



ORIGINAL ARTICLE

# Role of high resolution multislice CT scan in otosclerosis



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## KEYWORDS

Otosclerosis;  
Computed tomography;  
Multislice;  
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Cochlear otosclerosis

**Abstract** This prospective study was carried out to assess the radiological findings in patients with otosclerosis using high resolution multislice CT scan and to correlate these findings with audiological findings in those patients. This study was done at Al Azhar University hospitals during the period from Jan 2012 to Jun 2014. Thirty-two patients were enrolled in this study; 13 (40.63%) males and 19 (59.37%) females. Their age ranged from 13 to 55 with a mean of  $36.21 \pm 8.7$  years. Written consent was taken from all patients. Multislice CT scan was done to all patients and reports were done by computer assisted analysis with thorough audiological assessment including pure tone audiometry, tympanometry and stapedial reflex. Positive findings were present in 40/58 ears (69%) while negative findings were present in 18/58 ears (31%). Otosclerotic foci were more detected when slice thickness was lesser than one millimeter especially at fissula ante fenestrum and round window region. There was a good correlation between air bone gap and CT score ( $p = 0.002$ ). High resolution multislice CT helps in the diagnosis of otosclerosis with sensitivity (69%) and it aids in the diagnosis of doubtful cases. Otosclerosis has a special predilection to affect certain sites mainly the fissula ante fenestrum followed by the round window and the cochlear promontory.

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## 1. Introduction

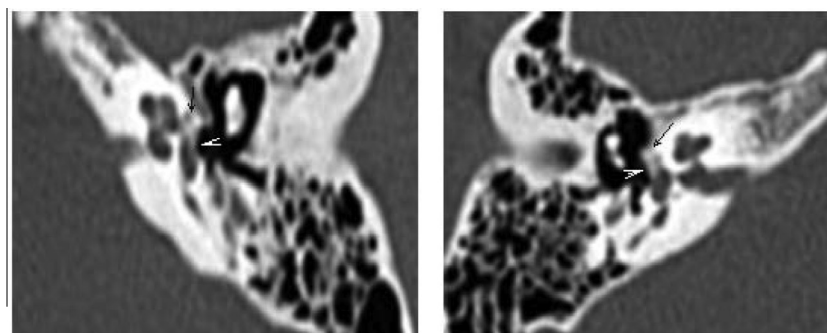
Otosclerosis is a primary focal osteodystrophy of the human otic capsule with an initial clinical manifestation of slowly progressive conductive or mixed hearing loss, tinnitus and

vestibular symptoms. As the disease progresses, inner ear symptoms, such as sensorineural hearing loss and tinnitus may manifest themselves constituting a dynamic clinical feature. Due to the close anatomic relationship between the vestibule and the stapes footplate, vertiginous symptoms can occur in patients with otosclerosis.<sup>12</sup>

With the introduction of the high-resolution temporal bone computed tomography, it may aid in the diagnosis of otosclerosis before surgical exploration. It provides visualization of

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a. Large focal otosclerotic hypodensity in fissula ante fenestrum of the L ear 'black arrow' with thickening of the anterior footplate 'white arrow head'.

b. Large focal otosclerotic hypodensity in fissula ante fenestrum of the R ear 'black arrow' with thickening of the anterior footplate 'white arrow head'.

**Figure 1** Otosclerotic foci in FAF.

bony demineralization as hypodense or radiolucent lesions at the fissula ante fenestrum and cochlear otic capsule. The hypodense lesions are related to the active spongiotic lesions. Inactive otosclerotic lesions may have the same density as the surrounding bones.<sup>16</sup>

Preoperative high resolution CT (HRCT) helps to allow the positive diagnosis of otosclerosis, foresee anatomic difficulties (i.e. narrow oval window, facial dehiscence) and look for other associated diagnosis (i.e. malleolus fixation, ossicular malformation), identify a risk of mobilized stapes footplate in cases of negative or doubtful images, and inform patients of the possible risk of postoperative sensorineural hearing loss in cases of pericochlear, internal auditory canal, or round window involvement.<sup>11</sup>

Marshall et al.<sup>13</sup> have published a CT grading system for otosclerosis: grade 1, solely fenestral, either spongiotic or sclerotic lesions, evident as a thickened staped footplate, and/or decalcified, narrowed, or enlarged round or oval windows; grade 2, patchy localized cochlear disease (with or without fenestral involvement) to either the basal cochlear turn (grade 2A), or the middle/apical turns (grade 2B), or both the basal turn and the middle/apical turns (grade 2C); and grade 3, diffuse confluent cochlear involvement of the otic capsule (with or without fenestral involvement). Grade 3 is differentiated from grade 2C by the diffuse confluent involvement in grade 3 of the entire cochlea, whereas grade 2C has patchy focal involvement of the entire cochlea (see Fig. 1).

This study was carried out to assess radiological findings in patients with otosclerosis using high-resolution multislice CT scan and to correlate the radiological findings with the audiological findings in patients with otosclerosis, and to study the role of high-resolution multislice CT scan in preoperative assessment of patients with otosclerosis regarding the anatomical and pathological reconsiderations (see Fig. 2).

## 2. Patients and methods

This prospective study was done at the Alazhar University hospital between Jan 2012 and Jan 2015. This study was carried out on 32 patients complaining of conductive hearing loss and SNHL diagnosed clinically and audiological as otosclerosis. Their age ranged from 18 to 55 years with a mean of  $36.21 \pm 8.7$  years. There were 13 males (40.63%) and 19 females (59.37%). Written consent was taken from all patients. Patients who underwent surgical intervention before the study for correction of conductive deafness in the examined ear will be excluded (see Fig. 3).

All the patients included in the study were subjected to:

1. Full general history taking (especially family history): including personal history, complaints, history of present illness, especially symptom of hearing affection with special concern about the onset of hearing affection and its progression and family history including all relatives affected with the same condition especially those affected at young age.
2. General examination: with special emphasis to exclude patients with congenital syndromes that may affect hearing.
3. Complete otolaryngologic, head and neck examination: to exclude other causes of conductive hearing loss, including: otoscopic examination and tuning fork tests.
4. Full audiological assessment at the time of diagnosis including pure tone audiometry, tympanometry and stapedial reflex.

According to the committee of hearing and equilibrium of the American academy of otolaryngology-head and neck: to include the hearing thresholds at 0.5, 1, 2 and 3 kHz in a 4-frequency pure tone average (PTA) (committee on Hearing and Equilibrium, 1995), in practical terms it probably does

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