Trigeminal nerve tumor: comparison of CT and MRI

Case report


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Benign tumors of the middle fossa components of the trigeminal nerve are rare. The authors describe the case history, radiological investigation, and operative findings of a patient with a large trigeminal neurofibroma of the middle fossa. The unusual mode of presentation is discussed. Valuable information was provided by magnetic resonance imaging prior to successful removal of this tumor.

Key Words • diagnostic imaging • magnetic resonance imaging • brain neoplasm • trigeminal nerve tumor • middle fossa

Tumors of the trigeminal nerve are unusual; those that are recorded often remain clinically quiescent until they have achieved a large size. In the past, the diagnosis has been suspected following radiological demonstration of expansion of the foramen ovale or extensive erosion of the floor of the middle fossa. Confirmation of this has required more extensive investigation including radionuclide scanning, angiography, and pneumoencephalography. Computerized tomography (CT) scanning has recently proved to be of value.

We present the case history of a patient with a large trigeminal neurofibroma. Certain features of her presentation are unusual. Although conventional radiology suggested the diagnosis, the extent of the tumor was revealed by CT scanning and more explicit details were demonstrated by magnetic resonance imaging (MRI).

Case Report

This 33-year-old woman was well until 2 years before admission when she experienced “double vision” for 2 weeks following an attack of left-sided facial pain which she attributed to “sinusitis.” These symptoms resolved, but 2 months later she noted blurring in the vision of her left eye and experienced episodic numbness and tingling of the lower half of the left side of her face. An ophthalmologist examined her, noted pallor of the left optic disc, and diagnosed retrobulbar neuritis.

The patient was referred to a neurologist who confirmed the funduscopic findings and also detected a central scotoma of the visual field of her left eye. No sensory or motor deficits were referable to the left trigeminal nerve. Visual evoked responses were normal on the right and unobtainable from the left eye. The most likely cause of her symptoms was thought to be disseminated sclerosis. Radiological investigations were deferred since the patient was in the first trimester of pregnancy, and she did not attend for further investigations until she had been delivered of a healthy baby. Subsequently, conventional radiographs of the skull revealed a large defect in the floor of the middle fossa and indicated distortion of the oropharynx by a soft-tissue swelling. A CT scan showed an avascular mass associated with left-to-right shift (Fig. 1 left) and erosion of the left sphenoidal wing.

Examination. The patient was referred to a neurosurgeon (R.H.L.) who confirmed the clinical findings. An otolaryngologist (R.T.R.) noted a large extrinsic mass in the oropharynx and nasopharynx, displacing the left tonsil and soft palate to the right. There was no sensory or motor deficit in the pharynx or larynx, and no evidence of secretory otitis. The mass was not palpable in the neck and no bruits were audible.

Angiography confirmed the avascular nature of the mass and demonstrated patency of the middle cerebral artery with considerable upward and medial displacement. From the displacement of the internal and external carotid arteries, it was clear that the mass extended...
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FIG. 1. Contrast-enhanced computerized tomography scan demonstrating a tumor in the left middle fossa (left), and a coronal reconstruction demonstrating extension of the tumor into the nasopharynx (right).

FIG. 2. Three-dimensional reconstruction of bone contours from computerized tomography scans, demonstrating the defect in the floor of the left middle fossa viewed from above.

FIG. 3. Magnetic resonance image clearly demonstrating the dumbbell shape of the tumor extending into the neck, and tumor invasion of the sphenoid air sinus (arrow).

into the neck. This was confirmed by coronal and sagittal reconstruction of CT scans (Fig. 1 right) which demonstrated a large middle fossa mass, extending into the left infratemporal and pterygoid fossae. The enlargement of the foramen ovale was clearly demonstrated by three-dimensional reconstruction from the CT scans (Fig. 2). Tumor definition was superior on MRI, which revealed a large dumbbell-shaped mass approximately 10 cm in its vertical axis and 5 cm wide. The extracranial portion was as large as the intracranial part. There was clear demonstration of displacement of the adjacent brain and optic chiasm, and invasion of the sphenoid air sinus by tumor was readily identified. The cavernous sinus, pituitary fossa, and infundibulum did not appear to be involved by tumor (Fig. 3).

Operation. Craniotomy via a subtemporal approach revealed a large hard avascular mass which was both intra- and extradural. The tumor appeared to originate from the mandibular nerve close to the gasserian ganglion, which could not be identified. There was no extension into the posterior fossa. At its entrance into the lateral wall of the cavernous sinus, the maxillary
nerve was closely adherent to the medial border of the tumor. The first step involved internal decompression of the intracranial portion of the tumor, followed by transection of the capsule along the floor of the middle fossa. During this stage of the procedure, the maxillary nerve was deliberately sacrificed. The tumor had eroded into the sphenoid sinus; the sinus was therefore cleared of tumor, its mucosa was removed, and the cavity was packed with muscle. The skin incision was then extended downward in front of the pinna, into the neck to the level of the carotid bifurcation. Exploration here revealed tumor palpable immediately medial to the internal carotid artery. The tumor could be detected, passing upward, deep to the ramus of the mandible.

At this point during the operation the intention had been to mobilize the facial nerve as it entered the parotid gland in the manner described by Fisch. The mandible was to be displaced anteriorly in order to facilitate access into the infratemporal and pterygoid fossae. However, with blunt dissection along the plane of the tumor capsule both from below and from above through the bone defect in the floor of the middle fossa, it was possible to free completely the extracranial portion of the tumor. This portion was then carefully delivered upward into the now empty fossa, thus avoiding trauma to the facial nerve and mandible. The dural defect in the floor of the middle fossa was covered with Lyodura. Histological examination confirmed that the tumor was a neurofibroma consisting of many spindle-shaped perineural cells, mast cells, and collections of Schwann cells with no mitotic figures.

Postoperative Course. The patient made an uneventful recovery and was discharged home on the 8th day. The only additional neurological deficit following surgery was anesthesia over the second and third divisions of the left trigeminal territory and loss of the motor function of the left trigeminal nerve. Facial function was normal. The visual field defect remained unaltered. At review 4 months later, the patient's condition was unchanged.

Discussion

Tumors of the trigeminal nerve are rare, comprising some 0.2% of all brain tumors in one series. They are generally divided into those involving the gasserian ganglion and those involving the retrogasserian roots in the posterior fossa, with the former being slightly more common. An appreciable proportion of tumors affect both the ganglion and the retrogasserian roots and so occupy both the middle and posterior intracranial fossae. Presentation is usually in the fourth and fifth decades of life, and there is a slight preponderance of male patients. Presenting symptoms and signs depend upon the tumor site. Posterior fossa masses associated with tumors of the retrogasserian portion of the trigeminal nerve present with symptoms typical of a cerebellopontine angle tumor, including ataxia, lower cranial nerve involvement, and slight or absent facial pain. Middle fossa tumors involving the ganglion usually present with continuous facial pain, sometimes with evidence of trigeminal nerve involvement as evidenced by facial numbness or masseter weakness. However, middle fossa tumors of the trigeminal ganglion are notorious in that facial numbness may be transient and there may be no pain and no masseter weakness. Such was the case with our patient. Rarely, a middle fossa tumor may cause facial weakness, supposedly by traction on the facial nerve transmitted via the greater superficial petrosal nerve, but this was not observed in our patient. Disturbance of vision is infrequent among patients with trigeminal nerve tumors and, when it occurs, it is usually secondary to papilledema associated with a posterior fossa tumor. Visual disturbances in the absence of papilledema are notably rare, especially in cases of middle fossa trigeminal nerve tumor and, when present, may signal the existence of a malignant gasserian ganglion neoplasm. Pain is a pronounced feature in such cases. Presumably, as in our patient, a tumor of sufficient size will compress and distort the optic tract. Extension of benign trigeminal nerve tumors along the peripheral branches of the nerve is reputedly rare, while extension into the neck to a point immediately above the carotid artery bifurcation, as in our patient, does not appear to have been reported previously. Indeed, presentation of such a mass in the nasopharynx has been considered evidence of a malignant tumor invading and enveloping the trigeminal nerve.

In the past, diagnosis has rested largely on interpretation of conventional radiographs of the skull demonstrating enlargement of the foramen ovale or erosion of the petrous apex. The value of angiography was questioned and in certain circumstances resort was had to radionuclide scanning, pneumoencephalography, and ventriculography. More recently, CT scanning has been shown to be a valuable investigative tool. It is apparent that this diagnostic technique may be superseded by MRI, which appears to provide better information. When compared with CT, MRI has an increased sensitivity in the detection of intracranial lesions. In the case reported here, MRI provided superior definition of the tumor boundary and of its relationship with adjacent structures. Further advantages include direct imaging in the coronal plane, improved definition of soft tissue, absence of bone artifacts, and avoidance of ionizing radiation.

The clinical history, size of tumor, and the impressive paucity of clinical signs, when one considers the degree of mass effect revealed in Figs. 1 and 3, all suggest that this lesion was enlarging extremely slowly. Interestingly, pregnancy did not adversely affect the symptomatology — a point apparently not considered in the literature. The unconventional but effective intracranial delivery of the extracranial part of this tumor provided the only unusual aspect of its removal. We were gratified with the rapid recovery of our patient, especially in view of

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the formidable mortality rate associated with attempts to remove such lesions in the past.10

Acknowledgments

The authors wish to thank the staff of the University Department of Medical Illustration, Manchester Royal Infir-
mary, for their help and Miss Pamela Brown for secretarial assistance. They also acknowledge the invaluable assistance of Dr. Helen Reid, University Department of Neuropathology, The Medical School, Manchester, for advice regarding the pathological features of this case.

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Manuscript received September 8, 1986.
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