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Original Article

Subfascial drains are safe and effective in preventing postoperative cerebrospinal fluid leaks after intradural spine tumor surgery

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ABSTRACT

Background: Delayed cerebrospinal fluid (CSF) leaks are a known complication following intradural spinal tumor surgery. The placement of subfascial drains in these patients undergoing requisite intradural surgery is controversial. Here, we demonstrated that placing a subfascial drain on partial suction for 48 h, with early ambulation, proved to be safe and effective in preventing early/delayed recurrent CSF fistulas.

Methods: Medical records of 17 patients undergoing surgery for intradural spinal tumors over a 30-month were reviewed. All patients underwent intradural tumor resection followed by primary dural closure, placement of Gelfoam in a non-compressive fashion, application of fibrin sealant, and utilization of a subfascial drain placed on partial suction for 48 h postoperatively. Patients are mobilized the morning following surgery. We tracked the incidence of postoperative recurrent CSF leaks, over drainage, infection, wound dehiscence, pseudo meningocele formation, and the reoperation rate.

Results: For the 17 patients, our programmed average utilization of subfascial drains was 48 h. Moreover, the average drain output was 165 mL. Over the 1-year follow-up period, no patient developed a recurrent early/delayed CSF leak, there were no wound complications, nor need for revision surgery.

Conclusion: Utilizing subfascial drains on partial suction following the resection of intradural spinal tumors with primary dural closure proved to be safe and effective.

Keywords: Intentional durotomy, Intradural spinal tumors, Postoperative cerebrospinal fluid leak, Subfascial drains

INTRODUCTION

Delayed cerebrospinal fluid (CSF) leak following the resection of intradural spinal tumors may lead to early/delayed recurrent fistulas, over drainage, infection, wound dehiscence, pseudo meningocele, intracranial hemorrhage, and reoperations. Recurrent CSF leaks contribute to the intraoperative times, postoperative length of hospital stay, and perioperative costs.[1-8] Here, we utilized primary

Gende	Age	Type of Tumor	Region	Drain duration	Drain output in ml	24 hr bedrest	Days in Hospital	Revison in 30 days	Revison in 90 days	Posistional Headache	Non Posistional Headache	Posistional Dizziness	Neck Pain	Infection	Other comments
F	50	Schwannoma	Cervical	3	88	yes	4	No	No	No	Yes	No	Yes	No	CT for HA, but normal, COVID,PNA
F	60	Meningioma	Cervical	2	125	yes	5	No	No	No	Yes	No	No	No	GLF
M	43	Astrocytoma	Cervical	1	0	yes	2	No	No	No	No	No	No	No	
M	47	Schwannoma	Cervical	2	100	yes	6	No	No	No	No	No	No	No	R facial pain, paresthesis distal Extremities
F	54	Meningothelial Meningioma	Cervical	3	835	yes	3	No	No	No	No	No	No	No	lightheaded/passedout on 1st postop f/u
F	72	Reccurent Intradural arachnoid web	Thoracic	2	100	yes	2	No	No	No	No	No	No	No	Recurrence of cyst s/p 2 yrs
M	65	Metastatic- Renal cell Carcinoma	Thoracic	2	175	yes	10	No	No	No	No	No	No	No	lost to f/u
F	75	Meningioma	Thoracic	2	194	yes	7	No	No	No	No	No	No	No	
M	68	Meningioma	Thoracic	1	8	yes	3	No	No	No	No	No	No	No	New RLE, buttock & peri-genital numbness post operatively x4 months
M	74	Metastatic - Renal Cell Carcinoma	Thoracic	2	160	yes	8	No	No	No	No	No	No	No	
F	73	Metastatic - Pancreatic Cancer	Thoracic	1	45	yes	3	No	No	No	No	No	No	No	
M	62	Schwannoma	Lumbar	2	184	yes	3	No	No	No	No	No	No	No	Residua mild LLE weakness/numbness postop
M	45	Schwannoma	Lumbar	2	145	Yes	2	No	No records	No	No	No	No	No	Continued LLE pain
F	33	Paraganglioma	Lumbar	2	325	yes	5	No	No	No	No	No	No	No	post op urinary retention
F	68	Schwannoma	Lumbar	2	85	yes	2	No	No	No	No	No	No	No	Subjective BLE numbness postop
M	85	Metastic-Adenocarcinoma	Lumbar	2	165	yes	14	No	No	No	No	No	No	No	
M	55	Schwannoma	Lumbar	2	75	yes	3	No	No	No	No	No	No	No	

Figure 1: Summary of collected data. HA: Headache, PNA: Pneumonia, GLF: Ground level fall, RLE: Right lower extremity, F/U: Follow up, s/p: Status post, LLE: Left lower extremity

dural closure followed by placement of Gelfoam, fibrin sealant, and subfascial drains on partial suction for approximately 48 postoperative hours. Notably, we sought to determine whether, with the early patient mobilization on the 1st postoperative day, this technique would prove to be safe and effective in preventing postoperative CSF leaks.

MATERIALS AND METHODS

Seventeen patients who met multiple inclusion criteria underwent the resection of intradural tumors; they were followed over an average 30-month postoperative period [Figure 1]. The nine males and eight females averaged 61 years

Total number of patients with spinal Tumor Patient	Patients with intentional Durotomy + subfascial drains	Patient with intentional Durotomy & without drain	Drain Duration	Drain output	Hospital Stay	Revision	Lost to f/u
20	17	1	1 -3 days	0 – 825 ml	2 - 15 days	0	1 patient
3 pathological fractures (no durotomy)		Good closure	Avg = 2 days	Avg = 165ml			

Figure 2: Results summary.

of age [Figure 2]. Following primary dural closures and the application of Gelfoam, a fibrin sealant, all patients had subfascial drains placed on partial suction for 48 postoperative

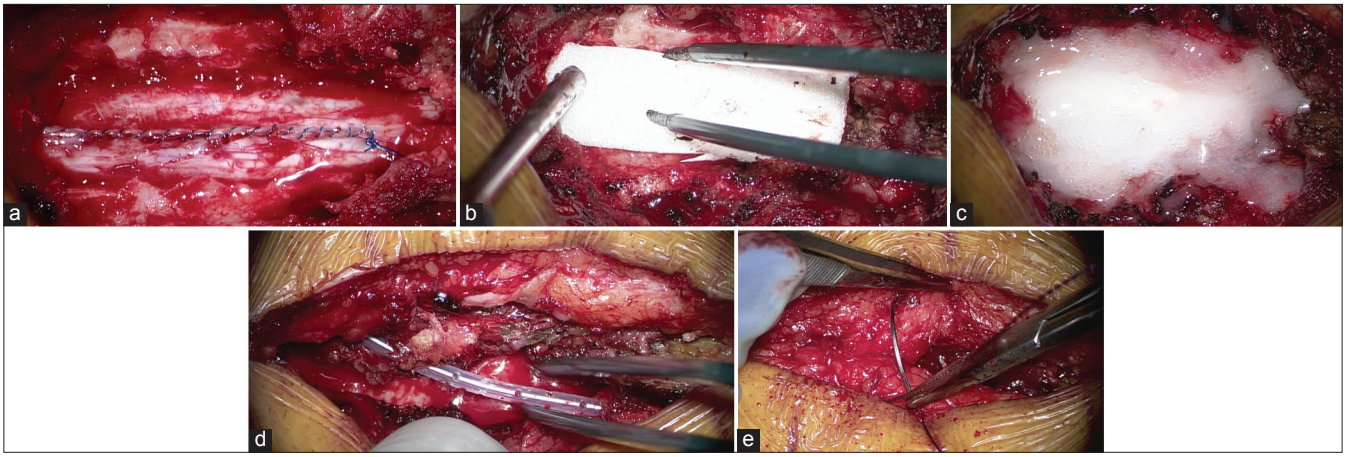

Figure 3: (a) Primary dural closure with 5-0 Prolene suture. (b) Placement of Gelfoam over dural closure. (c) Fibrin Sealant was applied over Gelfoam to reinforce dural closure. (d) Subfascial drain placement. (e) Fascia closure with Polydioxanone Stratafix.

hours. For patients who were all mobilized on postoperative day 1, the following parameters were monitored: daily drain output, duration of bed rest, length of hospital stay, early/delayed postoperative recurrent CSF leaks, infection, wound dehiscence, pseudomeningocele, and reoperations.

Surgical technique and protocol

After tumor resection, primary dural closure was performed under the operating microscope using a running simple 5-0 Prolene suture. Next, Gelfoam and fibrin sealant were applied over the dura in a non-compressive fashion, followed by the application of an intraoperative subfascial drain placed on "partial suction" for 48 postoperative hours; routine closure followed using Polydioxanone Stratafix 2-0, and VICRYL 3-0. Patients were mobilized the morning after surgery [Figures 3a-e].

It should be noted that placement of Gelfoam, particularly under a lamina, is not advisable and can be contra-indicated. In our technique, Gelfoam is placed in a non-compressive fashion and not under the lamina. We believe that this is more cost-effective and may have better absorptive/sealant properties than standard dural substitutes.

RESULTS

Subfascial drains were put in place for between 1 and 3 days, 82% of them for only two days; drain output averaged 165 mL. The average length of stay was five days (range: 2 days–15 days). The majority of patients stay for rehab placement, not CSF leak-related complications. One patient was lost to follow-up, and the average length of follow-up was 11.7 months (range 8–12 months). Sixteen patients had ≥12 months of follow-up [Figure 2].

Adverse events/complications

Postoperatively, one patient had nonpositional headaches, one had nonpositional head and neck pain, and one had neck pain. Note the patient with a headache and neck pain was later diagnosed with COVID pneumonia. No surgical revisions were required for delayed CSF leaks occurring between 30 and 90 days following surgery.

DISCUSSION

Primary dural closure

Few studies investigate the outcomes following resection of intradural spinal tumors, particularly regarding CSF early/delayed recurrent leaks and other adverse events. Primary dural closure, various dural closing techniques with/without synthetic patches, grafts, and layered watertight closure with supplemental sealants help reduce the risk of postoperative CSF leaks.

Subfascial drain placement

We believe that placement of subfascial dural closure, even after primary dural closure, helps divert CSF, blood, and serum from the subfascial space. Diverting the right amount of fluid away from the surgical bed by an Subfascial Drain drain on partial rather than full suction facilitates fascial healing;[1,3-4] We utilized SD for an average of 2 postoperative days, and drain duration averaged only two days. This brief period of drainage allowed for early mobilization and a shorter hospital stay; our average hospital length of stay was five days.[2] Despite the use of SD, we found no postoperative infections, and just one patient reported a nonpositional headache immediately postoperatively and was later found to have COVID pneumonia. Notably, no patients developed postoperative CSF leaks, and no revision procedures were warranted within the 30–90 postoperative window.

CONCLUSION

The use of subfascial drains after intradural spinal tumor surgery proved to be safe and effective.

Ethical approval

Institutional Review Board approval is taken, Number: UA IRBI: STUDY0001817.

Declaration of patient consent

Patients' consent not required as patients' identities were not disclosed or compromised.

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Nil.

Conflicts of interest

There are no conflicts of interest

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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