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REVIEW ARTICLE

Imaging Diagnostics: Congenital Malformations and Acquired Lesions of the Inner Ear☆

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Abstract
Introduction: Congenital malformations and acquired lesions of the inner ear are characterised by small structural changes in this region. In recent decades, treatment options have improved considerably. At the same time, there has been a great advancement in diagnostic methods, obtaining high-resolution labyrinth images.

Currently, we use a 64-multislice computed tomography scanner in spiral mode (Brilliance 64 Phillips, Eindhoven, the Netherlands), with an overlap of 0.66 mm and an interval of 0.33 mm, 120 kV and 300 mA. The magnetic resonance images were taken with Signa HDxt 1.5 and 3.0 T units (GE Healthcare, Waukesha, WI, USA).

We reviewed the radiological features of the lesions affecting the inner ear. They are classified as congenital (labyrinth malformation and statoacoustic nerve deficiencies) or acquired (otospongiosis, labyrinthitis, Ménière's disease, inner ear haemorrhage, intralabyrinthine schwannoma and endolymphatic sac tumour).

Conclusion: Magnetic resonance imaging and computed tomography play an essential role in diagnosing patients with inner ear pathology. The technique selected should be chosen depending on the clinical setting. In a generic way, tomography is the method of choice for the study of traumatic pathology or otospongiosis. When tumour or inflammatory pathology is suspected, magnetic resonance is superior. In cases of congenital malformation, both techniques are complementary.

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PALABRAS CLAVE
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Diagnóstico por imagen: malformaciones congénitas y lesiones adquiridas del oído interno

Resumen
Introducción: Las malformaciones congénitas y las lesiones adquiridas del oído interno se caracterizan por pequeños cambios estructurales de esta región. En las últimas décadas, las opciones terapéuticas han mejorado considerablemente, y paralelamente se ha producido un gran avance en los métodos diagnósticos, consiguiendo imágenes de alta resolución del laberinto.

Actualmente se utiliza una tomografía computerizada multicorte de 64 detectores (Brilliance 64 Phillips, Eindhoven, the Netherlands), un espesor de adquisición de 0,66 y un intervalo de 0,33 mm, 120 KV y 300 mA. Las imágenes de resonancia magnética proceden de los equipos Signa HDxt 1.5 y 3.0 T (GE Healthcare, Waukesha, WI, USA).

Se realiza una revisión de las características radiológicas de las lesiones que afectan al oído interno que son clasificadas según su origen en congénitas (malformaciones del laberinto y deficiencias de los nervios estatoacústicos) o adquiridas (otoespongiosis, laberintitis, hemorragia del oído interno, enfermedad de Menière, schwannoma intralaberíntico, tumour del saco endolinfático).

Conclusiones: La resonancia magnética y la tomografía computerizada juegan un papel fundamental en el diagnóstico de pacientes con patología del oído interno. La técnica de elección debe ser escogida en función del escenario clínico. De forma genérica, para el estudio de patología traumática u otoespongiosis la tomografia es el método de elección. Ante sospecha de patología tumoral o inflamatoria la resonancia se muestra superior. Para el estudio de patología malformativa ambas técnicas son complementarias.

Introduction

Congenital malformations and acquired lesions of the inner ear (IE) are characterised by small structural changes. Treatment options in this specific region have improved considerably in recent decades. At the same time, there has been great advancement in diagnostic methods, and it is currently possible to obtain high-resolution images of the labyrinth and the statoacoustic nerves.

Computed tomography (CT) and magnetic resonance (MR) imaging of the temporal bone enable excellent anatomical definition of the inner ear and are used in daily practice to study its pathology. Computed tomography is the method of choice for studying the bony structures of the ear, whereas magnetic resonance imaging provides images of both the membranous labyrinth and the cranial nerves.

With the aid of both diagnostic techniques, the radiologist can provide referring ENT specialists with the necessary information to enable a correct treatment approach. We consider that interdisciplinary collaboration is necessary and that all parties should have extensive knowledge of disorders of the inner ear and their diagnosis through imaging.

In this article, we shall describe and illustrate the radiological characteristics of the most common congenital and acquired diseases of the IE, showing the keys to correctly interpreting them on radiological images.

Technique

In general CT images were taken with a thickness of 0.625–1 mm, and reconstructed using a bone algorithm. Currently, we use a 64-multislice CT scanner (Brilliance 64 Phillips, Eindhoven, the Netherlands), with an overlap of 0.66 mm and an interval of 0.33 mm, 120 kV and 300 mA. The magnetic resonance images were taken with Signa HDxt 1.5 and 3.0 T (GE Healthcare, Waukesha, WI, USA).

Radiological Characteristics

The lesions found were classified according to their origin as congenital (labyrinth malformation and statoacoustic nerve deficiencies) or acquired (otospongiosis, labyrinthitis, Ménière's disease, intralabyrinthine schwannoma and endolymphatic sac tumour).

Congenital Malformations of the Inner Ear

Congenital malformations are defined as variations in the normal anatomical development of the inner ear, which result in functional disorders of the inner ear. The bony labyrinth develops between the fourth and eighth weeks of gestation; from the eighth week, it grows and ossifies. The structural malformations which can be diagnosed using radiological imaging of the inner ear are due to defects forming between the fourth and eighth weeks, whereas subsequent lesions affect the sensory epithelium and cannot be imaged. This is why in long-time series studies only 20% of patients with congenital hearing loss have malformations which are visible radiologically.[1]