Magnetic Resonance Imaging of Jugular Foramen Neurinomas

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Summary

Four cases of jugular foramen neurinoma, extending from the posterior fossa into the temporal bone through the jugular foramen, are reported. The information provided by magnetic resonance imaging was compared with that by computed tomography. Due to the excellent sensitivity, the absence of bone artifacts, and the ease of imaging in any plane, magnetic resonance imaging gave better information particularly about the location of the tumour than X-CT scan did. It included the dumb-bell-shaped tumour through the jugular foramen, the extra-axial nature of the tumour, and the precise anatomical relationships between the tumour and the facial and acoustic nerves or the internal carotid artery. Sagittal and coronal views clearly demonstrated the superior and inferior margins of the tumour. The information is very useful not only for preoperative diagnosis but also for planning the surgical approaches and postoperative follow-up.

Keywords: Jugular foramen neurinoma; magnetic resonance imaging; computed tomography; surgical anatomy.

Introduction

Neurinomas originating from the cranial nerves of the jugular foramen, so-called jugular foramen neurinomas (JFNs), are rare1, 3, 6, 13, 18. After the advent of CT scanning, determination of the presence of tumours in the posterior fossa has become easy. However, with only conventional CT scanning, the differentiation of an extra-axial tumour from an intra-axial one is sometimes impossible10, 16. Furthermore, an accurate diagnosis of the location of the tumour cannot be made because of the bony artifacts of X-CT scan. With magnetic resonance imaging (MRI), it seems to be possible to reveal specific lesion characteristics of the JFN, making preoperative diagnosis more accurate without bone artifacts. Some different surgical approaches to JFNs have been reported4, 5, 6, 9. Accurate information about the location and size of the tumours seems very important in selecting an adequate surgical approach.

We had an opportunity to treat four cases of JFN using MRI studies. The characteristic MRI findings of JFN are reported.

Materials and Methods

Four patients with JFN were studied with MRI and CT scanings. Two of the 4 patients (Case 1, Case 4) were preoperatively examined, and the other 2 (Case 2, Case 3) were examined 4 years and 4 1/2 years after the first operation, respectively.

MRI studies in three cases (Cases 1, 2, 3) were performed using a 1.5-T superconducting Signa unit (General Electric, Milwaukie). After obtaining a multislice intermediate-weighted spin-echo (SE) sequence with a 2,000-msec repetition (TR) and a 20-msec echo time (TE), (SE 2,000/20), and a multislice T2-weighted SE sequence with TR 2,000 and TE 80 (SE 2,000/80) in the axial plane, a multislice T1-weighted SE sequence with TR 400 or 600 and TE 25 (SE 600/25) or a multislice inversion-recovery (IR) pulse sequence with TR 1,500, inversion time (TI) 600 and TE 20 (IR 1,500/600/20) was obtained in both sagittal and coronal projections. An image acquisition matrix of 256 × 256 was used with a slice thickness of 5 mm. Number of excitation was 2. The remaining one case (Case 4) was examined using a 0.15-T resistive unit (Toshiba MRI-15 A).

Table 1. Clinical Manifestations of Four Cases of JFN

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age</th>
<th>Nerve origin</th>
<th>Chief complaint</th>
<th>Cranial nerve involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67</td>
<td>XI</td>
<td>hoarseness</td>
<td>VIII, IX, X, XI, XII</td>
</tr>
<tr>
<td>2</td>
<td>42</td>
<td>IX</td>
<td>swallowing disturbance</td>
<td>V, VII, VIII</td>
</tr>
<tr>
<td>3</td>
<td>57</td>
<td>IX</td>
<td>tinnitus</td>
<td>IX, X, XII</td>
</tr>
<tr>
<td>4</td>
<td>63</td>
<td>IX</td>
<td>tongue atrophy</td>
<td>VIII, IX, X, XI</td>
</tr>
</tbody>
</table>
Case Reports

Clinical manifestations of the four cases of JFN are summarized in Table 1.

Case 1: Neurinoma originating from the right 11th cranial nerve. A 67-year-old man was admitted on April 22, 1987 because of hoarse voice and swallowing difficulty. Precontrast CT scans demonstrated an isodense mass extending from the right cerebellopontine (CP) angle to the temporal bone through the jugular foramen. In postcontrast CT scans it was heterogeneously enhanced with low density components. Bone target CT scans revealed an enlargement of the right jugular foramen and marked destruction of the temporal bone. MRI confirmed an extra-axial posterior fossa mass with a huge extracranial mass extension into the temporal bone (Fig. 1A, B, C). Both the extra- and intracranial portions were connected through the jugular foramen and showed the hourglass appearance (Fig. 2). T1-weighted images (WI) clarified a tumour from the surrounding neural structures. In T2-WI the tumour was a hyperintense mass, and particularly the extracranial component of the tumour was clearly visualized (Fig. 1C). The facial and acoustic nerves inside the internal auditory canal were also seen and they were normal in size (Fig. 1A). The preoperative diagnosis was JFN, and surgery confirmed that the tumour was a neurinoma originating from the accessory nerve. The combined approach of suboccipital craniectomy and infralabyrinthine approach through mastoidectomy was selected because of a large extracranial component of the tumour. The intracranial component of the tumour was totally resected and the extracranial component was subtotally removed because the extra-