Basal Lateral Subtemporal Approach for Trigeminal Neurinomas: Report of an Experience with 18 Cases

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Summary

Subtemporal craniotomy centred on the external ear canal was used to surgically treat 18 trigeminal neurinomas. The approach was found to be suitable to deal with either or both the middle fossa and the posterior cranial fossa components of the tumour. The basal extension of the exposure was achieved by resection of the roots of the zygomatic arch, roof of the external ear canal and superior third of the mastoid bone. The temporalis muscle was rotated anteriorly. The direction of the approach to the tumour was the shortest and perpendicular from the surface and avoided any neural or vascular exposure or manipulation. The basal exposure was horizontally wide and significantly low which reduced the operating distance, limited the extent of temporal lobe retraction and provided additional space for manipulation of instruments. The exposure was manoeuvrable with anterior, posterior and medial expansion being possible during or prior to tumour resection. The approach had the advantage of being simple and relatively quick and of its familiarity to general neurosurgeons. The experience with the approach with trigeminal neurinomas and its possible advantages over other available approaches to these lesions are analysed in this report.

Keywords: Trigeminal neurinoma; cavernous sinus; tentorium; petrous bone.

Introduction

Advances in skull base surgery have resulted in development and refinements in approaches to trigeminal neurinomas. Most of the recent surgical approaches described to these lesions are either frontotemporal (pterional) with [4, 5, 12, 20] or without orbitozygomatic osteotomy [18] utilising a trans-sylvian [18], temporopolar [4, 5] or infratemporal fossa [8, 20] avenue, anterior subtemporal-transtentorial wherein the exposure is centred over the zygomatic arch [14, 15, 23] and posterior subtemporal approach wherein the temporal exposure is used in combination with a presigmoid or a petrosal approach [1, 4, 18]. We describe a lateral subtemporal approach centred over the external ear canal and discuss its possible advantages over other conventional approaches. The approach was used in 18 cases of trigeminal neurinomas.

Subtemporal or a middle cranial fossa approach is frequently used for the treatment of vascular lesions and tumours located in the petroclival and clival region. A common disadvantage of this approach has been damage to the temporal lobe caused by retraction, particularly when the venous drainage is interrupted. The more commonly used methods of basal expansion of the low temporal craniotomy to reduce retraction related brain injury include zygomatic osteotomy and inferior mobilisation of the temporalis muscle [20] and resection of the middle fossa floor [20, 22]. Partial unroofing of the external ear canal [21], inferior mobilisation or resection of the condyle of the temporomandibular joint [20] have also been recommended for enhancing the inferior angle of vision. A modified basal extension [10] of the lateral subtemporal approach is presented. Inclusion of mastoidectomy in the exposure adds the advantages of the more popularly employed petrosal approach to these tumours [1].

Patients and Methods

Surgical Technique

The patient is placed in a lateral position. Cranial nerve or brainstem function monitoring devices were not used in this series. A continuous external drainage of cerebrospinal fluid by lumbar subarachnoid catheter placement is set up. The scalp incision is shown in Fig. 1. It starts from the point which is about 1.5 to 2 cm anterior to the tragus of ear and about 1.5 cm inferior to the zygomatic arch. The incision is anterior to the trunk of superficial temporal artery. The frontal and zygomatic branches of the facial nerve are protected.
by working deep to the deep layer of temporalis and masseteric fascia and displacing the soft tissues harbouring these tiny nerves anteriorly. The incision curves initially superiorly and then traverses posteriorly. The incision exposes the squamous temporal and posterior parieto-occipital bone, posterior third of the temporalis muscle, roots of the zygomatic arch, supramastoid crest and the base of the mastoid process (Fig. 2). The incision can be extended further posteriorly and curved inferiorly to enhance the temporal, occipital and mastoid process exposure. The wide base of the scalp flap and preservation of all feeding arteries ensures its adequate vascularity. The posterior aspect of the temporalis muscle is mobilised in the subperiosteal plane from the temporal bone and from the sharp superior border of the zygomatic arch. The muscle is then rotated anteriorly.

A low temporal craniotomy with the base centred on the external ear canal is performed (Fig. 2a,b). The anterior and posterior roots of the zygomatic arch, the glenoid fossa and lateral half of the roof of the external ear canal are removed with the help of power driven saw in one piece or resected with the help of rongeurs and power driven drill (Fig. 2). Removal in one piece is frequently difficult and can result in an inadvertent opening up of the external ear canal, a procedure which could affect the sterility of the field. The external ear canal is protected by sharp subperiosteal separation of the canal from bony roof. The external ear canal has loose fibrous connections to the bony and cartilaginous wall. It is more firmly attached to the spine of Henle, where sharp dissection may be necessary to expose the canal. The meniscus of the temporomandibular joint is exposed but not removed. In tumours limited only to the middle cranial fossa or in smaller lesions the glenoid fossa may not be removed and mastoidectomy can be avoided. The superior third or half (about 1.5 to 2 centimeters below and medial to the supramastoid crest) of the mastoid air cells are drilled. The mastoid antrum may or may not be opened. The drilling of the mastoid process may be continued medially to expose the bony labyrinth around the superior and posterior semicircular canals. The sigmoid sinus and the region of its junction with the transverse sinus is not exposed and a thin plate of bone is left between the sinus and the mastoid exposure. The dura can now be elevated off the middle fossa floor after sectioning the middle meningeal artery and a basal extradural exposure is obtained as shown in Fig. 3. The tumours limited to or having a larger bulk in the middle fossa can be removed by an entirely extradural route after exposing the foramen ovale and dissecting the outer sheath of the dura [11]. However, in larger tumours and those with a significant posterior fossa component, an intradural exposure is preferred. By an intradural route and elevation of the temporal lobe, the middle fossa floor and the tentorium are exposed. The bulge of the tumour under the dura of the middle fossa floor is identified. A transverse incision is made in the bulge of the dura and the tumour within the dural walls is progressively removed saving the displaced normal trigeminal nerve fibres. An incision is made in the tentorium which begins at its free edge at the level of posterior end of the cerebral peduncle and then directed anterolaterally towards the lateral aspect of the superior petrosal sinus. A triangular flap of tentorium is then everted over the superior petrosal sinus (Fig. 4) providing a wide window from