Patch technique for repair of a dural tear in microendoscopic spinal surgery

A dural tear is a common but troublesome complication of endoscopic spinal surgery. The limitations of space make repair difficult, and it is often necessary to proceed to an open operation to suture the dura in order to prevent leakage of cerebrospinal fluid. We describe a new patch technique in which a small piece of polyglactin 910 is fixed to the injured dura with fibrin glue. Three pieces are generally required to obtain a watertight closure after lavage with saline. We have applied this technique in seven cases. All recovered well with no adverse effects. MRI showed no sign of leakage of cerebrospinal fluid.

Patients and Methods
Between March 2006 and July 2007 we encountered seven cases of dural tear during microendoscopic laminotomy. There were three men and four women with a mean age of 67 years (55 to 82). The operations were all carried out for stenosis of the lumbar canal and the tears were between 2 mm and 6 mm long (mean 3.4 mm).

A polyglactin sheet was cut into small squares between 3 mm and 10 mm in size. A mesh of the proper size to cover the tear was soaked in fibrinogen solution, placed over the injured dura and gently advanced with forceps until it adhered to the dura (Fig. 1). Several drops of thrombin solution were administered after the polyglactin patch had been placed. Usually three pieces of polyglactin were needed to stop leakage of cerebrospinal fluid completely (Fig. 2). When it was clear that there was no leak from the repair, the decompression operation was continued. At the end of the operation the site was irrigated with saline, and the wound was closed around a suction drain, which remained in place for two days. The patients were followed for a mean of 12 months (6 to 23). An MRI was obtained at a mean of 53 days (34 to 70).

Results
All patients were mobilised on the second day after operation and recovered well. None had symptoms of a persistent cerebrospinal fluid leak or needed reoperation. The mean volume of drainage was 30 ml (0 to 80). The post-operative MRI showed no evidence of a cerebrospinal fluid fistula.

Discussion
Microendoscopic spinal surgery has become increasingly popular for indications that now include lumbar disc herniation Superscript 1 and stenosis of the lumbar canal. Superscript 2-4 Good results can be obtained with limited exposure and techniques that are less invasive than those of conventional surgery. Technical difficulties and severe stenosis increase the risk of a dural tear. The standard repair technique for a dural tear is direct suture, but in microendoscopic surgery the small working space makes it very difficult to suture the injured dura. There have been reports describing closure without suture Superscript 5-8 in conventional spinal surgery, but to our knowledge this is the first description of a technique for dural repair that can be performed during microendoscopic surgery.

Polyglactin is an absorbable material that has been used since the 1980s as a dural substitute. Superscript 9,10 It is available as knitted, woven or...
feathered sheets that can be used to repair various types of organ defect. We employed the knitted type for our repairs. In previous reports one sheet of polyglactin was used for repair of the dura in brain or conventional spinal surgery. Most of these studies employed felt polyglactin, which is thicker than the knitted, but the thicker material may increase the difficulty of the microendoscopic procedure and its use for dural repair is forbidden in Japan. The three overlapping patches of thin, knitted polyglactin that we used did not interfere with the surgery. Because the sheets of knitted polyglactin have many small holes, one small patch did not stop cerebrospinal fluid leakage completely and we needed to use several pieces. In most cases three polyglactin patches gave a watertight seal.

The key element is the manoeuvre for securing contact. We gently opposed a piece of polyglactin soaked in fibrinogen to the injured dura until it adhered. This step took approximately one minute, during which the fibrinogen in the polyglactin reacted with thrombin in the operative field to form fibrin glue. The polyglactin piece was, therefore, glued to the dura before a thrombin solution was administered. Several additional drops of thrombin solution were then applied after each piece had been placed, to reinforce the seal. At first we covered the patch with both fibrinogen and thrombin at the end of the procedure, but we found that a large clot of glue was formed that could interfere with surgery. We thus abandoned this latter step.

An advantage of this technique is that it can be used for any part of the dura. A tear in the lateral portion of the dura is more difficult to suture than a central tear, but the method described increases the ease of a lateral repair because application of the seal is facilitated by the angle of the forceps.

The reliability of the repair may be questioned, but we observed neither leakage of cerebrospinal fluid nor disruption of the patch by irrigation, and MRI after operation showed no evidence of cerebrospinal fluid fistula. In animal experiments\textsuperscript{9,10} the polyglactin was fully covered with a collagen layer or neomembrane 28 to 45 days after surgery and had disappeared by 40 to 60 days.

Patch repair of injured dura using polyglactin and fibrin glue is a useful technique for preventing leakage of cerebrospinal fluid in microendoscopic spinal surgery without requiring an open operation and can be used in any minimally-invasive surgery, including microendoscopic surgery.

We wish to thank Dr A. Tessler for help with the preparation of the manuscript. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References