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Clinical Records

KTP laser assisted excision of glomus tympanicum

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Abstract
A 39-year-old female with a two-year history of mild hearing loss and discomfort on air flight descent was found to have a pulsatile mass behind an intact tympanic membrane. A suspected diagnosis of glomus tympanicum was confirmed by computed tomography (CT) scan imaging. The lesion filled the mesotympanum and hypotympanum but the jugular bony plate was intact, confirming the tympanic site of the lesion. This very vascular tumour was exposed by a tympanomeatal flap and the KTP laser used to shrink and coagulate the tumour progressively with minimal haemorrhage and blood loss. Complete excision of the lesion was achieved without the need for bony removal, and with minimal blood loss. The use of the KTP laser to coagulate this vascular lesion allowed safe removal of the tumour and avoided the need for extended facial recess or hypotympanotomy surgery.

Key words: Glomus tympanicum tumour; Laser surgery

Introduction

Glomus tympanicum is a paraganglioma arising in the middle ear and mastoid. It originates in paraganglionic chemoreceptor cells present in the promontory or along the tympanic branch of the glossopharyngeal nerve (Jacobson's nerve) (Guild, 1941; Rosenwasser, 1945; Guild, 1953). Because of the rich network of vascular spaces within the fibrous septa, biopsy and surgery of these lesions is associated with profuse haemorrhage with little tendency for spontaneous arrest of haemorrhage because the vascular spaces lack contractile elements. The diagnosis is, therefore, based on the clinical and radiological findings pre-operatively. The surgical approach to excision of these lesions is related to both the size and the site of the tumour. The KTP laser produces laser light at a wavelength of 532 nanometers (nm). Light of this wavelength is well absorbed by haemoglobin and other red pigmentation, and can, therefore, bring about effective coagulation of haemangiomas and other vascular lesions.

Case report

A 39-year-old woman presented with a two-year history of mild, left-sided hearing loss. This was associated with pain and discomfort on descent in air flights. Examination of her ear showed the presence of a pulsatile mass behind the tympanic membrane (Figure 1). This appeared to be bulging up and filling the hypotympanum and the majority of the mesotympanum, the upper margin being the only edge visible and this was evident behind the neck of the malleus and at the level of the incudostapedial joint. There was no audible bruit. Her pure tone audiogram confirmed a 30 dB conductive hearing loss on the affected side. CT scan confirmed the presence of a lobulated, soft tissue mass in the middle ear cavity overlying the promontory filling the mesotympanum and slightly displacing the incudostapedial joint posteriorly. Inferiorly the mass extended into the hypotympanum with partial obstruction of the Eustachian tube. The jugular plate was noted to be intact and no bony erosion was evident. The lesion enhanced homogeneously with contrast administration indicating its vascular nature. The radiological features were in keeping with the suspected glomus tympanicum diagnosis. Twenty-four hour urinary collections for VMA (vanillyl-mandelic-

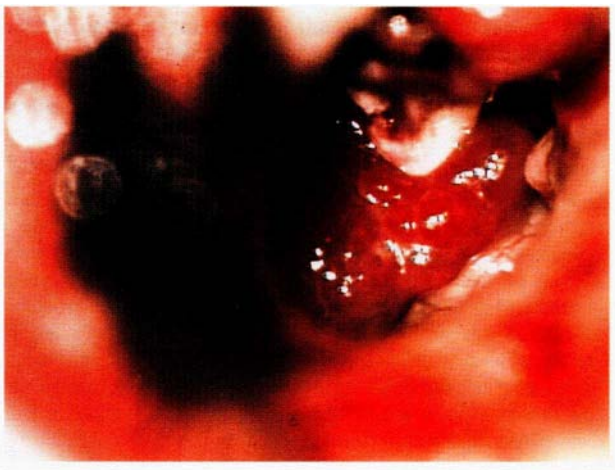

Fig. 1

The tumour in the middle ear seen after raising the tympanomeatal flap. Laser scars can be seen on its surface, having the effect of contracting the tumour and pulling it out of the facial recess and hypotympanum.

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FIG. 2
The middle ear following resection of the tumour.

acid) were within normal limits. Under general anaesthetic, the middle ear was approached by a post-auricular incision with a tympanomeatal flap elevating almost the entire skin from the ear canal and dissecting the drum from the lower half of the handle of malleus. The tumour was found to fill the facial recess posteriorly, overlying the descending portion of the facial nerve. The KTP laser (Aurora, Laserscope) was used to deliver laser light by a 0.2 mm fibre in a hand-held probe with built-in suction evacuation. Using a continuous setting of 2 watts, and holding the probe at a distance of approximately 0.5 cm above the tumour in order to defocus the light delivery, the tumour was coagulated.

On firing the laser, the tumour visibly blanched and contracted. This brought about gradual shrinkage of the tumour and it was seen to move anteriorly at the facial recess and downwards from below the handle of malleus. Some slight bleeding was encountered but, on further defocusing the laser, it was possible to coagulate this. Occasionally adrenalin-soaked swabs needed to be used. Copious haemorrhage was encountered at one point when cup biopsy forceps were used to take a sample for histological analysis. This bleeding was controlled with topical adrenalin soaked neurosurgical patties. The tumour was progressively reduced in size and the final segment extending into the Eustachian tube recess was identified by its pale colour as having been devascularized and this part of the tumour was lifted out with forceps without haemorrhage. Following excision of the tumour, the hypotympanum, promontory and the course of Jacobson's nerve were exposed to further defocused laser light in order to ablate the cells of origin of the tumour to diminish any likelihood of recurrence. The tympanomeatal flap was replaced and the wound closed. The blood loss was in the region of 20 ml. An unremarkable post-operative recovery was made with the exception of there being a small residual perforation anteroinferiorly in the tympanic membrane (Figure 2). Six months after surgery the patient's bone conduction thresholds were normal but she still had a mild conductive hearing loss (30 dB).

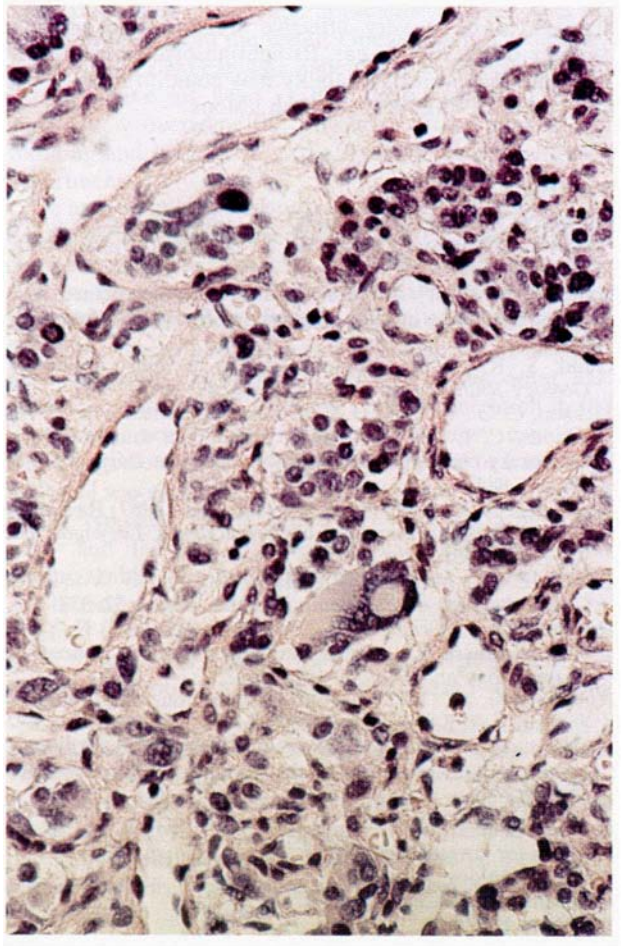

FIG. 3a
A histological slide of the glomus tympanicum tumour (H & E; × 40).

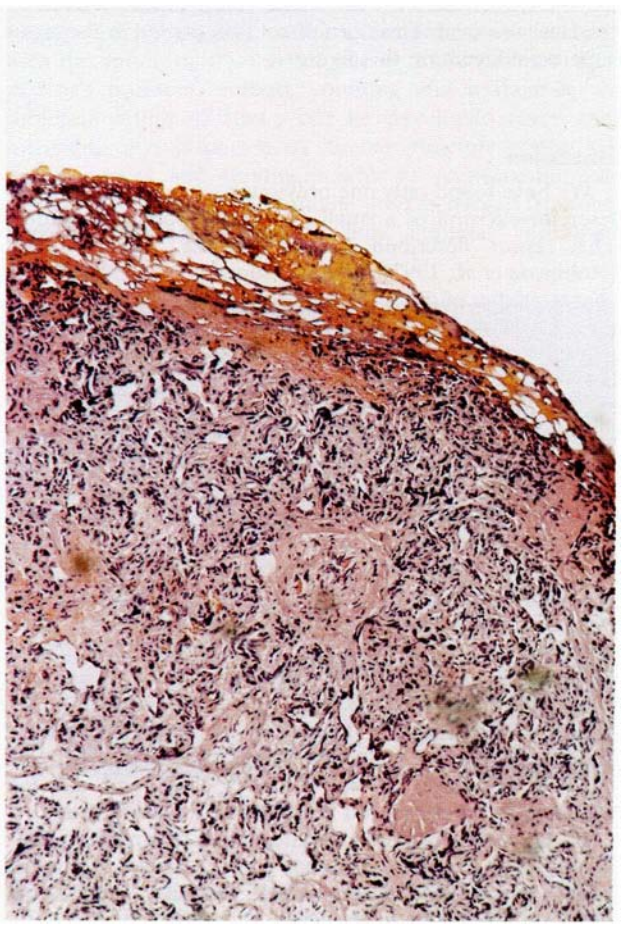

FIG. 3b
A histological slide of the tumour showing some of the effects of laser burn (H & E; × 10).

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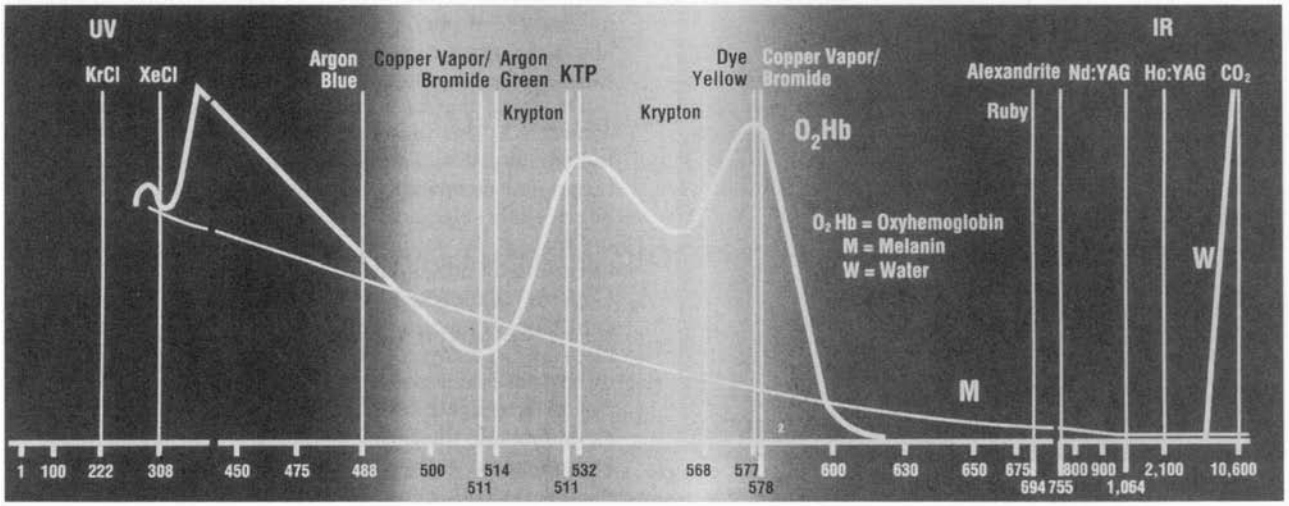

FIG. 4

The electromagnetic spectrum to indicate absorption of the various types of laser light by haemoglobin and water.

The histological appearances of the lesion removed were those classically seen in glomus tympanicum (Figure 3a) (Reddy *et al.*, 1983). It was composed of well-delineated nests of cuboidal cells (so-called 'zellballer') separated by richly vascularized sinusoidal fibrous septa. The cells had a mild degree of pleomorphism and an abundant granular cytoplasm.

The base of this polypoidal lesion (Figure 3b) showed the marked artefactual distortion (burn effect) related to the laser removal. This burn effect is best seen in the more superficial layers on this figure.

Discussion

We have found only one previous case report of use of a laser for excision of a small glomus tympanicum tumour. This report described the use of an NdYAG laser (Robinson *et al.*, 1993). Which is superior? The absorption characteristics of the KTP laser light at 532 nm mean that it is very well absorbed by haemoglobin – see Figure 4 which demonstrates absorption spectra. While NdYAG has better absolute tissue penetration, its absorption by haemoglobin is much less. We feel this makes the KTP laser more useful since there is less likely to be absorption into bony structures, or any transmission into the cochlea, while maximizing vascular absorption. The KTP instrument is probably more widely available in the UK which would again favour its use.

Reports of conventional surgical removal of glomus tumours (Jackson *et al.*, 1989) recommend the use of an extended facial recess approach for adequate removal. Another route is the hypotympanotomy approach (Glasscock and Shambaugh, 1990; Shambaugh, 1955). The need for this, and the associated sacrifice of the chorda tympani nerve, was avoided in our case by the contraction of the coagulated tumour due to the effects of laser light. It also avoided disruption of the ossicular chain and allowed resection to be completed in a relatively bloodless field.

Radiotherapy provides an alternative treatment modality (Konefal *et al.*, 1987) but has been described chiefly for larger irresectable lesions which required substantial radiation doses, typically 4500–5000 cGy. It is clearly beneficial to avoid this if reasonably possible when the lesion is localized.

The patient has a small post-operative perforation; this may actually be fortuitous in allowing better inspection endoscopically of the middle ear cleft to identify any future occurrence. It is intended to close this in due course.

One reported series (Reddy *et al.*, 1983) described a recurrence rate of glomus tumours of up to 50 per cent. This seems very high but their series included many larger tumours than the one treated in our case. While our patient will require long-term follow up, the KTP laser appears to be a very effective treatment for glomus tumours of the middle ear. Its light absorption characteristics and increasing availability may come to make it the first choice of treatment for such lesions.

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