Management of the temporal muscle during cranioplasty: technical note

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Over the past 2 decades there has been a resurgence of interest in the use of decompressive craniectomy in the management of neurological emergencies. While technically straightforward, the procedure is associated with a number of complications relating to the initial decompression and subsequent cranioplasty. One complication that has received relatively little attention relates to the management of the temporal muscle. Here, through an illustrative case, the author describes a novel method of minimizing dissection of the temporal muscle during a cranioplasty procedure. Rather than placing a synthetic material over the dura mater to prevent adhesions or dissecting the muscle off the dura, the dura was opened and reflected laterally, pedicled to the temporal muscle. The dural defect was closed with a dural substitute, and the bone flap was secured in a routine fashion. The temporal muscle was then secured in its anatomical position. At the 6-month follow-up, radiological and clinical examination confirmed the restoration of muscle volume with excellent cosmetic and functional results. Opening the dura on a temporal muscle pedicle does not represent a routine form of surgical reconstruction; however, the use of this method may have some advantages especially in young patients who have made a good recovery and for whom facial aesthetics may be particularly important.
Illustrative Case

History and Examination

An 18-year-old man presented for an elective left-sided autologous cranioplasty procedure. Two months earlier, he had undergone decompressive craniectomy following evacuation of an acute subdural hematoma. He had allegedly been assaulted and sustained a single punch to the side of his head. On admission to the hospital and prior to intubation, clinical examination confirmed a Glasgow Coma Scale score of E2, M5, V2. Shortly after intubation and ventilation, his left pupil became fixed and dilated. Computed tomography scanning confirmed a large, left-sided, acute subdural hematoma with an approximately 5-mm midline shift. He was immediately taken to the operating theater. At the time of surgery, the subdural hematoma was evacuated uneventfully; however, the brain was found to be edematous such that replacement of the bone flap was thought to be problematic. An extensive duraplasty was performed using locally harvested pericranium, and the bone flap was preserved in a refrigerated sterile container. After a 6-day stay in the intensive care unit, the patient was transferred initially to the ward and then to a rehabilitation facility. He went on to make a good recovery, and prior to the cranioplasty he was well and had no focal neurological deficits.

Operation

He was readmitted to the neurosurgical facility for an autologous cranioplasty procedure. Following uneventful reflection of the scalp flap, the temporal muscle was found to be densely adherent to the dura, and there was no clear plane of dissection. Several attempts were made to dissect the temporalis muscle off the dura, but they failed. An attempt was also made to leave the temporal muscle attached to the dura and to replace the bone flap over both structures; however, the bulk of the temporal muscle made this problematic despite the use of mannitol to relax the brain.

A number of areas where the previous duraplasty had failed were noticed, and the cortical surface of the brain was clearly visible. It was then decided that the simplest thing to do would be to open the dura circumferentially, leaving the inferior aspect pedicled on the temporal muscle. The dural defect was reconstructed using DuraGen (Integra LifeSciences Corp.), a synthetic dura substitute. The bone was replaced and secured with miniplates, and the temporal muscle was replaced in its anatomical position and secured by suturing the dural edges to the underside of the galea around the scalp flap incision by using a synthetic absorbable sterile surgical suture (Fig. 5).
Postoperative Course

The patient went on to make an uneventful recovery with no evidence of postoperative CSF leakage, and at the 6-month follow-up the cosmetic and functional results were excellent (Fig. 6).

Discussion

When considering the potential life-saving nature of a decompressive craniectomy in the context of neurological emergencies, management of the temporal muscle in terms of functional and aesthetic outcome would appear to be of relatively minor importance. However, given that both the initial decompressive surgery and the subsequent cranioplasty procedure are now known to be associated with significant morbidity, it may be reasonable to make as much effort as possible to minimize any potentially deleterious effects of surgery.

A number of methods that aim to place some sort of synthetic barrier between the temporal muscle and the dura at the time of the initial decompressive surgery have been described.2,4,6,9–20,22 All of these methods would appear reasonable; however, they are not always possible, and in many cases the temporal muscle becomes firmly adherent to the dura especially when pericranial duraplasty has been performed. It is by no means suggested that opening the dura on a temporal muscle pedicle represents a routine form of surgical reconstruction. However, dural resection and reconstruction are common undertakings in many neurosurgical procedures such as meningioma resection, and the management of cortical adhesions and cerebral swelling is part of any neurosurgeon’s armamentarium.

While neurosurgeons are adept at dealing with dural adhesions to the brain, there are some situations in which this technique may be contraindicated, such as when there are defects in the dural repair that have led to direct muscle-leptomeningeal cicatrization. However, if there is a clean plane of dissection, the use of this technique may have some advantages especially in young patients who have made a good recovery and for whom facial aesthetics may be particularly important.

A number of limitations require consideration. It remains to be established whether the lack of temporal muscle dissection reduces the incidence of postoperative hematoma; however, the preservation of muscle mass and an excellent aesthetic result may represent a good enough reason to consider the use of this technical variation in certain circumstances. In addition, a larger series of patients must be followed up to confirm that less dissection of the temporal muscle does indeed lead to improved cosmetic and masticatory function. Finally, a larger series is required to establish that any provided benefits are not outweighed by potential complications such as CSF leak, seizures, subdural hematoma, or focal deficit due to either direct cortical injury or devascularization.

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References


FIG. 5. An alternative approach is to open the dura and leave it on a temporal muscle pedicle. The dural defect can be repaired with a proprietary dural substitute (blue).

FIG. 6. Axial (left) and coronal (right) CT images obtained 6 months following left-sided autologous cranioplasty, showing excellent restoration of temporalis muscle bulk.

Disclosures
The author reports no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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