Pterional Transzygomatic approach

This approach allows wide access to different topographic areas (clinoid process region and clinoidal ICA, the entire cavernous sinus (CS), and the posterior fossa from the interpeduncular fossa to the facial nerve) via a lateral trajectory [1)].

see Pretemporal transzygomatic transcavernous approach

see Transzygomatic approach with anteriorly limited inferior temporal gyrectomy.

Videos

<html><iframe width="560" height="315" src="https://www.youtube.com/embed/dMylK2BRLFc" frameborder="0" allow="accelerometer; autoplay; encrypted-media; gyroscope; picture-in-picture" allowfullscreen></iframe></html>

Position

The patient is positioned in the supine position with the head attached to the table with a Mayfield skull clamp. The head is elevated and left parallel to the ground plane.

Incision

The incision starts at the level of the lower edge of the zygomatic arch, slightly anterior to the tragus, and extends behind the hairline towards the contralateral pupillary line. In patients with thick subcutaneous tissue, a preauricular incision can be extended downwards quite safely, up to 25 mm below the superior edge of the zygomatic arch.

The anteroposterior position of the incision will depend upon the type and location of the lesion to be treated.

Dissection of the soft tissues

The dissection of soft tissues starts with subgaleal disection until the fatty tissue over the temporal aponeurosis is recognized. This sector roughly corresponds to the anterior fourth of the temporal muscle and is located immediately posterior to the frontal branch of the superficial temporal artery. From there, an incision is made on the external layer of the temporal fascia which, together with the interfascial fat, is dissected anteriorly in that plane to protect the frontal branch of the facial nerve. In this inter- fascial space runs a small vein, perpendicular to the incision, which must be coagulated and cut. Afterwards, the orbital rim is exposed at the top of the field, with the zygomatic arch lying below.

Sectioning of the zygomatic arch

The zygomatic arch is sectioned with two vertical cuts: a posterior cut immediately before the temporo–mandibular joint; and an anterior cut just behind the union of the zygomatic arch and zygomatic bone. Thus, the zygomatic arch is moved downwards, together with the masseter muscle.

The temporal muscle is separated from the skull via retrograde dissection, so as to avoid post-operative muscular atrophy.

A small cuff of muscle and fascia, at the level of the superior temporal line, is kept in place for reinsertion of this muscle at the end of surgery. Thus, the muscle is taken downwards, through the space left by the sectioned zygomatic arch. This procedure allows for complete exposure of the floor of the middle fossa.

Craniotomy

A pterional approach (fronto–temporo–sphenoidal craniotomy) is performed in the usual way [2) 3)].

The quantity of frontal and temporal bone to be removed depends upon the type and location of the lesion to be resected. The greater wing of the sphenoid bone and the squamous portion of the temporal bone are drilled out until complete exposure of the lateral aspect of the temporal dura is achieved.

Two burr holes are made in the pterion above and below the lower wing of the sphenoid bone and the bone between them is flattened with a burr. A frontotemporal bone flap is cut with a vertical saw that includes the temporal muscle cuff. An additional hole below the upper temporal line may be helpful for this purpose. A free bone flap is lifted elevating and breaking down the bone. In the event of tumors that infiltrate the pterional bone or the external third of the sphenoid wing, it may be necessary to make the craniotomy around the involved bone, which is then removed by drilling or with a bone gouge. This is a pathological bone with reactive hyperostosis and/or tumor infiltration that must be removed, sometimes with profuse vascularization.

Possibilities

The transzygomatic approach offers excellent exposure to the floor of the middle fossa and the lateral wall of the cavernous sinus (both intradurally and extradurally). Also, combined with a pretemporal approach, it affords a good view of the interpeduncular cistern; and using a transtemporal approach, it provides good access to the insular region.

Once the craniotomy has been performed, the anatomical possibilities are numerous:

1.- intradural access to the middle fossa

2.- intradural pretemporal access to the basal cisterns

3.- intradural transtemporal access to the insular region

4.- extradural access to the middle fossa [4].

Case series

José M González-Darder in 2019 presented a prospective series of 26 cases with SWMs larger than 3 cm in one of its main diameter. All patients were studied following the same clinical and imaging procedures. The surgical approach was through a pterional transzygomatic craniotomy. The surgical procedure has the following steps: 1. Extradural tumor devascularization and resection of the hyperostotic and/or infiltrated bone and then intradurally; 2. Intradural tumor debunking; 3. Microdissection of vascular branches and perforators from the capsule; 4. Identification of the optic and oculomotor nerves and internal carotid artery; 5. Tumor capsule dissection and resection; 6. Dural resection or cauterization; 7. Dural and bone reconstruction and closing. Results All lesions were completely removed. Most complications were transient. The most relevant complication was a large middle cerebral artery infarct with permanent hemiplegia despite a decompressive craniotomy. Conclusion Large SWMs can be considered as a single pathology regarding the surgical approach and intraoperative microsurgical procedure strategies. The pterional transzygomatic approach allows an extradural devascularization of the tumor and an extensive bone resection that facilitates the intradural stage of tumor resection. The proposed approach allows a wide and radical resection of the duramater and bone that increases the Simpson grade. However, surgery does not control other biological or molecular prognostic factors involved in tumor recurrence [5].

José M González-Darder et al. presented the experience with the transzygomatic pterional approach in the treatment of neurosurgical pathology of the base of the skull located in the middle cranial fossa and surrounding areas.

A retrospective study of pathological findings, surgical outcomes and complications in a series of 31 cases operated on between 2009 and 2011 using a transzygomatic pterional approach.

The lesions involved the sphenoid wing (25.9%), several regions due to invasive growth pattern (19.5%), the temporal lobe (16.1%) and cavernous sinus (12.9%). The others were located in the floor of the middle fossa, Meckel's cave, incisural space, cisterns, and infratemporal region. The pathological nature of the lesions was: benign meningioma (42%), temporal lobe tumour (19.5%), vascular disease (12.9%), inflammatory lesions (6.4%), atypical meningioma (6.4%), epidermoid cyst (6.4%), neurinoma (3.2%) and poorly differentiated infratemporal carcinoma (3.2%). The approach was usually combined extra-intradural (58.1%) and, less frequently, just extradural (16.1%) or intradural (25.8%). Approach-related complications were minor: haematomas in the wound not requiring treatment (67.8%), superior transient facial paresis (9.7%), transient temporomandibular joint dysfunction (12.9%) and atrophy of the temporal muscle (16.2%). There were no hardware-related complications or cosmetic issues related to the osteotomy and posterior osteosynthesis of the zygomatic arch.

The pterional approach combined with osteotomy of the zygomatic arch allows mobilising the temporalis muscle away from the temporal fossa, consequently exposing its entire surface to complete the temporal craniotomy up to the middle fossa; it helps to access and treat pathology in this region or it can be used as a corridor to approach surrounding areas [6].

Langevin et al. reported the experience with the lateral tranzygomatic approach for resection of sphenoid wing meningiomas in which the entire zygoma is mobilized and remains vascularized by masseter muscle attachments.

A retrospective review of the records of 19 patients who underwent sphenoid wing meningioma resection via a lateral transzygomatic approach between 1997 and 2007 was performed. A confirmatory cadaver dissection was performed to illustrate the anatomic nature of the technique. To achieve maximal exposure and minimal brain retraction, a lateral transzygomatic approach with osteotomies of the entire zygoma, which remains pedicled on the masseter muscle, was used.

Results: Nineteen patients with sphenoid wing meningioma underwent resection via a lateral transzygomatic approach. Complete resection of the meningioma was achieved in 17 cases. Morbidity consisted of temporary frontal nerve weakness (57.9%), mild to moderate temporalis atrophy (36.8%), and diplopia (15.8%). There were no cases of wound infection, bone malunion, or resorption. A mean follow-up period of 33.1 months (range, 2-71 months) revealed no recurrences after surgery as demonstrated by computed tomography or magnetic resonance imaging.

Conclusion: The lateral transzygomatic approach to the sphenoid wing can be performed safely with minimal morbidity and facilitates complete resection of the tumor. Complete removal at an early stage is the best prognostic factor in treating sphenoid wing meningioma. This approach belongs in the armamentarium of surgeons who are involved in the resection of skull base neoplasms [7].

References

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