Pterional craniotomy

The resulting bone flap is centered over the depression of the sphenoid ridge. Approximately 33% of the craniotomy is anterior to the anterior margin of temporalis muscle insertion, ≈ 66% is posterior.

With the craniotome, starting at the frontal burr hole the craniotomy is taken anteriorly across the anterior margin of the superior temporal line, staying as low as possible on the orbit (to obviate having to rongeur bone, which is unsightly on the forehead). The distance “B” from the medial extent of the craniotomy to the frontal burr hole is 3 cm for anterior circulation aneurysms. For the approaches to skull base (e.g. Dolenc approach), distance “B” is larger and takes the opening to ≈ the mid orbit. Then from point “B,” a sharp superior turn is made and the opening is taken back to point “A.” The height (“H”) of the craniotomy needs to be only ≈ 3 cm for aneurysms of the Circle of Willis, and slightly larger (≈ 5 cm) for the middle cerebral artery aneurysms. Minimal exposure of the temporal cortex is necessary for aneurysms of the skull base region. For large flaps (e.g. for tumors), “H” is made larger to expose more temporal lobe.

Pterional approach

see also pterional approach.

Frontotemporal craniotomy, also known as “pterional craniotomy” (PC), provides an optimal microscopic exposure and a wide open working space for manipulation of intracranial structures, and it has been widely used in the field of neurosurgery for treatment of lesions in the anterior and posterior circulations 1).

The pterional craniotomy provides wide, multidirectional access to the anterior and middle cranial fossae as well as many structures of the interpeduncular fossae.

Other frontotemporal craniotomies derived from the pterional 2) 3) and supraorbital 4) craniotomies, as are the combined epi- and subdural approach with anterior clinoid removal 5) 6) and the orbitozygomatic extension of the pterional craniotomy 7) 8).
The pterional craniotomy is well established for microsurgical clipping of most anterior circulation aneurysms. The incision and temporalis muscle dissection impacts postoperative recovery and cosmetic outcomes.

The minipterional (MPT) craniotomy offers similar microsurgical corridors, with a substantially shorter incision, less muscle dissection, and a smaller craniotomy flap.

see Minipterional craniotomy.

Although pterional craniotomy and its variants are the most used approaches in neurosurgery, few studies have evaluated their precise indications.

da Silva et al., evaluated the pterional (PT), pretemporal (PreT), and orbitozygomatic (OZ) approaches through quantitative measurements of area, linear, and angular exposures of the major intracranial vascular structures.

Eight fresh, adult cadavers were operated with the PT, followed by the PreT, and ending with the OZ approach. The working area, angular exposure of vascular structures and linear exposure of the basilar artery were measured.

The OZ approach presented a wider area (1301.3 ± 215.9 mm²) with an increase of 456.7 mm² compared with the PT and of 167.4 mm² to the PreT (P = 0.011). The extension from PT to PreT and OZ increases linear exposure of the basilar artery. When comparing the PreT and OZ, they founded an increase in the horizontal and vertical angle to the bifurcation of the ipsilateral middle cerebral artery (P = 0.005 and P = 0.032, respectively), horizontal angle to the basilar artery tip (P = 0.02), and horizontal angle to the contralateral ICA bifurcation (P = 0.048).

The OZ approach offered notable surgical advantages compared with the traditional PT and PreT regarding to the area of exposure and linear exposure to basilar artery. Regarding angle of attack, the orbital rim and zygomatic arch removal provided quantitatively wider exposure and increased surgical freedom. A detailed anatomic study for each patient and surgeon experience must be considered for individualized surgical approach indication.

Complications

Temporal hollowing occurs to varying degrees after pterional craniotomy. The most common cause of temporal hollowing is a bone defect of the pterional and temporal regions due to the resection of the sphenoid ridge and temporal squama for adequate exposure without overhang. The augmentation of such bony defects is important in preventing craniofacial deformities and postoperative hollowness. Temporal cranioplasty has been performed using a range of materials, such as acrylics, porous polyethylene, bone cement, titanium, muscle flaps, and prosthetic dermis. These methods are limited by the risk of damage to adjacent tissue and infection, a prolonged preparation phase, the possibility of reabsorption, and cost inefficiency. We have developed a method of temporal augmentation using a calvarial onlay graft as a single-stage neurosurgical reconstructive operation in patients requiring craniotomy. In this report, we describe the surgical details and review our institutional outcomes. The patients were divided into pterional craniotomy and onlay graft groups. Clinical temporal hollowing was assessed using a visual analog scale (VAS). Temporal soft tissue thickness was measured on preoperative and postoperative computed tomography (CT) studies. Both the VAS and CT-based...
assessments were compared between the groups. Our review indicated that the use of an onlay graft was associated with a lower VAS score and left-right discrepancy in the temporal contour than were observed in patients undergoing pterional craniotomy without an onlay graft 10).

Videos

Left pterional craniotomy for thrombectomy and clipping of ruptured left MCA giant aneurysm


