Labyrinthitis ossificans: the earlier diagnosed, the better outcome.

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Section: Head & neck imaging
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Imaging Technique: CT
Imaging Technique: MR
Case Type: Clinical Cases
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Patient: 45 years, male

Clinical History:

A 45-year-old man presenting with a 2-month history of sudden onset of hearing loss in the left ear, non-pulsatile tinnitus and vertiginous episode, with residual instability. No other accompanying otological symptoms. Previous bilateral stapedectomy, secondary to otosclerosis.

Imaging Findings:

The temporal bone dedicated CT scan demonstrated an increased density within the left semicircular canals, and less markedly in the cochlea. A comparative image with the right inner ear, which was normal, is shown (Fig. 1).

The brain MRI showed lack of normal high signal of fluid within the left membranous labyrinth on heavily T2 weighted images, with partial visualization of the vestibule and total absence of visualization of the cochlea and semicircular canals. After paramagnetic intravenous contrast administration, enhancement of the left cochlea and semicircular canals was seen (Fig. 2).

Discussion:

Labyrinthitis ossificans is a pathologic process secondary to inner ear inflammation, in which the membranous labyrinth ends up ossifying [1]. Multiples etiologies have been related to this disease like meningitis, chronic otitis, inflammatory/autoimmune disorders, hematologic conditions (sickle cell disease), posttraumatic or surgical (labyrinthectomy, stapedectomy) [2, 3].

The pathogenesis starts with an initial inflammatory stage, with the presence of leukocytes in the perilymphatic spaces, secondary to a primary insult. Later, a serofibrinous exudate leads to proliferation of fibroblasts, the fibrous stage. Finally, in the ossification stage, the fibroblasts differentiate into osteoblasts, with the formation of osteoid matrix within the labyrinthine spaces [2, 3]. The entire process may last for months or years.

Clinically, patients present progressive sensorineural hearing loss [1, 3]. The early identification of labyrinthitis ossificans is important for hearing preservation. Ossification of the cochlea could hinder, or even make impossible, the cochlear implant placement [1].
Nonenhanced CT is useful in the ossification stage, finding an increased density within the semicircular canals and cochlea. The location of mineralization within the labyrinth may be helpful for the otologist, indicating the electrode-device selection, cochlear electrode implantation technique, and additional procedural changes [1, 3].

MRI can play a crucial role in the early diagnosis of labyrinthitis ossificans (acute and fibrosis stages), identifying an inflammatory pattern in heavily T2-weighted sequences, which demonstrate decreased signal intensity, and in postcontrast T1-weighted sequences, showing inner ear enhancement [3].

The only treatment of labyrinthitis ossificans is the cochlear implant, requiring an early diagnosis which allows its implantation. Moreover, the knowledge of the location and degree of ossification is important for preoperative patient counselling and postoperative patient training [1, 3].

Take home message: the early diagnosis of labyrinthitis ossificans is essential for a prompt treatment with cochlear implant.

**Differential Diagnosis List:** Labyrinthitis ossificans, Labyrinthine or cochlear aplasia, Cochlear otosclerosis, Osseous dysplasia, Intralabyrinthine schwannoma, Ossifications in the context of autoimmune diseases of the labyrinth

**Final Diagnosis:** Labyrinthitis ossificans

**References:**


Benson JC, Carlson MT, Lane JI. MRI of the Internal Auditory Canal, Labyrinth, and Middle Ear: How We Do It. Radiology 2020; 00:1-15 (PMID: 32960730)
**Figure 1**

Description: Temporal bone CT scan demonstrating increased density within the left semicircular canals (arrows), comparing to the right side. **Origin:** © Department of Radiology, Clínica Universidad de Navarra, Spain, 2019
Description: Brain MRI SPACE T2-weighted sequence showing lack of signal fluid within the left semicircular canals. Origin: © Department of Radiology, Clínica Universidad de Navarra, Spain, 2019
b

Description: Brain MRI 3D reconstruction of the SPACE T2-weighted sequence evidencing the absolute absence of signal fluid within the left semicircular canals. Origin: © Department of Radiology, Clínica Universidad de Navarra, Spain, 2019

c

Description: Brain MRI T1 weighted sequence with and without contrast, showing an enhancement (arrow) of the left cochlear and semicircular canals. Origin: © Department of Radiology, Clínica Universidad de Navarra, Spain, 2019