Kawase approach

Numerous surgical approaches have been developed to access the petroclival region. The Kawase approach, through the middle fossa, is a well-described option for addressing cranial base lesions of the petroclival region.

A report of Kawase et al. in 1991 presented a surgical method and the results in 10 patients with petroclival meningiomas extending into the parasellar region (sphenopetroclival meningiomas). Minimal but effective extradural resection of the anterior petrous bone via a middle fossa craniotomy offered a direct view of the clival area with preservation of the temporal bridging veins and cochlear organs. The dural incision was extended anteriorly to Meckel's cave, and in cases with invasion of the cavernous sinus, Parkinson's triangle was enlarged by mobilization of the trigeminal nerve. This approach offered an excellent view from the mid-clivus to the cavernous sinus. Extra-as well as intradural tumor masses and dural attachments could be cleared under direct view of the pontine surface. The risk of injury to the lower cranial nerve and of retraction damage to the temporal lobe and brain stem were kept minimal by this approach. Total tumor resection was achieved in 7 patients, with no resultant mortality. Eight patients had a satisfactory postsurgical course, extraocular paresis being their main complaint. The extent of tumor resection depended on the degree of tumor adhesion to the carotid artery, and operative morbidity on the degree of tumor invasion of the brain stem. Of the 3 patients in whom subtotal tumor removal was achieved, only one experienced regrowth of the tumor and underwent a second operation during the follow-up period (6 months-6 years) ¹.

Extradural subtemporal approach to the petrosal ridge and a resection of the anterior pyramid produced direct observation of the lower basilar artery, with minimum retraction of the temporal lobe and preservation of the temporal bridging veins.

The traditional Kawase approach provides a 10 × 5-mm fenestration at the petrous apex of the temporal bone between the 5th cranial nerve and internal auditory canal.

Due to interindvidual variability, sometimes this area proves to be insufficient as a corridor to the posterior cranial fossa.

Indications

Lesions involving the trigeminal porus and Meckel cave can be approached through Kawase's approach or a suprameatal extension of the retrosigmoid approach. Kawase's approach is best suited for accessing middle fossa lesions with smaller petroclival components located above the internal auditory canal ².

Two patients with low basilar trunk aneurysms facing toward the brainstem, were operated on by the “transpetrosal approach,” with successful clipping of the aneurysms. Auditory function was preserved in one case. This approach decreases the possibility of retraction damage to the temporal lobe, brainstem, or cranial nerves, and may be helpful for surgery of aneurysms arising around the vertebrobasilar junction or at the origin of the anterior inferior cerebellar artery ³.

Modification

Tripathi et al. describe a modification to the technique of the extradural anterior petrosectomy consisting of additional transcavernous exploration and medial mobilization of the cisternal
component of the trigeminal nerve. This approach is termed the modified Dolenc-Kawase (MDK) approach.

They describe a volumetric analysis of temporal bones with 3D laser scanning of dry and drilled bones for respective triangles and rhomboid areas, and they compare the difference of exposure with traditional versus modified approaches on cadaver dissection. Twelve dry temporal bones were laser scanned, and mesh-based volumetric analysis was done followed by drilling of the Kawase triangle and MDK rhomboid. Five cadaveric heads were drilled on alternate sides with both approaches for evaluation of the area exposed, surgical freedom, and angle of approach.

The MDK approach provides an approximately 1.5 times larger area and 2.0 times greater volume of bone at the anterior petrous apex compared with the Kawase's approach. Cadaver dissection objectified the technical feasibility of the MDK approach, providing nearly 1.5-2 times larger fenestration with improved view and angulation to the posterior cranial fossa. Practical application in 6 patients with different lesions proves clinical applicability of the MDK approach.

The larger fenestration at the petrous apex achieved with the MDK approach provides greater surgical freedom at the Dorellos canal, gasserian ganglion, and prepontine area and better anteroposterior angulation than the traditional Kawase approach. Additional anterior clinoidectomy and transcavernous exposure helps in dealing with basilar artery aneurysms.

Sphenopetroclival meningioma

Minimal but effective extradural resection of the anterior petrous bone via a middle fossa craniotomy offer a direct view of the clival area with preservation of the temporal bridging veins and cochlear organs.

The dural incision is extended anteriorly to Meckel's cave, and in cases with invasion of the cavernous sinus, Parkinson's triangle is enlarged by mobilization of the trigeminal nerve.

This approach offers an excellent view from the mid-clivus to the cavernous sinus. Extra-as well as intradural tumor masses and dural attachments could be cleared under direct view of the pontine surface.

The risk of injury to the lower cranial nerve and of retraction damage to the temporal lobe and brain stem is kept minimal by this approach.

Total tumor resection was achieved in 7 patients, with no resultant mortality. Eight patients had a satisfactory postsurgical course, extraocular paresis being their main complaint. The extent of tumor resection depended on the degree of tumor adhesion to the carotid artery, and operative morbidity on the degree of tumor invasion of the brain stem. Of the 3 patients in whom subtotal tumor removal was achieved, only one experienced regrowth of the tumor and underwent a second operation during the follow-up period (6 months-6 years).

**Approach for AICA Aneurysm Clipping**

Kawase approach Patient F 54Y with petrous apex meningioma

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