Polypropylene Mesh Substitute for the Fascial Defect After Using for the Dural Repair

—Technical Note—

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Abstract

Use of the anterior sheath of the rectus abdominis muscle (anterior sheath) as a dural substitute and patching of the large defect of the anterior sheath with polypropylene mesh are described. Five patients were treated using the anterior sheath and the mesh. No postoperative complications such as cerebrospinal fluid leakage, infection, or abdominal wall hernia occurred. The mesh is useful as a patch for the sheath defect.

Key words: anterior sheath of rectus abdominis muscle, duraplasty, polypropylene mesh

Introduction

Duraplasty can be performed with various materials, including cadaveric dura, Gore-Tex, periosteum, and fascia of the temporal muscle. However, complications such as viral infection, cerebrospinal fluid (CSF) leakage, inflammatory response, subarachnoid hemorrhage, may occur.⁶⁻⁹⁾ Periosteum and temporal muscle fascia cannot be used in the second operation after use in the first operation. Here, we describe the use of the anterior sheath of the rectus abdominis muscle (anterior sheath) for the second operation after using abdominal fat in the first operation as a dural substitute, and the use of a mesh patch to repair the large defect of the anterior sheath.

Materials and Methods

Abdominal fat tissues were harvested, followed by exposure of the anterior sheath. An adequate part of the sheath was removed to perform the duraplasty. The sheath defect was patched with a mesh constructed of knitted polypropylene monofilaments (Bard® Marlex® Mesh; C. R. Bard, Inc., Billerica,

Mass., U.S.A.) (Fig. 1 upper). The epidural space was packed with the abdominal fat tissue and duraplasty performed with the sheath.

Five patients, one with a large recurrent pituitary adenoma and four with meningiomas, were treated at Rokko Island Hospital from February 1997 to April 1999 (Table 1).

Results

This method of repair was applied in three cases of recurrence (Cases 1-3). No CSF leakage or infection, or abdominal herniation or infection occurred after the operations. The patients did not complain of traction discomfort in their abdominal area. This method was then used in the first operation of two patients (Cases 4 and 5). No complication occurred in these patients postoperatively.

Illustrative Cases

Case 1: A 19-year-old male underwent the first transsphenoidal and the second transcranial (right fronto-orbital-zygomatic approach) surgeries for a large prolactinoma in 1997. Abdominal fat was grafted in both operations and the fascia of a temporal muscle was used in the second operation as the patch for a dural defect. However, the third

Fig. 1 Drawings (upper) and intraoperative photograph (lower) showing placement of polypropylene mesh for a defect in the anterior sheath of the rectus abdominis muscle.

Table 1 Summary of cases

Case No.	Age	Sex	Disease	Follow-up period
1	19	M	recurrent pituitary adenoma	2 yrs
2	64	F	recurrent temporal base meningioma	1 yr
3	63	F	cerebellar meningioma, postoperative CSF leakage and meningitis	2 yrs
4	49	M	foramen magnum meningioma	6 mos
5	51	F	cerebellar meningioma	3 mos

CSF: cerebrospinal fluid.

transcranial operation was needed, because of rapid suprasellar regrowth caused by malignant change of the tumor before radiosurgery. The anterior sheath of the rectus abdominis muscle was used to repair the dural defect as described above (Fig. 1 lower). The postoperative course was uneventful. Radiosurgery by gamma knife was added.

Case 3: A 63-year-old female underwent subtotal removal of a huge cerebellar meningioma in December 1996 (Fig. 2 upper row). The dura was repaired with artificial dura. CSF accumulated in the epidural space despite CSF drainage after the

Fig. 2 Case 3. upper row: Computed tomography (CT) scans showing a huge cerebellar meningioma. middle row: CT scans showing cerebrospinal fluid (CSF) accumulation in the epidural space of the posterior fossa. lower: CT scan 3 months after the third operation showing neither CSF leakage nor infection.

first operation (Fig. 2 middle row). Abdominal fat was packed in the space in January 1997. The patient was discharged after the second operation and was fine until October. She was admitted again because of infection of the space. CSF leakage occurred

Fig. 3 Case 4. **left:** Magnetic resonance (MR) image showing a foramen magnum meningioma before operation. **right:** MR image showing total removal of the tumor.

despite conservative therapy. The dura was patched with a large piece of anterior sheath and the epidural space was again packed with abdominal fat. The leak stopped and the infection was resolved. The patient has been fine since the third operation (Fig. 2 lower).

Case 4: A 49-year-old male underwent surgery for a foramen magnum meningioma (Fig. 3 left). Abdominal fat tissues and a piece of anterior sheath were obtained and the mesh patch was inserted before craniotomy. The tumor was totally removed through the left transcondylar fossa approach. The dura was patched with the anterior sheath and the epidural space was packed with the fat tissues. No complications such as CSF leakage or infection occurred after this operation (Fig. 3 right).

Discussion

Surgeons may hesitate to adopt this method at the first operation because of the operative scar in the abdomen. However, this method is useful at the second operation, if the fascia or the superficial layer of temporal muscle and the periosteum have been used at the first operation, particularly in skull base surgery using abdominal fat. A large patch of anterior sheath can be obtained by this technique. Our results indicate the safety of the anterior sheath as a dural substitute.

Repair of the anterior sheath after harvesting a patch of 2–3 cm² can be achieved by direct suture of the anterior sheath, but if the defect is more than 3–4 cm², a patch is necessary to prevent ventral or incisional hernia and traction discomfort of the abdominal wall.

Polypropylene mesh is indicated to reinforce weakened soft tissue, for example, for repair of in-

guinal or incisional hernias and abdominal wall defects.^{1,3–5)} Patients with inguinal hernia aged from 10 to 80 years followed up for 6 to 8 years had a wound infection rate of 0.6% and no serious complication.^{1,5)} There were no recurrences in patients with inguinal hernia less than 60 years old or who weighed less than 84 kg.¹⁾ Patients with recurrence had a mean weight of 92 kg and mean age of 72 years, indicating that overweight patients require special care.¹⁾ Our five patients were aged 19 to 64 years and weighed less than 80 kg. Follow up for up to 2 years found no complication. This mesh has been used in the abdomen for more than two decades³⁾ and seems to be safe. However, inflammatory response to a Marlex mesh duraplasty was reported to mimic a recurrent convexity meningioma 20 years after the initial surgery.²⁾ Therefore, this mesh requires care as a dural substitute. The method using this mesh is not a new concept, but is rarely adopted in neurological surgery.

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Commentary

Repair of the dural defect has been a serious problem since identification of the risk of Creutzfeldt-Jakob disease using cadaveric dura mater. The pericranial flap is the most ideal dural substitute, but is not obtainable in the suboccipital craniotomy or in the case of reoperation. A fascial sheath of the rectus abdominis or the femoral quadriceps has been used for a free graft of the dural substrate, but the replacement is a problem in a patient with a large defect. Fascial repair using polypropylene mesh has been infrequently used in neurosurgery, despite the more common use in general surgery. We must appreciate its usefulness, but the indication should be limited only to patients in whom the pericranial flap is not ob-

The authors present the use of polypropylene mesh to patch the large defect of the anterior sheath of the rectus abdominis muscle after removal of the sheath to perform the duraplasty. In skull base surgery, CSF leakage and CNS infections are serious complications. Watertight closure of the skull base dura is quite important to prevent these complications. These complication rates are higher when the defect is closed with synthetic dural grafts than autografts. The author's techniques with polypropylene mesh patch of the donor site to prevent ventral or incisional hernia and traction discomfort of the abdominal wall are useful in clinical practice.

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