

## **Fibrin-glue coated collagen matrix helps prevent cerebral spinal fluid leakage from the skin after durotomy**

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### **INTRODUCTION:**

Post-surgery for intradural lesions, it is crucial to perform dural reconstruction to mitigate the risk of cerebral spinal fluid (CSF) leakage. Despite the reconstruction efforts, open CSF leakage can lead to severe complications such as wound infection, meningitis, hypomyelination, cerebral hemorrhage, and nerve root compression syndrome. The widespread and effective use of liquid fibrin glue for dural sutures is well-established.

In spinal cord surgery, the combination of Polyglycolic acid sheet (PGA sheet) and fibrin glue has proven effective for dural reconstruction. Our approach involves the utilization of PGA sheets and fibrin glue, alongside dural sutures, to enhance the prevention of CSF leakage. Recently, a novel absorbable artificial dura mater, composed of a porous collagen matrix, has been developed and is being considered valuable for dural reconstruction in patients requiring dural repair. Despite reports suggesting the efficacy of placing a porous collagen matrix after dural suture, instances of open CSF leakage persist in these reports. Notably, there is a lack of comparative studies between PGA sheets and porous collagen matrix in preventing spinal fluid leaks.

Our hypothesis posits that the hydrophilic collagen matrix holds an advantage over the hydrophobic PGA sheet in preventing CSF leakage in the moist surgical field post-dural suture. Since June 2019, we have implemented the use of fibrin glue-coated porous collagen matrix for dural reconstruction in our department. The primary objective of this study was to assess the effectiveness of fibrin glue-coated porous collagen matrix in preventing CSF leakage from the skin.

**METHODS:** The research involved a cohort of 319 patients who underwent surgery for intradural lesions requiring dural reconstruction at our department between 2006 and 2023. The study compared two groups: the PGA sheet group (P group) and the porous collagen matrix group (C group), excluding cases of accidental dural injury. Both groups had the materials placed at the dural suture site and coated with fibrin glue. A comparative analysis was conducted on age, gender, disease type, and the occurrence of reoperation due to postoperative CSF leakage. The parameters were assessed using the Wilcoxon test and Fisher's exact test, with statistical significance set at  $P < 0.05$ . Statistical analysis was performed using the JMP software program (version 16; SAS Institute, Cary, NC, USA). The study protocol received approval from the local ethics committee, and all patients provided written informed consent. All procedures were conducted in strict adherence to relevant guidelines and regulations.

**RESULTS:** The median age was 60 (49-71), with 166 female patients. 319 patients (275 spinal cord tumors, 5 spinal herniation, 7 syringomyelia, and 26 membranous lesions) were in the P group (219 patients) and the C group (100 patients). Reoperations for CSF leakage occurred in 11 cases (3.4%), but there were significantly fewer reoperations for postoperative CSF leakage in the C group. (11 cases in group P, 0 cases in group C) ( $P < 0.05$ )

### **DISCUSSION AND CONCLUSION:**

This is the first report showing the utility of a fibrin-coated collagen matrix and the superiority of a porous collagen matrix sheet over a PGA sheet in preventing CSF leakage during spinal surgery when fibrin glue is used.

The incidence of CSF leakage in spinal cord surgeries ranges from 3-27%. Following planned dural incisions, the CSF leakage rate typically falls between 0-10%. Porous collagen matrix dural repair is acknowledged as a valid approach. However, studies solely employing the porous collagen matrix have reported instances of cerebrospinal fluid leakage and pseudo meningocele formation in 4.3% of patients. A porous collagen matrix should be placed alone if overlap with autologous dura mater can be achieved; however, if an overlap of more than 1 cm is difficult, the use of fibrin glue is recommended. We believe that applying fibrin glue to the collagen matrix is useful in spinal surgery, as it is difficult to obtain margins in spinal surgery due to the narrow operating area. In the present study, the collagen matrix coated with fibrin glue did not cause CSF leakage, and the fibrin glue-coated collagen matrix was superior to the fibrin glue-coated PGA in preventing CSF leakage after spinal durotomy. This technique might be a good addition to surgical options for dural repair and might reduce spinal fluid leakage, which can cause significant events.