

base. The periosteum of the petrous apex and clivus is sharply elevated using a septal raspatory. Scissors are used to cut the fibrous attachments at the level of the petro-occipital fissure. The medial pterygoid plate is drilled, the mucoperiosteum of the nasal cavity is opened at this level, and the nasopharynx is entered. The contralateral choana and the vomer can be seen. The tumor mass, the surrounding soft tissue, the Eustachian tube and the pterygoid muscles are removed en bloc.

Tumors involving the sphenoid sinus and the pterygopalatine fossa: The base of the greater wing of the sphenoid bone is drilled. The middle fossa dura is uncovered. The blue line of the sphenoid sinus is observed. The vidian nerve is seen just passing beneath the sinus, the maxillary nerve courses above and parallel to the vidian to enter the foramen rotundum.

The pterygopalatine fossa can be controlled. By retracting the middle fossa dura, the horizontal segment of the internal carotid artery until it reaches the anterior foramen lacerum is seen. The sphenoid sinus is opened.

Lesions involving the sphenoid sinus and the parasellar region: The maxillary nerve running in the inferolateral wall of the cavernous sinus is sectioned. This allows control of the lateral part of the sinus. The dura of the cavernous sinus is opened. Profuse bleeding from the sinus can be managed by Surgicel packing. The abducent nerve crosses the lateral surface of the internal carotid artery just distal to the anterior foramen lacerum. Further opening of the dura and retraction of the temporal lobe allows visualization of the oculomotor nerve in the cavernous sinus.

At the end of the procedure, the temporalis muscle is rotated to obliterate the surgical defect, the zygomatic arch is wired into place, the wound is closed in layers.

Hints and pitfalls

The middle fossa dura plate should be completely thinned out to gain maximal working space. More space can be gained by exposing the middle fossa dura and slightly retracting the temporal lobe when needed. This maneuver allows complete control of the horizontal segment of the internal carotid artery, since in some cases the middle fossa dura partly overlaps that segment of the artery.

The vidian nerve is an important landmark for identifying the sphenoid sinus lying roughly on its floor. Another landmark is the vomer, the sinus being immediately above it.

In nasopharyngeal carcinoma the nasopharynx is entered as much as possible. This is done by drilling the medial lamina of the pterygoid plate (which is the lat-

eral wall of the choana), and the nasal cavity is entered incising the mucoperiosteum. The internal maxillary artery enters the pterygopalatine fossa anteroinferior to the vidian nerve, and is therefore relatively safe during initial access to the fossa. Before excising the soft tissue of the infratemporal fossa, the internal maxillary artery branches should be carefully coagulated. The pterygoid venous plexus can give rise to profuse and troublesome bleeding.

This can be avoided by always staying in the subperiosteal plane during elevation of the soft tissue and muscles from the glenoid fossa and base of the pterygoid, respectively.

Drilling the base of the pterygoid and retraction of the middle fossa dura allows complete control of the anterior foramen lacerum and the precavernous segment of the internal carotid artery. Tough fibrocartilaginous tissue is found at the level of the petro-occipital syncondrosis, separating the clivus from the petrous apex. Sharp dissection is needed at this level during tumor excision. If the nasopharynx is not opened, tight closure of the Eustachian tube can only be obtained by suturing it. If the nasopharynx is opened, the temporalis muscle is used for obliteration, without any need for suturing.

Type D Infratemporal Fossa Approach

This approach is a modification of the type B and type C infratemporal fossa approach, aiming at removal of lesions involving the petrous apex, clivus, cavernous sinus without traversing the middle ear and mastoid (Fig. 11).

Surgical anatomy

The genu of the internal carotid artery is closely related to the cochlea. The distance between the two varies from 1 mm to 5 mm. The geniculate ganglion is again closely related to the genu of the horizontal internal carotid artery. The mandibular condyle, middle meningeal artery, maxillary nerve and Eustachian tube all lie lateral to the transverse portion of the internal carotid artery. Sacrificing these structures or displacing them is mandatory to control this segment of the artery from the lateral aspect.

Indications

Extradural lesions of the middle or upper clivus, petrous apex, retropharyngeal, parapharyngeal or infratemporal fossa, with or without minimal invasion of the sphenoid sinus, e.g. chordomas, chondrosarcomas, meningiomas and trigeminal neurinomas. Intradural or transdural lesions lying ventral to the brain stem or involving the cavernous sinus, or both, e.g.