Use of ligamentum nuchae graft for dural closure in posterior fossa surgery

Technical note

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The technique of harvesting the ligamentum nuchae and its use in posterior fossa surgery are discussed. By using this technique the author has avoided postoperative cerebrospinal fluid leakage in more than 200 procedures.

KEY WORDS • ligamentum nuchae • dural closure • posterior fossa surgery

WATERTIGHT closure of the dura is an important desideratum in posterior fossa surgery; not only does it help provide support for the cerebellum, but it also helps prevent contamination of the cerebrospinal fluid by perioperative effusions as well as bacterial wound infections. Numerous materials have been advocated to help achieve watertight closure, including autogenous grafts (for example, periosteum or fascia lata), and synthetic materials. However, use of these materials has been associated with various complications such as hemorrhage, inflammatory reactions, and fatal transmission of Creutzfeldt–Jakob disease.

In an attempt to provide a safe and suitable material for use as a dural graft, we have evolved a procedure whereby we harvest the ligamentum nuchae by direct dissection as we open the posterior fossa, thus obtaining a strong, safe material that is readily adaptable for grafting.

Operative Procedure

After induction of general anesthesia, the patient is placed in the forward oblique position, in either a pin headrest or a horseshoe headrest, depending on the patient’s age. After normal skin preparation is performed, an incision is made in the midline from above the external occipital protuberance inferiorly to approximately the spinous process of the third cervical vertebrae. Dissection is made down to the fascia overlying the cervical musculature. A Y-shaped incision is then made in the fascia and muscle. A V-shaped muscle fascia flap is opened to the occipital bone and reflected superiorly. This maneuver enables ready identification of the ligamentum nuchae in the midline.

Beginning on the right side, working from above and then inferiorly, the ligament is dissected from its point of attachment to the muscles laterally, and inferiorly to the spinous processes of C1–3 and its attachment to the skull base. A similar dissection is performed on the left. The dissected portion of the ligament is then removed in one piece. This yields a graft ranging from 4 to 7 cm in length, usually with a width of approximately 3 cm and a thickness of 2 to 3 mm (Fig. 1). Once the graft is harvested, it

![Fig. 1. Intraoperative photograph showing the ligamentum nuchae as it is dissected from paraspinous muscles. Note the locations of the occipital protuberance (A) and the C-2 spinous process (B). The sutures elevate the ligament prior to its removal.](image-url)
is placed in a saline-soaked sponge for the duration of the procedure.

We generally open the dura over the right cerebellar hemisphere, then the left, crossing the midline and beginning our dissection on the right side of the opening before proceeding downward across the midline and into the upper cervical area. After the intradural portion of the procedure is completed, dural closure is initiated.

Before we began to use the technique described in this paper, we found it impossible to achieve primary watertight closure. With the use of ligamentum nuchae graft material, however, we have been able to accomplish this. The graft is cut essentially in the shape of a “7,” and sutured in a watertight fashion to the dura (Fig. 2). In addition to its thickness and viability as a recently harvested and healthy substance, this material is readily available and seems to heal very efficiently.

As part of the closure procedure, we use tenting sutures to secure the dura and the freshly grafted dural material to the cervical musculature to vitalize the tissue and promote watertight closure.

During the past 10 years we have used this technique in more than 200 procedures in patients of all ages. The cases in which it has been applied include cerebellar and brainstem tumors, intracerebellar hemorrhage, cerebellar arteriovenous malformations, Arnold–Chiari malformations, and arachnoid cysts. Thus far no cerebrospinal fluid leaks have occurred postoperatively in this series of patients. In addition, postoperative magnetic resonance images obtained in all patients revealed no pseudomeningoceles. Our experience indicates that use of this technique provides a readily available, safe, and effective material for the repair of posterior fossa dural defects.

References


Fig. 2. Intraoperative photograph showing the ligamentum nuchae graft sutured in place. The suction tip is at the level of the occipital protuberance; the arrow indicates the location of the spinous C-2 process.

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