

Clinical Analysis of Fibrin Sealant for Cerebrospinal Fluid Leaks in Transnasal Transsphenoidal Endoscopic Surgery: A Systematic Review of 2,672 Patients

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Abstract

Cerebrospinal Fluid (CSF) Leaks are a common complication intraoperatively and postoperatively in neurosurgery. With the evolution of endoscopic surgeries over the last few years, CSF leaks are still a common complication following this approach. Reconstruction of skull base defects following these procedures has been a challenge for this novel approach. Our study objective is to explore the outcomes of using Fibrin sealant patches (Tachosil) to prevent and repair postoperative CSF leaks following endoscopic endonasal transsphenoidal approach (EETA) in patients with various skull base pathologies, and iatrogenic CSF leak. The incidence of CSF leak still remains a crucial outcome in determining the success of this approach. The long term outcome of fibrin sealant use is scarce in literature and the aim is to review the literature for outcomes such as recurrence of CSF leaks, complications, and need for revision surgery. We also aim to compare the outcomes to those of Duraseal.

Keywords: Cerebrospinal Fluid Leak, Fibrin Glue, Neurosurgery, Sealant, Endoscopic Transsphenoidal Surgery

Introduction

- CSF leaks are a frequent complication in neurosurgery, occurring intraoperatively and postoperatively.
- Despite minimally invasive endoscopic techniques, including the endoscopic endonasal transsphenoidal approach (EETA) it persists.
- Successful repair is crucial to minimize complications and the need for revision surgery.
- Fibrin sealant patches (Tachosil) are becoming frequently used, but long-term efficacy data is scarce.
- Dural repair materials vary in mechanism and composition: TachoSil™ – Fibrin-based hemostatic patch, providing both sealing & hemostatic properties. DuraSeal™ – Liquid polyethylene glycol hydrogel-forming a watertight seal.
- The long-term outcomes of these sealants for postoperative CSF leak repair remain unclear.

Methods and Materials

- Conducted using three major databases: PubMed, Embase, Web of Science
- Screening: performed using Rayyan.ai.
- We included cohort studies, RCTs, and case reports on postoperative CSF leakage following EETA.
- Excluded Strictly pediatric studies, Traumatic CSF leaks, technical notes, and other reviews were excluded.
- Statistical analysis & figure generation: MATLAB (R2024a)

Results

Fibrin was commonly used along with grafts or layers of fat such as fascia lata or pedicled nasoseptal flap (PNSF). Fibrin Sealant was used for reconstruction in an endoscopic transsphenoidal surgery reconstruction and none of the patients had negative postoperative outcomes related to the fibrin sealant. Following this, we conducted an analysis that shows the correlation between fibrin sealant, surgical approaches, pathology location, and time and presentation of CSF leak.

The **length of stay** in the hospital was compared between the groups treated with Tachosil and those treated with DuraSeal based on the available data from various studies. The average length of stay for the group treated with Tachosil was approximately 6.6 days, with a mean of about 5.4 days for the group treated with Duraseal (p-value < 0.01). The **revision surgery rate** in the hospital was compared between the groups treated with TachoSil and those treated with DuraSeal. Tachosil: 3 revisions out of 597 patients (~0.5%). Duraseal: 24 revisions out of 791 patients (~3.0%) DuraSeal had significantly more revisions than TachoSil (p < 0.01).

The **complication rate** in the hospital was compared as well. DuraSeal had a slightly higher complication rate (1.7%) than TachoSil (1.49%). However, the difference was not statistically significant. The **lumbar drain usage and resolution rate** were compared as well. were used significantly more frequently in the DuraSeal group (8.42%) compared to the TachoSil group (0.72%) (p < 0.001). However, the resolution rate of cerebrospinal fluid leaks was similar between the groups, with 100% resolution in TachoSil and 80.6% in DuraSeal (p = 0.564).

Figure 1. PRISMA Flowchart

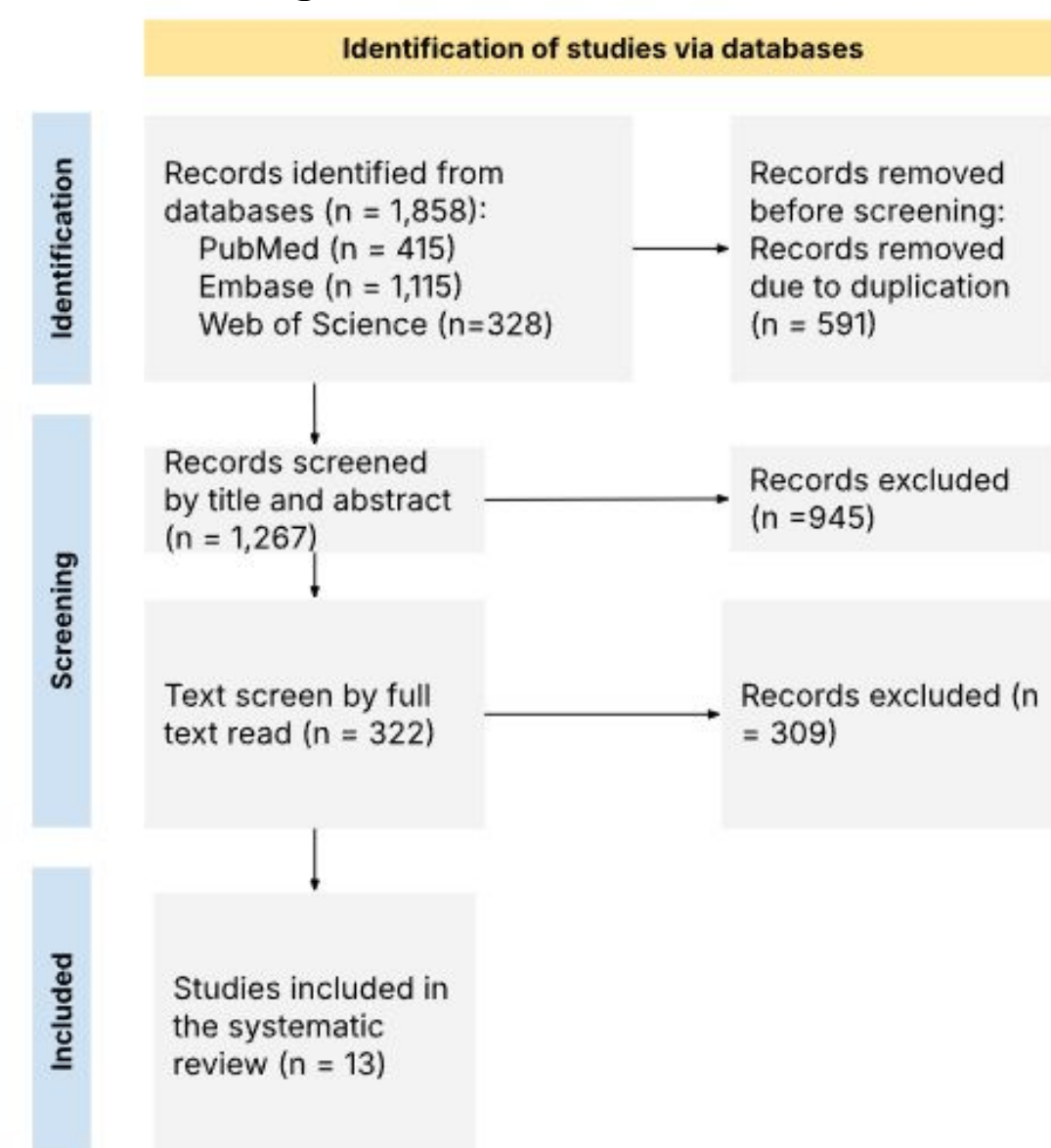
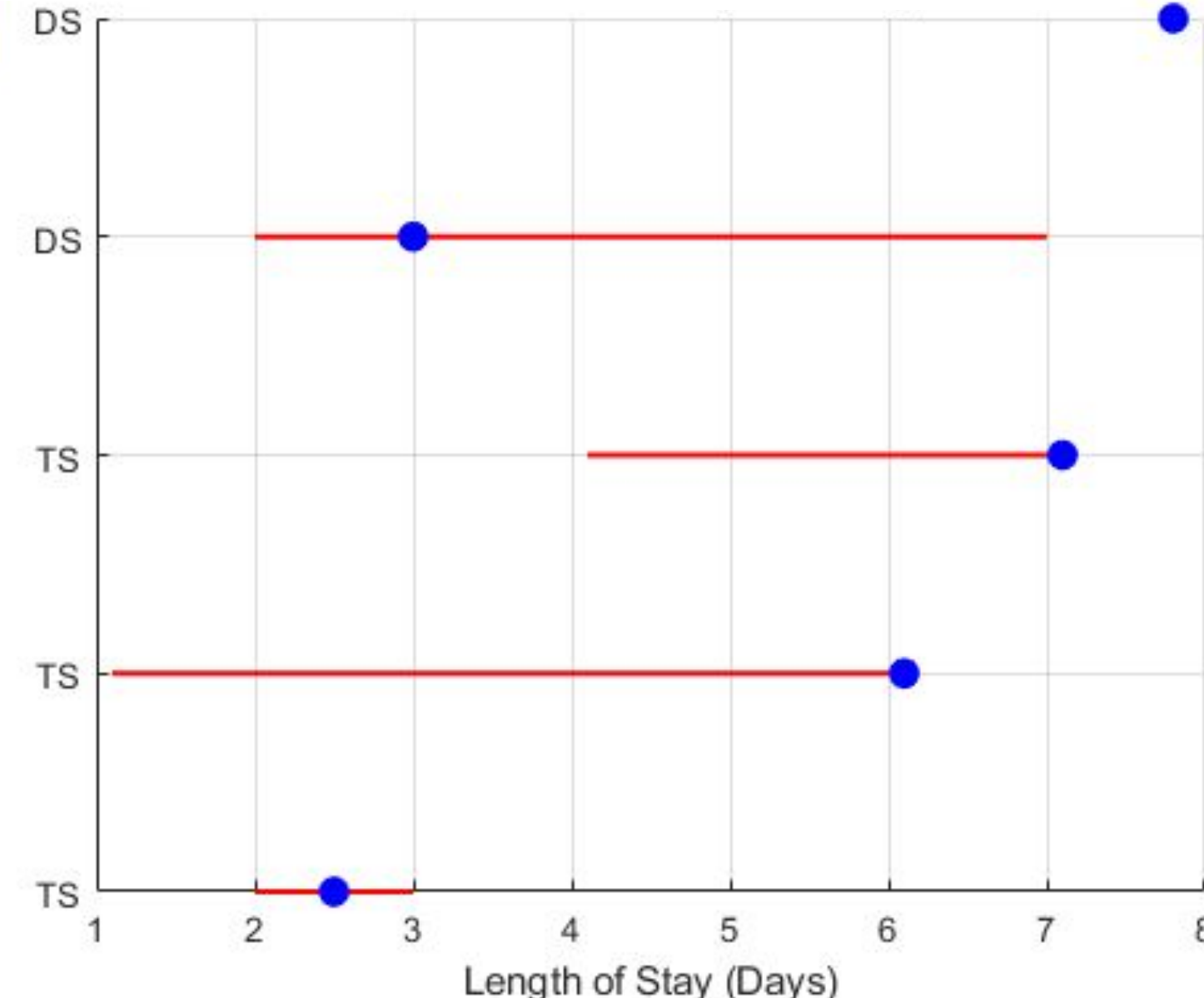


Figure 2. Length of Stay Forest by Sealant Group



Discussion/Conclusion

Conclusion: Length of stay was better for DuraSeal, but revision surgery rate was better for TachoSil. While the complication rate was not statistically significant, TachoSil performed better. The outcome weight of revision surgery rate is greater than length of stay. These findings suggest that while DuraSeal patients required lumbar drains more often, TachoSil may be equally effective with lower LD utilization. Therefore, TachoSil would be the better option for EETA.

Discussion: Long-term outcomes and complications following the repair of CSF leaks further outline the challenges in post-operative management. Meningitis remains high, and the rate of persistent leaks was high in cases of revision surgeries especially in those where duraseal was applied; further intervention thus warrants.

Generally, postoperative CSF leaks usually occur due to flap necrosis, improper placement, and migration of the flap or graft because of technical errors, gravitational forces, or CSF pressure. Findings pointed to the carefulness of surgical technique and the importance of postoperative monitoring in reducing complications.

The aims of closure during trans-sphenoidal surgery should ideally be to achieve successful occlusion of intra-operative CSF leak with (1) minimal patient morbidity, (2) without significant prolongation of operative time, (3) without increasing hospital length of stay. Traditional packing group, intrasellar packing with fat or synthetic material may occasionally displace the normal gland enhancing the distance between the margin of the normal gland and the dural edge, thereby enhancing the possibility of leakage of CSF.

The length of hospitalization also was in constant variation, as complicated patients, such as those requiring lumbar drains, or with meningitis, stayed longer and took an average of about 7.1 up to 9.6 days,. Abdominal fat graft site infections complicated the recovery of some patients. Other complications included as spinal headaches and recurrent CSF leaks needing secondary revision surgery remained prevalent. One remarkable case involved a patient who developed meningitis and pneumocephalus following a bout of sneezing six weeks post-discharge, underscoring the need for continued vigilance even after hospital discharge.

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