

CASE REPORT

Computed tomography findings of labyrinthitis ossificans secondary to meningitis: a case report

Menenjitte bağılı labirentitis ossifikansın bilgisayarlı tomografi bulguları:
Olgu sunumu

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A 26-year-old man was admitted to our hospital with chronic left ear drainage. He had a history of meningitis when he was a child. Computed tomography (CT) of the temporal bone showed complete obliteration of the otic labyrinth by sclerotic tissue. Based on CT findings, the patient was diagnosed as labyrinthitis ossificans. Computed tomography is an appropriate method of examination for the identification of labyrinthitis ossificans and is of particular importance for evaluation of patients before cochlear implantation.

Key Words: Cochlear diseases/radiography; labyrinthitis/etiology/radiography; meningitis, pneumococcal; ossification, heterotopic/radiography; temporal bone/pathology; tomography, X-ray computed.

Yirmi altı yaşında erkek hasta kronik sol kulak akıntısı ile kliniğimize başvurdu. Öyküsünden çocukluğunda menenjit geçirdiği öğrenildi. Temporal bilgisayarlı tomografi (BT) incelemesinde labirentin sklerotik doku ile oblitere olduğu saptandı. Bilgisayarlı tomografi bulguları ile labirentitis ossifikans tanısı kondu. Bilgisayarlı tomografi görüntüleme, labirentitis ossifikans tanısında uygun bir yöntemdir; aynı zamanda özellikle koklear implantasyon ameliyatı öncesi hastaların değerlendirilmesinde önemlidir.

Anahtar Sözcükler: Koklear hastalık/radyografi; labirentitis/etioloji/radyografi; menenjit, pnömokokal; osifikasyon, heterotopik/radyografi; temporal kemik/patoloji; bilgisayarlı tomografi.

Labyrinthitis ossificans is the pathologic ossification of spaces in the membranous labyrinth that occurs as a response to a destructive process like bacterial meningitis, vascular occlusion, otosclerosis and trauma.^[1-4] The significance of cochlear ossification has increased over the last two decades with the development of the cochlear implantation.^[1] It was first recognized in the late 1800 s.^[1,3] In the past, the diagnosis was only histologically, but today, radiological imaging especially computed tomography

(CT) is essential.^[2] In this report, we evaluated and discussed the CT findings of a 26-year-old man with labyrinthitis ossificans.

CASE REPORT

A 26-year-old man complained of the left ear drainage. He had a history of meningitis, when he was two years old. Then he has had left ear drainage intermittently up to now. Ear-nose-throat examination revealed that left tympanic membrane was per-

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forated subtotally, and also a purulent drainage was present. His neurological examination was normal. CT examination of the temporal bone revealed increased density of the left cochlea due to ossification, granulation tissue within the left middle ear. The cochlea, vestibule and semicircular channels were completely obliterated by the sclerotic tissue (Fig. 1a, b and 2). The internal auditory canal thickness bilaterally was within normal limits. Inner ear structures and the middle ear cavity on the contralateral side were normal (Fig. 3). There was also obliteration of left mastoid cells consistent with chronic mastoiditis (Fig. 1). Patient was diagnosed as labyrinthitis ossificans with these CT findings.

DISCUSSION

Labyrinthitis ossificans is a progressive fibrosis and ossification of granulation tissue within labyrinth that results unilateral or bilateral profound deafness.^[1,5] Inflammation usually occurs in perilymphatic spaces. Endolymphatic spaces are relatively spared.^[6] Fibrosis and ossification within the cochlea firstly develop in the scala tympani of the basal turn adjacent to the round window.^[1,2] According to an animal experiment after onset of meningitis, fibrosis occurs as early as 2 weeks, and within 2 months, a new bone formation follows fibrosis.^[7] Continuing ossification has been observed as late as 30 years.^[8] Trauma, otosclerosis and viral infections are the other causes of labyrinthitis ossificans. The most

common cause is the bacterial infection of the inner ear (suppurative labyrinthitis).^[2] 21% of cases over the age of 2.5 years who are alive after meningitis have a sensorineural hearing loss and of these cases have total hearing loss.^[9] Persistent hearing loss was found in 14.9% in Turkey.^[10] According to the kinds of the bacterial agents causing meningitis, the incidence of hearing loss and ossification can change. *Streptococcus pneumoniae* infection produces the greatest degree of ossification after suppurative labyrinthitis and with *S. pneumoniae* incidence of hearing loss is greater than with other infecting organism.^[1]

Paparella and Sugiura^[3] divided the development of labyrinthitis ossificans into three stages: In the initial or acute stage, at first purulence then serofibrinous exudate appears within the perilymphatic spaces; the second stage (fibrous stage) following the fibroblastic proliferation, fibrosis occurs; at the third stage osteoid deposition and osteoneogenesis is seen. The osteoid deposition only occurs where fibrosis is present. Ossification usually signifies that hearing will not return.^[11]

In the acute stage components of bacterial cell wall triggers the host defenses and inflammatory response occurs.^[1] *S. pneumoniae* cell wall teichoic acids are potent activators of alternative complement pathway.^[12] The wall components induce alternative pathway to cascade. An experimental study demon-

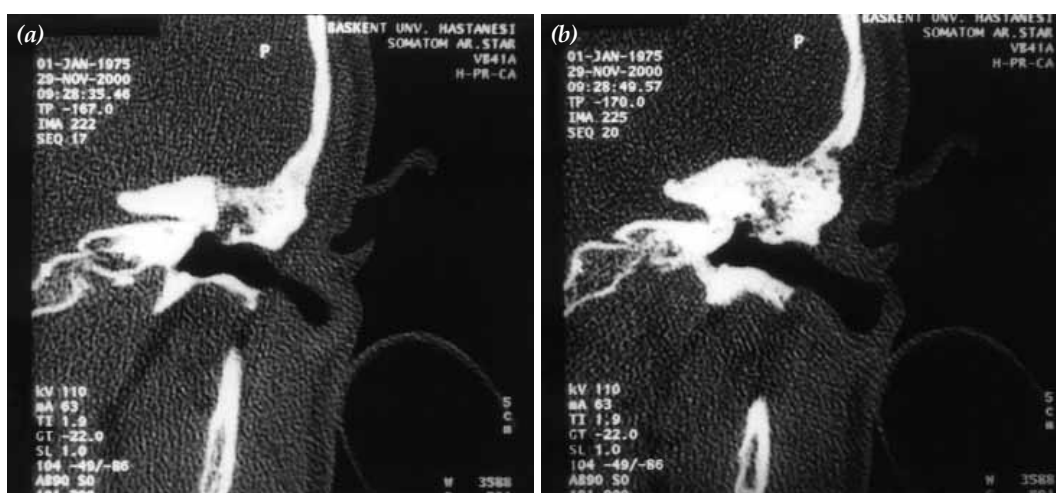


Fig 1 - (a) Coronal non-contrast CT image of the temporal bone with 1 mm thickness shows granulation tissue in middle ear cavity (black arrow) and obliteration of left mastoid cells (white arrow) (b) and increased density of tympanic portion of left temporal bone with obliteration of cochlea, vestibule and semicircular canals (white arrow).

strated that reduction of intense inflammatory response to *S. pneumoniae* cell wall components in suppurative labyrinthitis secondary to bacterial meningitis significantly reduced the amount of fibrosis.^[1]

CT imaging is a favorable examination for labyrinthitis ossificans and is also especially important for patients before the operation of cochlear implantation.^[13] Osseous obliteration or partial ossification of the basal turn may make implantation difficult or impossible. CT images are particularly helpful in determining who is not a good candidate for cochlear implant.^[14] Increased density in the fluid space of cochlea can be seen at CT as soon as 2 months after infection.^[11] CT demonstrates sclerosis, irregularity, or obliteration of the cochlea, vestibule, and/or semicircular canals.^[15] Ossification of the semicircular canals usually precedes the cochlear ossification, so findings in canals should be evaluated very precisely as a sign of cochlear ossification. Despite perfect bony detail, CT has some limitations. In 57% of patients, early ossification and soft tissue abnormalities can not be seen with CT scanning.^[16] Assessment of "indistinct endosteum of the basal turn of the cochlea" is also difficult to differentiate from volume averaging of bone surrounding a small lumen.^[13] The role of magnetic resonance

imaging (MRI) is advancing.^[14] Although early ossification and/or fibrosis of soft tissue abnormalities can not be demonstrated with CT, T2 weighted MRI shows fluid within the cochlea directly and therefore can identify soft-tissue obstruction, but an objection to routine MRI is its cost.^[13] So MRI should be able to use to provide information when abnormalities are undetectable with CT.^[17,18]

In the differential diagnosis congenital aplasia of the inner ear (Michel deformity) is important. In labyrinthitis ossificans, the contour of the labyrinth is preserved. The convexity of bone over the (obliterated) horizontal semicircular canal remains apparent. In a Michel deformity, the horizontal semicircular canal never forms, so this convexity is absent.^[14]

In conclusion labyrinthitis ossificans is the result of pathological neo-ossification within the lumen of otic capsule. Ossification occurs as the final event of the repair process following a destructive process.^[1] CT images have facilitated the diagnosis of labyrinthitis ossificans by demonstrating sclerosis, irregularity, or obliteration of the cochlea, vestibule and/or semicircular canals and would help to identify the suitable ear for implantation.^[13-15]



Fig 2 - Axial CT images of temporal bone at the level of the internal acoustic canal shows dense bone obliterating most of vestibule and semicircular canal (thin arrow) and granulation tissue in the middle ear cavity and mastoid antrum are also noted (thick arrows).



Fig 3 - Coronal non-contrast CT image of the contralateral side shows normal cochlea, semicircular channels and middle ear cavity.

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