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Radiologic Characteristics in a Case of Facial Nerve with Multisegment Involvement

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A 47-year-old female patient presented with an acute onset of facial palsy and otitis media on the left side. Temporal bone CT scans revealed an irregularly shaped lesion in the middle ear cavity extending into the mastoid air cells. MRI images confirmed intra- and extra-temporal involvement of the facial nerve schwannoma. The correlation of distinct imaging findings of the facial nerve schwannoma along the course of the facial nerve and anatomical features of the temporal bone is discussed. Korean J Otorhinolaryngol-Head Neck Surg 2013;56:48-52

Key Words Facial nerve · MRI · Schwannoma.

Introduction

Facial nerve schwannomas are rare benign neoplasms that originate from Schwann cells at any point along the course of the facial nerve. Only few studies have reviewed the natural course of the facial nerve schwannomas.[1,2] The tumor is usually very slow-growing, and the growth rate was estimated as 0.7–2.6 mm/year.[1] Clinically, the patients may present with wide range of facial dysfunction, ranging from asymptomatic to total facial palsy.[3] Other possible symptoms include hearing loss, vestibular dysfunction or palpable parotid mass, depending on the size and location of the tumor.

Implementation of high resolution magnetic resonance (MR) imaging with gadolinium enhancement has enabled detailed examination along the whole length of facial nerve, and multisegment involvement has been highlighted as a distinct feature of the facial nerve schwannomas.[4] Computed tomography (CT) studies and MR imaging play pivotal roles in evaluating the extent of the benign tumor. Although surgical exploration and pathologic evaluation confirms the disease ex-tent, expectant management is a feasible treatment option and the timing of surgical intervention remains to be individualized to each patient.[2] Thus, information provided by imaging studies is crucial for optimal treatment planning.

We report a case of facial nerve schwannoma that involves multiple segments along the nerve from the internal auditory canal to intra- and extra-temporal portions. CT and MR studies have demonstrated distinct features of the disease in different segments of the involved facial nerve.

Case

A 47-year-old female patient was referred to our department for acute onset of facial palsy and otitis media on the left side. Initial complaint of left sided otalgia prompted her initial visit to another hospital three days prior. Three days later, peripheral type facial nerve palsy of House-Brackmann (HB) grade III had developed on the same side and the left tympanic membrane was reported to show a bulging appearance. Under the initial diagnosis of complicated acute otitis media with facial nerve palsy, myringotomy was performed to reveal only minimal effusion. Since acute infection was considered less probable cause, the patient was referred to our hospital. The patient presented with slight aggravation of left sided facial nerve palsy of HB grade IV. Electroneuronography revealed left sided facial palsy of 69.6% degeneration ratio compared to the right. Pure tone audiogram revealed conductive hearing loss of 60 dB HL. Temporal bone CT scans revealed soft tissue density filling the middle ear cavity and mastoid air cells (Fig. 1). The labyrinthine segment of the facial nerve canal appeared widened (Fig. 1A). The epitympanic space was widened and ossicles appeared to be pushed laterally and the geniculate fossa showed bulbous enlargement filled with the soft tissue density (Fig. 1B, C and D). Bony septa of the mastoid air cells appeared destructed and the cavity was filled with soft tissue density that extended from the middle ear cavity (Fig. 1E-H). As tumorous condition along the facial nerve course was suspected, temporal MR imaging with gadolinium enhancement was performed for further evaluation. T2-weighted axial images identified a homogenous lesion of expansile nature extending from geniculate ganglion (Fig. 2A) to tympanic cavity and mastoid air cells (Fig. 2B, C and D). The extratemporal portion of the tumor in the parotid gland appeared benign-looking with a round

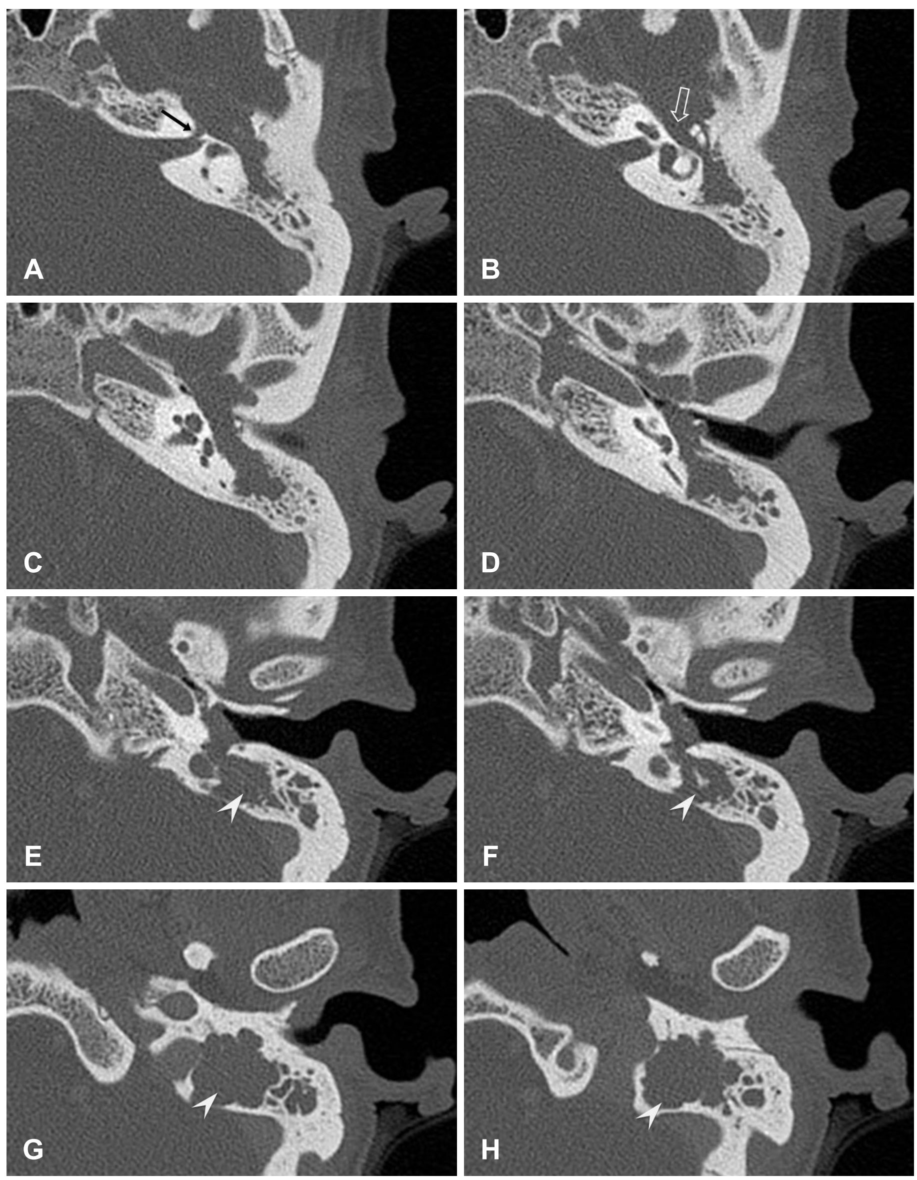

Fig. 1. Axial temporal bone CT scans show soft tissue density extending from labyrinthine portion to tympanic to mastoid portion of the facial nerve canal. The labyrinthine segment (black arrow) of the facial nerve canal appeared widened (A). The epitympanic space (empty arrow) was widened and ossicles appeared to be pushed laterally and the geniculate fossa showed bulbous enlargement filled with the soft tissue density (B, C and D). Bony septa of the mastoid air cells appeared destructed and the cavity was filled with soft tissue density that extended from the middle ear cavity (arrowheads)(E-H).

shape, smooth margins and homogenous enhancement (Fig. 2E). Axial T1-weighted post contrast-enhanced images showed homogenous enhancement of the distal portion of the intracanalicular and labyrinthine segment as well as the well enhanced lesion causing the bulbous enlargement of the geniculate fossa of the facial nerve (Fig. 2F). The homogenously en-

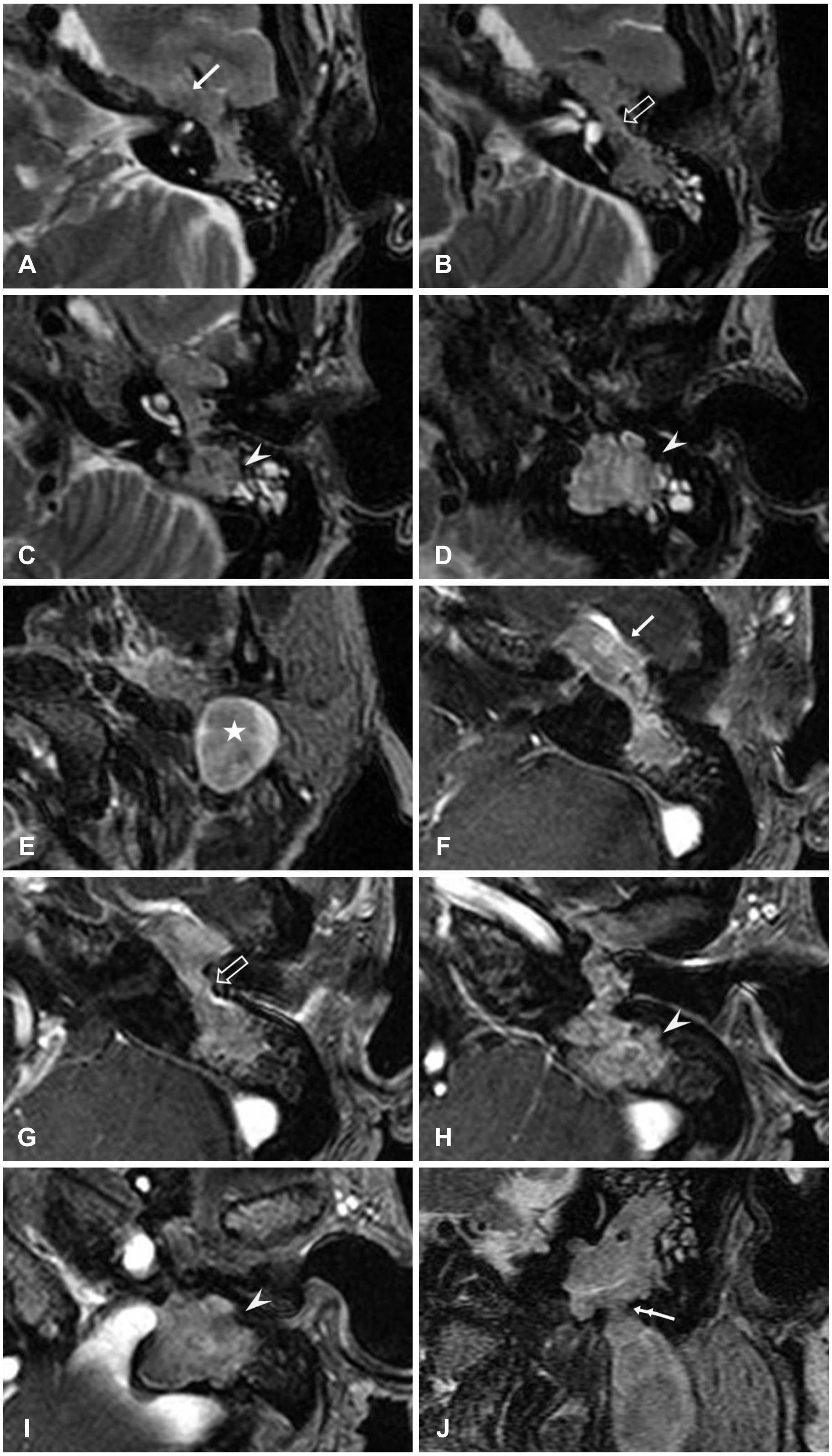

Fig. 2. T2-weighted axial images show an expansile homogenous lesion extending from geniculate ganglion (filled arrow)(A) to tympanic (empty arrow) and mastoid (arrow heads) portions of the facial nerve (B, C and D). The extratemporal portion of the tumor (star) appeared benign-looking with a round shape, smooth margins and homogenous enhancement (E). T1-weighted post contrast enhanced axial images showed homogenous enhancement of the distal portion of the intracanalicular and labyrinthine segment and the bulbous enlargement (filled arrow) of the geniculate fossa of the facial nerve (F). The tumor extended along the tympanic segment (empty arrow) of the facial nerve filling the middle ear cavity (G). The tumor in the mastoid segment (arrow heads) appeared multilobulated with irregular margins, mimicking tumor invasion (H and I). A T2-weighted coronal image shows the continuity of the intra- and extratemporal portions of the facial nerve tumor through the stylomastoid foramen (double-headed arrow)(J).

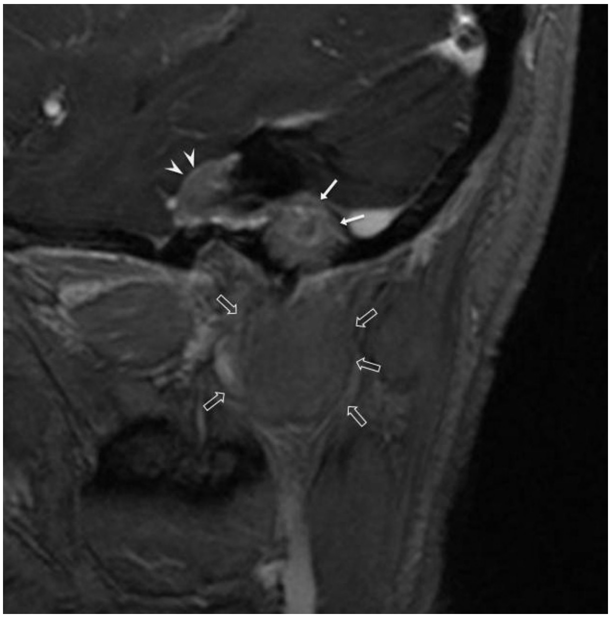

Fig. 3. A reconstructed parasagittal post contrast enhanced image (perpendicular to the internal auditory canal and parallel to the axis of tympanic facial nerve) demonstrates the contiguous involvement of the facial nerve along its course; geniculate fossa (white arrow heads), mastoid segment (white arrows) and extratemporal segment (empty arrows).

hanced tumor lesion extended along the tympanic segment of the facial nerve filling the middle ear cavity (Fig. 2G). The descending mastoid segment was also involved and the lesion appeared multilobulated with irregular margins, mimicking tumor invasion (Fig. 2H and I). A T2-weighted coronal image shows the continuity of the intra- and extratemporal portions of the facial nerve tumor through the stylomastoid foramen (Fig. 2J). The continuous extension of the tumor from the labyrinthine, geniculate ganglion, tympanic, mastoid and extratemporal segment could be traced from these images. In addition, a parasagittal post contrast enhanced image (perpendicular to the internal auditory canal and parallel to the axis of tympanic facial nerve) was reconstructed to demonstrate the contiguous involvement of the facial nerve along its course from geniculate fossa, mastoid segment to extratemporal segment in the parotid gland (Fig. 3). After oral corticosteroid therapy and conservative care, the patient's facial nerve function recovered partially. Feasibility of surgical excision of the tumor and facial nerve reanimation by hypoglossal nerve graft, or gamma-knife surgery is under consideration.

Discussion

Facial nerve schwannomas can arise from anywhere along the course of the facial nerve from its origin at pontomedullary junction to the intratemporal bony canal to extratemporal branches within the parotid gland.[3,4] Since the clinical picture varies widely according the location and extent of the tumor involvement as well as the size and duration, CT and MR imaging techniques are important diagnostic tools.[5,6] Bone algorithm CT scans are indispensable in identifying numerous diseases involving the temporal bone, and high resolution (HR) CT scans with thinner sections provided detailed images of the temporal bone. Bony canal of the facial nerve traverses through the temporal bone, and its complex anatomy is well visualized in HRCT scans. Subtle enlargement of the labyrinthine segment of the fallopian canal or widened internal auditory canal may signify the presence of facial nerve schwannoma. The physician may be alerted by the presence of soft tissue signal extending from the tympanic segment of the facial nerve into the tympanic cavity or enlargement of the mastoid portion of the bony canal. However, CT scans have their limitations in visualizing abnormality in the soft tissue such as extratemporal facial nerve schwannoma in the parotid gland. Also, small sized tumors may be missed due to minute changes in the bony structures. A recent study has addressed the role of MR imaging in diagnosis of the extent of nerve involvement in facial nerve schwannomas and has shown that multisegment involvement is common.[4] Increased detection of facial nerve schwannomas involving the cerebellar pontine angle and internal auditory canal segments was attributed to post contrast enhanced thin-slice T1 imaging.[4] Detailed examination of the facial nerve schwannomas arising from each segment of the nerve using various MR imaging techniques has shown distinctive characteristics according to the tumor location.[7] By following the course of the facial nerve in our patient's CT scans and MR images, different patterns of tumor growth in the context of surrounding anatomy could be delineated. In the internal auditory canal, contrast enhancement of the facial nerve tumor was visualized in MR images, but CT findings were unremarkable due to the small size of the tumor. Bone algorithm CT scans revealed smooth enlargement of the labyrinthine portion of the facial nerve canal, corresponding to enhancing soft tissue mass lesion filling the canal. Bulbous enlargement with homogenous enhancement in the geniculate fossa was identified in MR images, and erosion of surrounding petrous apex bone was shown in CT scans. In the middle ear, the tumor expanded to fill the tympanic cavity and appeared as a lobulated homogenous lesion in MR images and as soft tissue density pushing ossicles laterally in CT scans. The imaging features of the facial nerve schwannoma in the mastoid air cells were quite different. The tumor mimicked other invasive tumors, appearing as soft tissue density filling the mastoid and destroying bony septa of adjacent air cells in CT scans. The lesion no longer retained the smooth surface; a well-enhanced lesion filling the mastoid bone with irregular margins. The tumor extended through the stylomastoid foramen to form a fusiform lesion in the parotid gland. To our knowledge, such detailed description of imaging characteristics in a single facial nerve schwannoma over the complex course of the facial nerve has not been reported, and we were able to reconstruct a parasagittal image to encompass the geniculate, tympanic, mastoid and extratemporal portion of the facial nerve tumor to demonstrate the characteristic multisegmental involvement.

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