatment modalities and even use of sealing agents but none give an algorithm of management. Our study aims at known technique that can help to treat these kinds of low-pressure CSF leaks.

Materials and Methods This was a prospective study done over a period of 5 years from January 2014 to January 2019. All patients who underwent procedures in which durotomy was done were included in the study.

Results A total of six patients were enrolled for the study. The duration of the study spanned 5 years from January 2014 to January 2019. All the patients after taking informed consent underwent the necessary investigations and a blood patch was done. Five of the patients the CSF stopped but in one patient it persisted. This patient again underwent investigation and under image guidance another blood patch was put after which the CSF leak stopped.

Conclusion Blood patch under imaging guidance is a safe and simple technique. The success rates of cessation of CSF leaks are good. Also, it is a cost-effective method using an autograft (patient's blood).

Keywords
- autograft
- blood patch
- CSF leak
- postoperative
- sealing agents

Introduction

Cerebrospinal fluid (CSF) leak after a neurosurgical procedure is a known complication that may result in bad outcomes.[1] The incidence of CSF leak varies based on the site involved; it ranges from 4 to 32% for transsphenoidal to posterior fossa procedures.[2] With this complication, the possibility of developing meningitis and that resulting in morbidity always remains.[2–4] The costs involved in treating postoperative CSF leak increases exponentially that becomes a barrier in continuing optimum treatment.[2] Since most of these CSF leaks postoperatively are low pressure leaks, the treatment options are to first manage with agents that

DOI https://doi.org/10.1055/s-0043-1768599.
ISSN 2248-9614.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

reduce CSF production like acetazolamide (carbonic anhydrase inhibitor), furosemide.[5] The next option is being invasive and putting a catheter into the subarachnoid space in the form of a lumbar drain.[6] This can be done in combination of continuing with the conservative measures mentioned earlier.[7] If conservative measures and lumbar subarachnoid catheter fail and the CSF leak is persistent, then surgical repair in the form of resuturing or closure of the defect is planned.[8] There are many studies that compare treatment modalities and even use of sealing agents but none give an algorithm of management.

Our study aims at known technique that can help to treat these types of low-pressure CSF leaks.

Materials and Methods

This was a prospective study which was done over period of 5 years from January 2014 to January 2019. Ethical clearance was obtained from the institutional ethics committee as per the institutional policy. Ours is a tertiary care center catering to neurosurgical patients with ailments in both cranial and spinal diseases. Detailed workup was done including assessment of nutritional status, liver function tests, renal function tests, and coagulation profile. All patients who underwent procedures in which durotomy was done were included in the study. The procedures included cranial and spinal neurosurgery. Age and sex were not taken as a parameter. Adult and pediatric as well as male and female patients were included.

Patients who had high-pressure CSF leaks, infections, CSF leaks due to trauma, patients operated at other centers, and who have active allergies were not included in the study. We did not encounter CSF leak in pregnant ladies as we did not come across them during the period of study.

All the patients who had a CSF leak after surgery were enrolled into the study after taking their informed consent and informing them of the complications of the proposed intervention and further procedures that may occur or may be required. Informed consent was taken. In our study, there were two surgeons involved having the same protocol on preoperative and postoperative care.

Procedure

In all the patients in whom durotomy was done, it was closed either primarily or using autologous graft (pericranium or fascia lata). This was mentioned in the informed consent that was taken from the patient and patient bystanders prior to procedure. The closure was done with 3–0 sized braided absorbable suture made of a copolymer of lactide and glycoside (polyglactin 910). The technique of suturing was continuous sutures all along the dural defect. The end result was a lax dural closure that was watertight. No sealant agents were used. This was used for both cranial and spinal procedures. When needed the bone flap was replaced, a subgaleal drain to prevent hematoma collection was placed and the skin was closed in two layers: the galea with 2–0 polyglactin 910 and skin with nylon 2–0 sutures. After procedure patients were kept in postoperative ward till recovery of conscious and then shifted to ward.

Follow-Up

The patients were on daily follow-up; the collection of CSF that did not cause any tension in the healing wound was managed with conservative methods. The patients who had a leak from the wound site were started with conservative treatment and if the leak persisted were offered a blood patch procedure. A local ultrasound was done to detect the defect if not proved, then a magnetic resonance imaging was done to ascertain the defect. Only those whose defect was diagnosed underwent the blood patch procedure.

Blood Patch Procedure

Once the defect is detected, it can be approached with a percutaneous route that causes least damage. Under aseptic precaution a 10cc syringe with the patient's blood drawn from the femoral vein was used to percutaneously inject the blood at the defect site. Once injected, the site was held under compression for 4 to 5 minutes. Then a compression bandage was done at that site. The patient is then followed up. This is a bedside procedure that has to be done under aseptic precaution.

Results

A total of six patients were enrolled for the study. The duration of the study spanned 5 years from January 2014 to January 2019. One patient was a post-temporal craniotomy who had CSF otorrhea, one was post-suboccipital craniectomy with CSF otorrhea, one was a postfrontal craniotomy with CSF rhinorrhea, one was a post-microdiscectomy, and two were postoperative lumbosacral neural tube defects closure (►**Table 1**).

All the patients after takin informed consent underwent the necessary investigations and a blood patch was done. In five patients the CSF was stopped, but in one patient it persisted. This patient again underwent investigation and under image guidance another blood patch was put after which the CSF leak stopped.

All these patients were on agents that reduce CSF production for 3 days after the CSF leak started but had persisted to have leak of the same quantity as detected on the first occasion. Post the blood patch application, CSF leak had stopped in all the patients. There were no further complications.

Table 1 Causes of postoperative CSF leak

Type of procedure	Number of patients
Post-temporal craniotomy	1
Post-suboccipital craniectomy with CSF otorrhea	1
Post-frontal craniotomy	1
Post-microdiscectomy	1
Postoperative lumbosacral neural tube defects closure	2

Abbreviation: CSF, cerebrospinal fluid.

Discussion

The results of our prospective study gave us favorable outcomes. But the number of cases taken for the study was small as most of the patients yield to conservative managements. We propose a relatively lesser invasive procedure to manage low-pressure postoperative CSF leaks as the approximate defect can be ascertained.

This method can be used just before an invasive catheter insertion or surgical intervention. Literature proves that the cost of managing postoperative CSF leaks is 141% more than patients not having a CSF leak.[1] The risk further increases if meningitis sets in thereby also increasing the morbidity.[2,3] The presence of CSF leaks mandates a long intensive care unit stay, antibiotics to prevent infections, lumbar drain, revision surgeries, resuturing, and shunt placement.[9–11]

Blood patch has been used to treat spontaneous dural rupture that results in intracranial hypotension.[12]

Bayazit et al analyzed 32 patients who had CSF leak postoperatively; they observed 10 patients were treated successfully by conservative management. The rest of them had to go to the next level of management that was lumbar drain insertion, in which 12 patients responded and the leak stopped. The remaining 10 had to undergo surgical correction and closure of CSF leak. They concluded that this algorithm is the safest and best option in the management of CSF leaks. This was confirmed in their study by nonrecurrence of the leak.[5] Magnus et al in their study too shared the same conclusion as that of Bayazit et al.[6] There is a dearth of literature on the technique of blood patch for iatrogenic CSF leak. Gottschalk in his paper concluded that blood patch therapy is a safe and technically relatively simple method with a high success rate.[13] He also went on to state that even though the success rates are good, some cases need repeating the blood patch that was the same we too observed. Since CSF leak can predispose the patient to grave sequelae, the proposed procedure can be done with the least available infrastructure yielding good results.

Conclusion

In our study, we conclude that blood patch under imaging guidance is a safe and simple technique. The success rates of cessation of CSF leaks are good. Also, it is a cost-effective method using an autograft (patient's blood). The chances of the hematoma getting infected are present but we did not encounter it. Since our study number is small, we will need more studies on this technique.

Conflict of Interest
None declared.

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