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Radiology in Focus

False-positive MRI in a patient with otoneurological pathology

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Abstract
After a short survey on the diagnostic work-up for acoustic neuroma, the authors underline the importance of magnetic resonance (MRI), enhanced by gadolinium, for otoneurological pathology. Through the presentation of a clinical case, the *pros* and *cons* for the routine application of MRI in suspect cerebellopontine angle (CPA) tumours in particular are reviewed. The possibility of false-positive MRI findings is discussed, although in this specific case a proper therapeutic approach was eventually carried out in order to resolve the associated VIIth nerve disturbance.

Key words: Magnetic resonance imaging; Acoustic schwannoma.

Introduction

New perspectives and trends in the last few years have profoundly changed the diagnostic work-up for VIIIth nerve schwannoma and similar pathologies of the internal auditory canal and cerebellopontine angle (CPA). This is especially true for the timing of the different tests available.

The introduction of magnetic resonance imaging (MRI) enhanced with the infusion of a paramagnetic medium, such as gadolinium, has played a crucial role in the diagnosis, leading to a drastic change of imaging for acoustic schwannoma (Curati *et al.*, 1986; Jackler *et al.*, 1990). Enhanced MRI, in fact, shows up small volumetric modifications of the facial-acoustic bundle (Millen *et al.*, 1989), so that small tumours (1 cm or less) that would be undetected by a CT scan, can be clearly identified. Whether positive or negative, the high sensitivity of this new imaging technique has certainly contributed to the definitive diagnostic assessment.

Whilst a negative MRI is a frequent finding in a large number of patients, it is rather unusual to have a positive MRI in the absence of pathology. In this paper an infrequent otoneurological syndrome is presented and discussed in the light of the modern diagnostic protocol for acoustic schwannoma, for which the therapeutic approach has relied mainly on enhanced MRI findings.

Case report

A 25-year-old man was admitted to the ENT Department of the University Hospital of Rome, presenting with sudden hearing loss in the left ear, associated to a complete VIIth nerve palsy, grade 5/6 according to House and Brackmann (1985). Paraesthesia and headache in the left temporal region were also noted. A previous otoneurological evaluation carried out elsewhere had advised cortisone therapy for one month, without any significant improvement in the neurological signs.

A labyrinthine evaluation carried out in our department showed a left anacusis and severe labyrinthine hyporesponsitivity on the same side. It was not possible to carry out evoked response audiometry due to the low hearing threshold. Electromyography (EMG) displayed the presence of spontaneous electrical potentials (fibrillations) accounting for severe damage of the VIIth nerve, with increased spontaneous firing of polyphasic motor units, and motor nerve conduction velocity of 4.9 msec in latency (normal = 4 msec) and 150 microvolt in amplitude.

A CT scan was negative for a CPA lesion. Because of the high suspicion of a left CPA lesion a MRI scan with gadolinium enhancement was requested. It showed 'a region with increased magnetic contrast within the left IAC, which could be interpreted either as a small intracanalicular VIIIth nerve neuroma, or as a vascular loop (Fig. 1a and b). A translabyrinthine approach was therefore performed, with a negative outcome for space-occupying lesions in the CPA region. The intracranial intrapetrous portion of the VIIth nerve was found to be hyperaemic and oedematous, and was therefore decompressed up to the geniculate ganglion area.

The post-operative progress was normal, with gradual improvement in the VIIth nerve function which, three months after the operation, reached grade 2/6.

Discussion

The application of a complete series of audiological tests has contributed greatly to more frequent identification of patients affected by acoustic schwannoma in the otological area, whereas in the past they were considered exclusively neurosurgical cases. The routine use of a battery of tests predictive of hearing impairment of neural origin has, in fact, allowed a large number to be diagnosed at an early stage (Musiek *et al.*, 1983). At the same time, the wide application of these tests has shown that some of them were not as sensitive and specific as was believed. This is the case for pure tone audiometry (Portmann *et al.*, 1989), subjective tests for recruitment (Pfaltz *et al.*, 1991) and stapedius reflex testing (Gilain *et al.*, 1991), not always been in agreement with the expected findings. Nowadays it is well established that both evoked response audiometry (ERA) and electrocochleography play a significant role in diagnostic testing for acoustic

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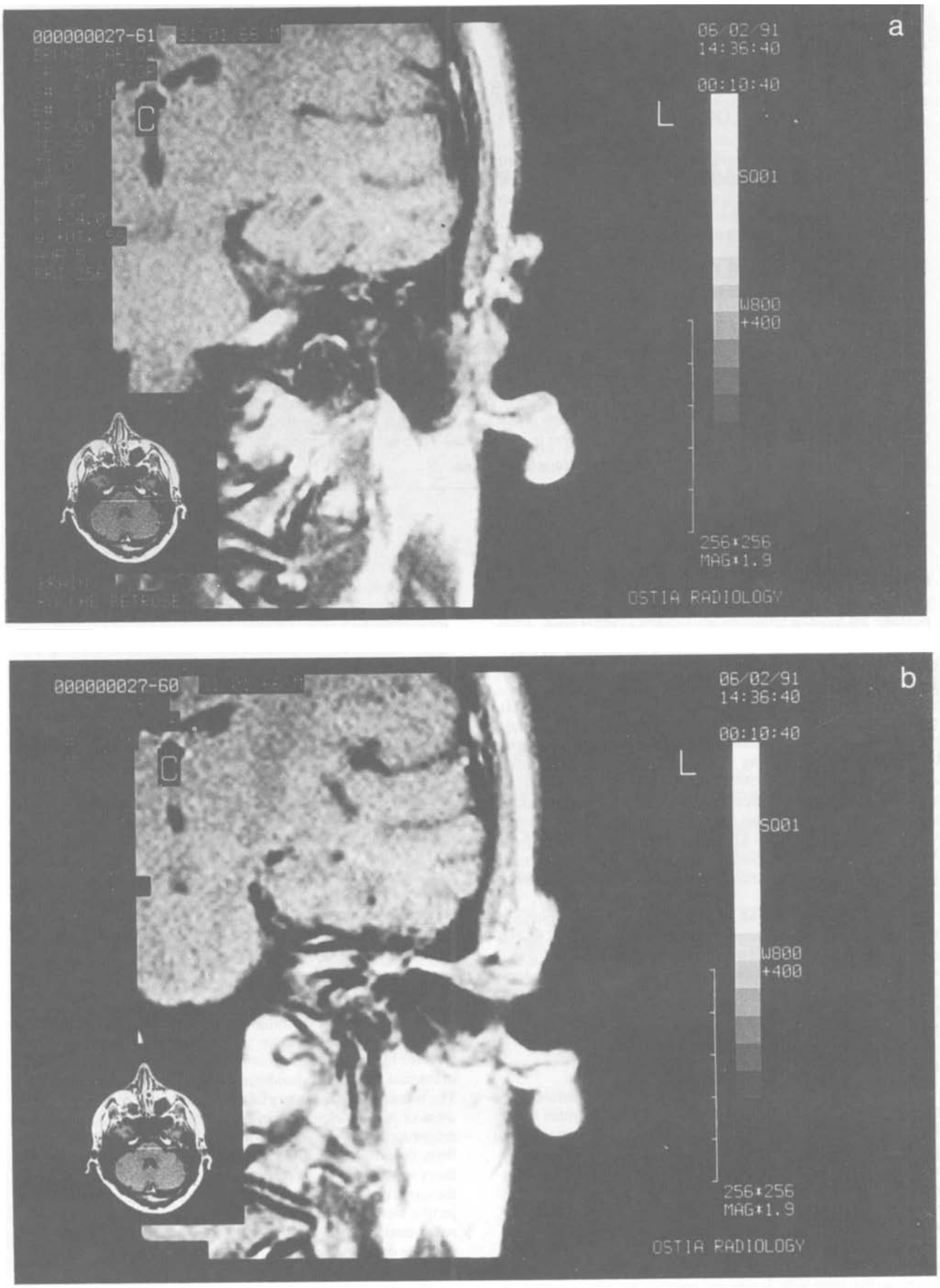

FIG. 1

Magnetic resonance contrast-enhanced with gadolinium showing a positive reaction within the level of the cerebellopontine angle (a) and the internal auditory canal (b).

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schwannoma, giving important clues for its detection (Portmann *et al.*, 1989; Gilain *et al.*, 1991) and size (Haralampiev and Ribaric, 1991). However, in several cases, such as the one presented in this paper, these tests are less reliable or cannot even be performed, owing to technical problems, i.e. hearing threshold profound or absent.

In such cases, the diagnosis has to rely on imaging techniques which, as already mentioned, have undergone striking changes in the last decade. Whilst traditional tomography has been replaced by CT scanning as a routine radiographic procedure, both of them are nowadays superseded by the accuracy of information guaranteed by MRI. Despite the high cost, which restricts its routine application, MRI is often requested whenever there is even a slight suspicion of an acoustic schwannoma. By using this technique, such a tumour can be identified at an early stage, thus allowing different therapeutic options. In fact, while the presence of a small schwannoma represents a clue for its surgical removal, due to the greater possibilities for functional preservation, e.g. hearing and facial nerves (Shelton and Hitselberger, 1991), some of these patients, aged or with poor general conditions, are not likely to undergo immediate surgery. In such cases, if the size of the tumour does not affect vital functions, periodic MRI can be placed in order to check on tumour growth.

The wide use of gadolinium-enhanced MRI has shown the possibility of a large number of false-positive patients, either at the first sitting or during planned post-operative controls of radical surgery. Different components can be positively contrasted by gadolinium within the IAC, such as the cochlear nerve in conservative surgery, dural lining, fat tissue from adjacent bone marrow or as obliterative material (Jackler *et al.*, 1990).

Also some VIIth nerve pathologies can account for false-positive findings and may generate diagnostic difficulties in the presence of other significant signs. The case presented in this paper proved to be related to this matter, although VIIth nerve paralysis had to be considered a secondary sign of a complex cochleo-vestibular syndrome. The assessment of labyrinthine functions strongly supported the hypothesis of a CPA or IAC space-occupying mass (schwannoma or meningioma), but, contrary to VIIth nerve schwannoma, pseudo-tumoural masses (Yanagihara *et al.*, 1991) and Bell's palsy (Millen *et al.*, 1989), Herpes Zoster oticus could not be ruled out (Anderson and Laskoff, 1990; Davey *et al.*, 1991, unpublished results), even though vesicular lesions in the conchal region were missing.

From a therapeutic point of view, it has been reasonable to perform a translabyrinthine approach to the CPA region in our patient, due to the absence of a hearing threshold in the affected ear and the suspicion of a mass within the IAC.

In conclusion, MRI has to be considered a landmark in the diagnostic work-up for acoustic schwannoma, especially when audiological tests indicate the possible presence of neural hearing pathology. However, there are various clinical situations for which MRI could be necessary even when audiological tests are negative or, as in our case, impossible to perform.

Taking into account the data derived from the literature, enriched with personal clinical experience, this will allow more and more precise diagnosis and, consequently, appropriate therapeutic approaches.

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