# Infratemporal Approach For Jugular Foramen Meningioma

UĞUR ERONGUN, YAVUZ UYAR, BİLGE ÇAKIR, ALİ UYGUN, YALÇIN KOCAOĞULLAR,

Selçuk University Medical School Departments of Neurosurgery (UE, AU, YK), Otorhinolaryngology (YU) and Radiology (BÇ) Konya, TÜRKİYE

**Abstract :** The properties of tumours of the jugular foramen are presented and the details of the infratemporal A approach, a new technique for neurosurgeons, are discussed.

**Key Words :** Jugular foramen, Meningioma, Infratemporal A approach.

## INTRODUCTION

The jugular foramen is a canal in the skull base between the lateral aspect of the occipital bone and the inferiomedial part of the petrous pyramid and is divided anatomically into two parts by a bone or fibrous septum, anteriorly the pars nervosa and posteriorly the pars venosa. While the inferior petrousal sinus and the N. glassopharingeus are passing through the pars nervosa, the V. jugularis interna, N. vagus, N. accessorius, ascendant pharingeal artery and meningeal branches of the occipital artery pass though the pars venosa. The foramen jugulare which has such a complicated structure, is affected by congenital, vascular and, most frequently, tumoural lesions and these lesions reveal various clinical syndromes. Most often encountered tummours in the foramen jugulare region are glomus jugulare tumour, neuroma, meningioma, metastatic carcinoma, chondroma, nasopharynx carcinoma and carcinoma of the tympanic cavity. Symptomatology of these tumours may be primarily otological or neurological or a combination of both (3, 7). The most encountered initial symptoms are loss of hearing, tinnitus, otorrhoea, facial paralysis, pain and 9th, 10th, 11th cranial nerve paralysis. Paralysis of these nerves is called Syndrome of the jugular fossa or Vernet's syndrome and is characterized by loss of taste sensation in the posterior third of the tongue, paralysis of the vocal cords and soft palate and weakness of the trapezius and sternocleidomastoid muscles. If tumours of the foramen jugulare region extend medially to the hypoglossal canal and cause hypoglossal nerve paralysis, the clinical presentation is known as Collet-Sicard syndrome.

## CASE REPORT

This 42-year-old female was admitted to the ENT clinic on 21 January 1992 with a complaint of hoarseness. After questioning the patient it was revealed that the prasent complaint started 9 months previously and had increased since then and during the past two months headache and difficulty in swallowing were added. General physical examination revealed no significant finding. After otoneurolaryngological examination, it was found that the right vocal cord was fixed in the paramedian line, the uvula was retracted to the left and the gag reflex was lost.

Routine laboratory studies and plain X-rays showed no significant abnormality. Although clinically there was no neurological deficit related to the 11th cranial nerve, EMG revealed partial denervation of the sternocleidomastoid muscle. Electrophysiological evaluation of the facial muscles, audiogram and electronystagmogram were within normal limits.

After an axial and coronal CT investigation of the basis cranii an 18x22x20 mm mass originating in the jugular canal was found. The mass had enlarged the canal by filling the lumen and showed extracanaliculary extension at the caudal part. The mass, which had a dumb-bell configuration extended along the posterior contour of the petrous bone to the cerebello-pontine angle obliterating the cerebello-pontine cistern. There were amorphous calcifications inside and around the mass. CT after administration of contrast material showed slight enhancement. There was no perifocal oedema. The width of the internal acoustic canal was normal. The right lateral recess of the 4th ventricle was compressed. (Fig 1,2) Although the morphological appearance



*Fig. 1a,b : Axial and coronal CT showing a mass filling enlarging the jugular foramen with extracanaliculary extension.*



*Fig. 2a,b : On postoperative axial and coronal CT, complete removel of the tumuor.*

of the mass on CT was meningioma, it was thought that it could be a neurogenic tumour due to its configuration so from that standpoint, the infratemporal A approach developed by Fisch, was chosen for complete removal of the mass.

Endotracheal general anestheisa was performed. A skin incision in the shape of an inverse "S" was made beginning in the right temporal region and passing through the postauricular area and extending downward to the hyoid bone at the neck. The incision was carried down to the mastoid periosteum. A periosteal flap in connection with the external auditory canal was prepared from mastoid periosteum. The external auditory canal was

incised, the skin was turned back and stitched. The entrance of the external auditory canal was occluded using a periosteal flap. The branches of the facial nerve in the parotid gland was exposed. Then attention was directed to the neck and the vessel-nerve sheath was exposed. The internal jugular vein, common carotid artery, external and internal carotid arteries were found and tracks of the N. vagus, N. glossopharingeus and N. accessorius were identified. Mastoidectomy was performed. The sigmoid sinus, digastric ridge, facial nerve and bony labyrinthine were exposed by removing retrosigmoid, retrofacial, retrolabyrinthine, supralabyrinthine, infralabyrinthine, pericarotid and supratubal cells. At the same time the posterior bone wall of the external auditory canal was removed so that a bridge was made. The tympanic membrane and ossicle chain were removed. A new fallopian canal beginning around the geniculate ganglion and passing along the anterior wall of the external auditory canal was made and the facial nerve was elevated from its normal position and transported to this new canal. (Fig 3) The mastoid apex and bony laminas on the sigmoid sinus were removed. Small dural incisions were made in front and behind the sigmoid sinus and then the sigmoid sinus was ligated with a pair of sutures. The vertical portion of the ICA was exposed on the medial wall of the middle ear. The tube of Eustachian was obliterated with bone-wax. The styloid process was excised and using a high speed drill the inferior part of the tympanic bone was removed so that the jugular bulb, sigmoid sinus, V. jugularis interna and cervical segment of the ICA and its vertical segment in the temporal bone were completely exposed. The jugular bulb was partially filled by a tumoural mass. The V. jugularis interna was ligated in the neck and the tumour was exposed by opening the bulbus of the jugular vein. During this period massive bleeding from the petrousal sinuses was controlled. The tumour had enlarged the jugular foramen and compressed the 9th, 10th and 11th cranial nerves. Bony structure around the jugular foramen was removed by drilling and 2x2 cm of the dura was exposed. After opening the dura mater the cerebello-pontine angle was exposed. When the abnormally thickened arachnoid walls of the cisterns were opened it was

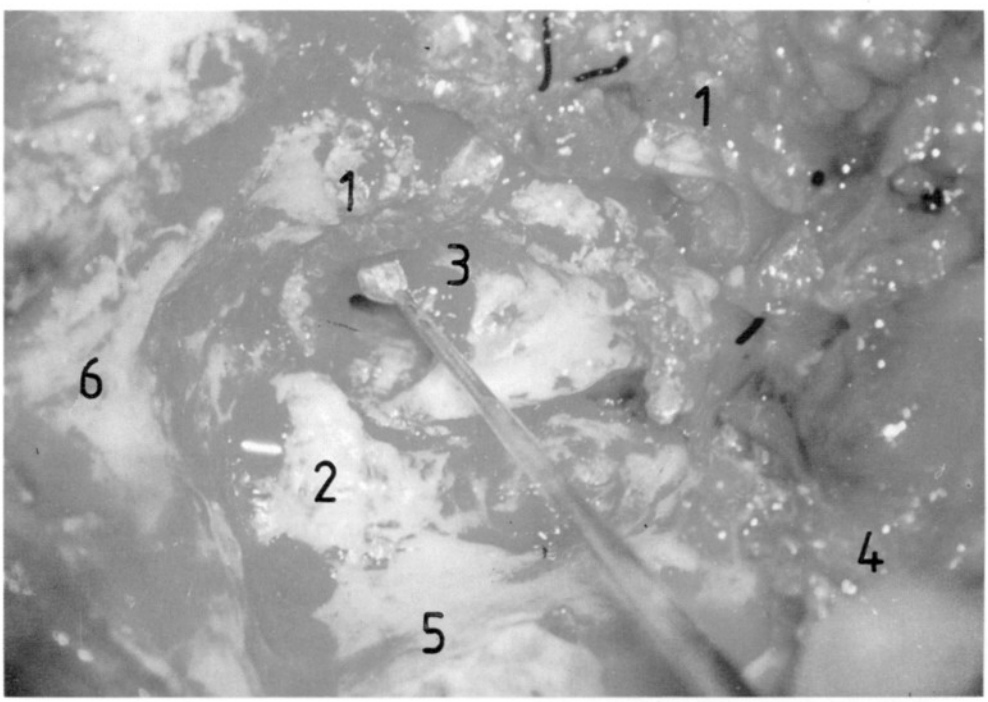


*Fig. 3 : View of the operation field after facial nerve transposition (anterior reroruting)*

*1- Facial nerve (at the tip of microdissector)*
*2- Bony labyrinthine*
*3- The segment of the ICA in temporal bone.*
*4- Internal jugular vein.*
*5- Sigmoid sinus*
*6- Middle cranial fossa*

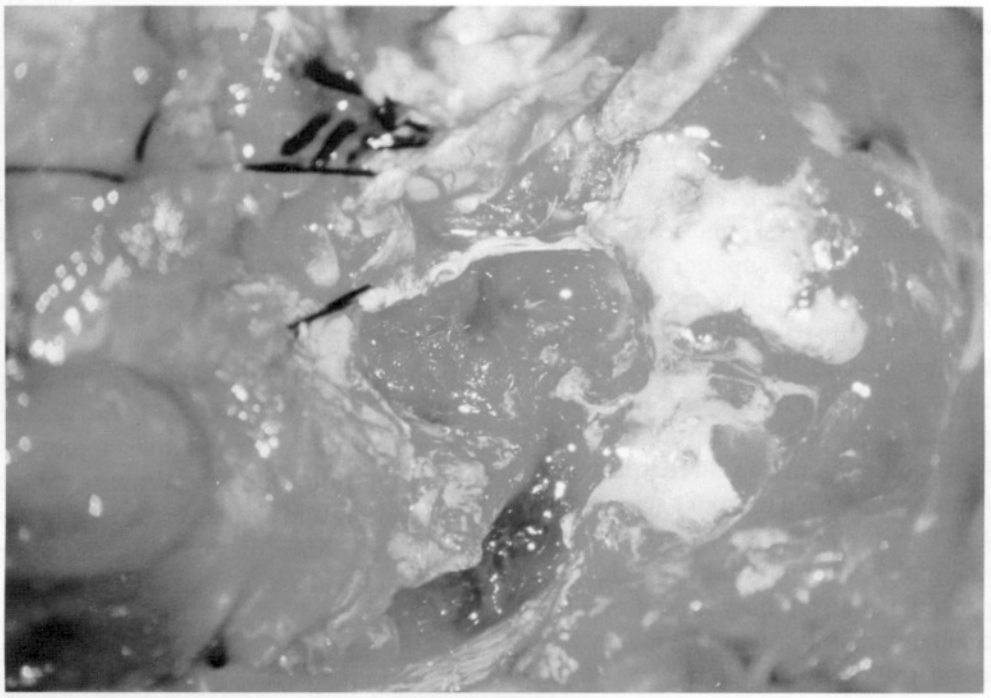

*Fig. 4 : Tumoral tissue at the tip of the aspiration tube and cerebellum immediately above are seen.*

*Fig. 5 : The seventh and eight cranial nerves, brain stem, PICA and cerebellum at the tip of the bipolary forcep after total excision of the tumour.*

seen that the operative field was completely occupied by the tumour which had an epiarachnoidal cleavage with the cerebellum. (Fig 4) It was recognized that the tumour was macroscopically a meningioma rather than a neuroma. It was impossible to identify any vital vascular and neural structure in the operative field, so to achieve mobilization of the mass internal decompression was dissected from the 7th and 8th cranial nerves on the superior pole. After dissection was completed, both the cranial nerves were visible. Preserving the epiarachnoidal cleavage between the tumour and the brain stem, the tumoural mass was reduced in size and mobilized from the nest it had made on the brain stem. At last the PICA was dissected from the inferio-posterior portion of the tumour and total tumour excision was achieved. (Fig 5) The dural opening was covered by a musculo-facial graft from temporalis muscle. The cavity was packed using fat harvested from the anterior abdominal wall and a temporalis flap was designed to cover the cavity completely.

The patient had no additional neurologic deficits during the postoperative period. Pathology revealed angioblastic meningioma.

## DISCUSSION

Radical surgical management of jugular foramen tumours has made great progress in parallel with advances in neuroradiological investigations. Particularly the introduction of CT, NMR and DSA has provided considerable aid. The complexity of the anatomical structure in the jugular foramen region, the close proximity of the jugular foramen to very important neurovascular structures like the ICA, jugular bulb, the seventh and eighth cranial nerves and the brain stem, and the possibility of an intracranial mass extending to the extracranial space or an extracranial one to the intracranium have increased the importance of surgical treatment of jugular foramen tumours.

First of all, it should be determined whether tumours of the jugular foramen are purely intracranial or solely extracranial or have both extracranial and intracranial components (5). After location the translabyrinthine, infratemporal A, transsigmoid, transmandibular, retrosigmoid or suboccipital surgical approaches can be used, depending upon the symptomatology, size and extension of the tumour.

With the translabyrinthine approach, due to labyrinthectomy, permanent total sensorineural hearing loss occurs postoperatively. For this reason, it can be performed in cases with hearing loss. Although Horn and House (4) postulated that this approach provided direct access to the jugular bulb and posterior fossa, existence of the facial nerve superficially over the jugular foramen limits surgical manipulations in this region. Because the area exposed is limited, radical excision of intracranially located tumours is impossible.

The transsigmoid appoach for jugular foramen tumours was described by Mann and et al. (8). With this technique, the jugular foramen is exposed without performing facial nerve transposition and labyrinthectomy thus cochleavestibular function is protected. After mastoidectomy, the sigmoid sinus is found and the jugular bulb exposed. The disadvantage of this approach is limited exposure of the jugular foramen so removal of large tumours and particularly their intracranial components, is difficult.

With the transmandibulary approach an asteotomy is performed on the mandible at the midline (6). The parapharyngeal area is entered through the floor of the mouth and the jugular foramen is exposed by retracting half the mandible laterally. But this type of approach is not practical because as the area is deeply situated it is very difficult to reach the intradural portion and haemostasis may be a surgical problem due to inability to control the sigmoid sinus.

The infratemporal A approach as performed by Fisch provides direct access to the jugular foramen (1). The details of this technique were discussed in the case report. The most important advantage of this approach is that it provides wide exposure of the foramen jugulare region because transposition of the facial nerve is possible and the intracranial component can be exposed easily. The most important disadvantage is permanent conductive deafness since the bony chain of the middle ear and external auditory way are excised and obliteration occurs, but hearing aids are effective. Despite the risk of paresis or paralysis after facial nerve transposition, this complication is rare and transient with meticulous surgical manipulation. This technique of Fisch is also prefered in tumours which have excessive extracranial extension since the neck has been exposed to the level of the hyoid bone.

The suboccipital approach is preferred for tumours purely intracranial in location which don't cause hearing loss. This methot is advised for excision of tumours greater than 2 cm in diameter. It requires long-standing retraction of the cerebellum and to expose the extracranial part of the tumour is difficult. On this approach control of bleeding has some difficulties related to surgical technique. However, with the infratemporal approach, the sigmoid sinus and internal jugular vein are ligated and profuse bleeding from petrousal sinuses can easily be controlled (9).

Following examination of the techniques discussed above, the infratemporal A appoach was chosen for our patient for three reasons:

1. The most direct and widest possible exposure of the jugular foramen is afforded due to transposition of the facial nerve.

2. Bleeding can be controlled by haemostasis of the important sinuses and veins in the region.

3. It is also possible to expose the intracranial component of the tumour.

Fisch, who developed the infratemporal A approach, described the removal of tumours greater than 2 cm in diameter in two stages (1,2). Although the tumour was greater than 2 cm in diameter, in our patient complete removal was accomplished using a one-staged surgical approach.

**Correspondence:** Asso. Prof. Dr. Uğur Erongun
Selçuk University, Medical School
Neurosurgery Department
Konya - TÜRKİYE

## REFERENCES

1. Fisch U, Mattox D: Infratemporal fossa approach type A. In Fisch U (ED): Microsurger of the skull basi. Stuttgart-New York: Thieme Medical Publishers, 1988: 136-281
2. Franklin DJ, Moore GF, Fisch U: Jugular foramen peripheral nerve sheath tumors. Laryngoscope 99: 1081-1087, 1989
3. Friedman CD, Costantino PD, Teitelbaum BS : Primary extracranial meningiomas of the head and neck. Laryngoscope 100: 41-48, 1990
4. Horn KL, House WF, Hitselberger WE: Schwannomas of the jugular foramen. Laryngoscope 95: 761-768, 1985
5. Janecka IP-Sekhar LN: Meningiomas. Head and neck perspectives. In Fisch U, Valavanis A, Yaşargil MG (ED): Neurological surgery of the ear and skull base. Amsterdan-Milano: Kugler and Ghediki Publications, 1989: 139-152
6. Krespi YP, Sisson GA: Transmandibuler exposure of skull base. Am J. Surg. 146: 102-106, 1984.
7. Kumen A, Mafee M, Vassalli L: Intracranial and infratemporal meningiomas with primary otologic symptoms. Otolaryngol Head Neck Surg 99: 444-454, 1988.
8. Mann WJ, Amedee RG, Gilsbach J: Transsigmoid approach for tumors of the jugular foramen. Skull base surg 1: 137-141, 1991.
9. Raquet F, Mann WJ, Amedee RG: Functional deficits of cranial nerves in patients with jugular foramen lesions. Skull Base Surg 1: 117-119, 1991.