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Case Report

Pneumocephalus and Retro-Auricular Trapped Air after Transmastoid Plugging Approach

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Abstract

The transmastoid superior semi-circular canal dehiscence (SCCD) approach is growing in popularity thanks to the fact that otologic surgeons are used to using the transmastoid approach and favourable results are obtained. We present a rare case of post-operative pneumocephalus in a 48-year-old woman who presented with superior semi-circular canal dehiscence on both sides. She also presented a pre-operative breach of the tegmen on the right side. We performed a plugging for this right SSCD by transmastoid approach. The bony tegmen defect was closed using Bone Pâté. The dizziness improved significantly but she continued to suffer from autophony in the opposite left ear. After five months, she presented with a right retro-auricular swelling. This mass increased in size (with Valsalva). The CT scan revealed the presence of an extracranial air mass in the retroauricular region, extending to a large canal wall up (CWU) mastoidectomy cavity. A small pneumocephalus was also visible and caused by a defect via an osteal breach of the tegmen. This post-operative pneumocephalus was probably due to the formation of a mucous veil, functioning as a valve that had formed in the mastoid cavity. This situation can be compared to a pneumothorax. This mucosal veil recurred despite a surgical revision during which the mastoid had been filled with Bone Pâté. Finally, a myringotomy tube placement eliminated this air-filled mass and prevented its fluctuation.

Keywords: Ear surgery, Minimal invasive surgery, Neurotology, Otoneurology, Temporal bone, Vestibular diseases

Introduction

Superior semicircular canal dehiscence (SSCD) was first described in 1998 by Lloyd Minor [1].

This syndrome is characterized by a set of clinical cochlear and vestibular symptoms. The symptomatic SSCD acts like a third window in the inner ear.

High-resolution temporal bone CT-scans, or ideally, Cone Beam CT scans (CBCT) (because of its higher sensitivity) plays a central role in the diagnosis of SSCD [2].

The combination of audiometry, vestibular evoked myogenic potentials (VEMP), and CT scanning allows to diagnose this lesion. In patients with persistent debilitating symptoms, a surgical treatment can be proposed.

The traditional surgical approach is via the middle cranial fossa. But this is associated with a higher morbidity due to the

craniotomy and temporal lobe retraction. During dural elevation, trauma to membranous labyrinth may also lead to sensorineural hearing loss (SNHL). The overall success rate is 94% and the complication rate is low [3].

According to a recent meta-analysis [4], there is no statistically significant difference between middle fossa and transmastoid approach in terms of outcome. The overall success rate is 94%, the complication rate is low.

The differences are the shorter hospital stay for transmastoid surgery, and the possible adverse events associated with craniotomy and retraction of the temporal lobe for the middle fossa approach. It also avoids a stay in an intensive care unit.

Because otologic surgeons are familiar with transmastoid surgery and because of the lower morbidity of this procedure, we prefer the transmastoid approach.

We present a rare case of a post-operative pneumocephalus.

Case Presentation

A 48-year-old woman presented with superior semicircular canal dehiscence on both sides. Initially she suffered from dizziness, disequilibrium, bilateral autophonia, hyperacousis and right hypoacusis.

The CT scan images confirmed the presence of SSCD bilaterally (5.4 mm on the right and 3.5 mm on the left (Figure 1). She also presented a pre-operative osseous defect of the tegmen on the right side. The diagnosis of Minor's syndrome was confirmed by audiometry and VEMP.

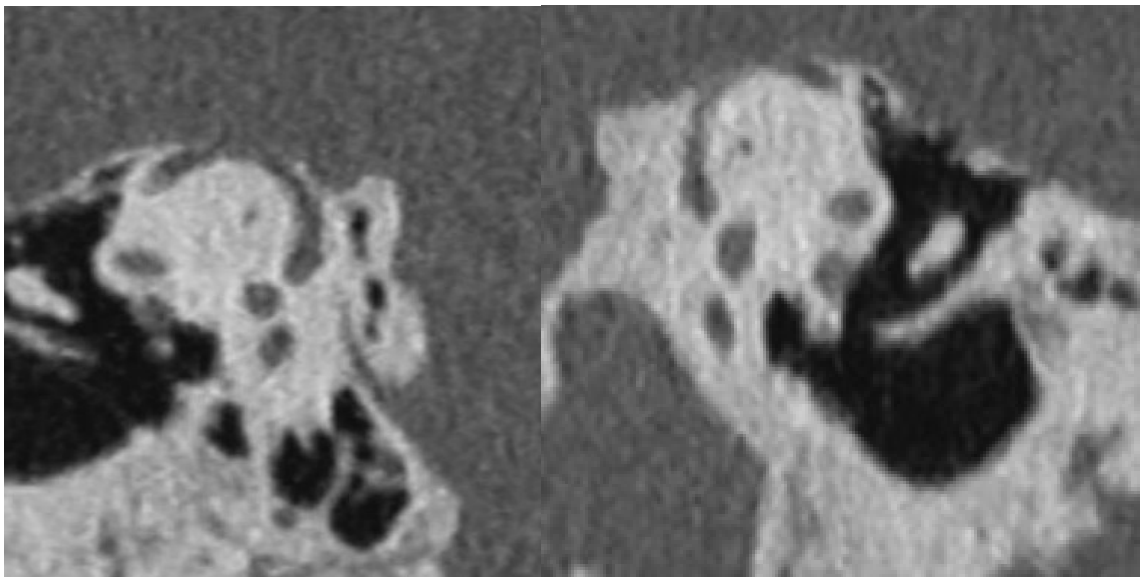

Figure 1: a-b. Cone Beam CT scans (plane of Pöschl): (a) Superior semicircular canal dehiscence on the right ear (b) and on the left ear.

We performed a plugging of the right SSCD by the transmastoid approach. The dura was retracted using bipolar coagulation. The plugging was done using fascia and Bone Pâté (Figure 2). The tegmen defect was closed using Bone Pâté.

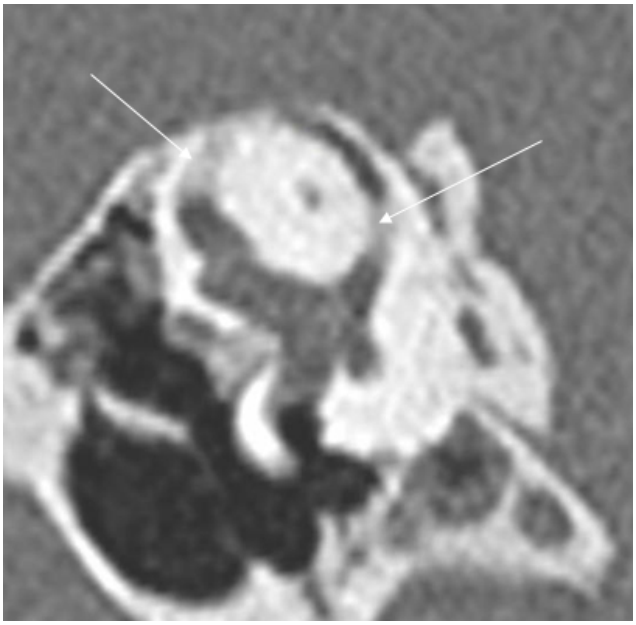

Figure 2: Cone Beam CT scans (plane of Pöschl): post-operative plugging of the superior semicircular canal dehiscence on the right ear (white arrows).

The dizziness improved significantly but she continued to suffer from autophony in the opposite left ear. After five months, she presented with a right retroauricular swelling. This mass increased in size (with Valsalva). The CT scan revealed the presence of an extracranial air mass in the retroauricular region, extending to a large canal wall up (CWU) mastoidectomy cavity (Figure 3). A small pneumocephalus was also visible and caused by a defect via an osteal breach of the tegmen (Figure 4).

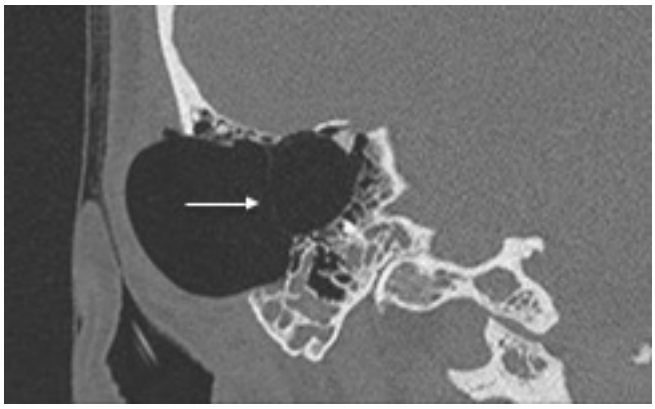

Figure 3: High-resolution temporal bone CT-scan (coronal slice) (right ear): Extracranial air mass in the retro-auricular region which extends a large petrosectomy canal wall up mastoidectomy cavity. The vertical valve-like veil is visible in the middle of the cavity (white arrow).

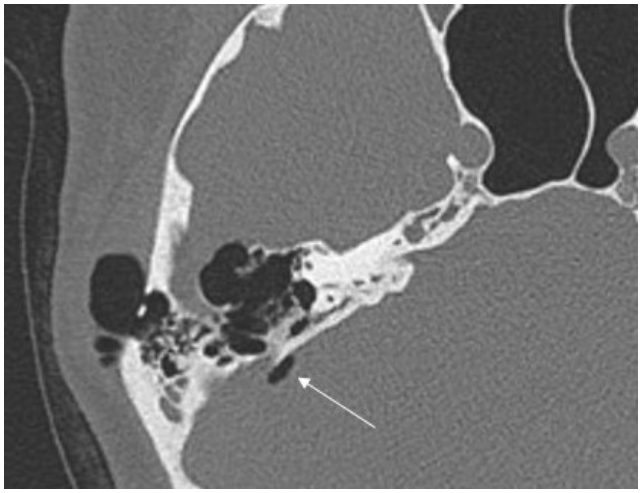

Figure 4: High-resolution temporal bone CT-scan (axial slice) (right ear): pneumocephalus localized at the postero-superior edge of the temporal bone (white arrow).

A reoperation was proposed and when opening the mastoid, we found a mucous veil that had formed in the middle of the mastoid cavity. A valve mechanism seems to be at the origin of the air mass present behind this mucous veil.

This mucosal veil has been removed.

The osteomeningeal breach tegmen defect was also visualized at the level of the tegmen. The mastoid and osseous defect in the tegmen were closed with bone pâté.

As the patient was still symptomatic due to its opposite dehiscence, a plugging of the left SCC was performed at the same time.

A month later, she presented with a recurrence of her retroauricular swelling. A CT scan confirmed the persistence of air in the retroauricular area, pushing the pinna forward but no intracranial air could be seen any more (Figure 5).

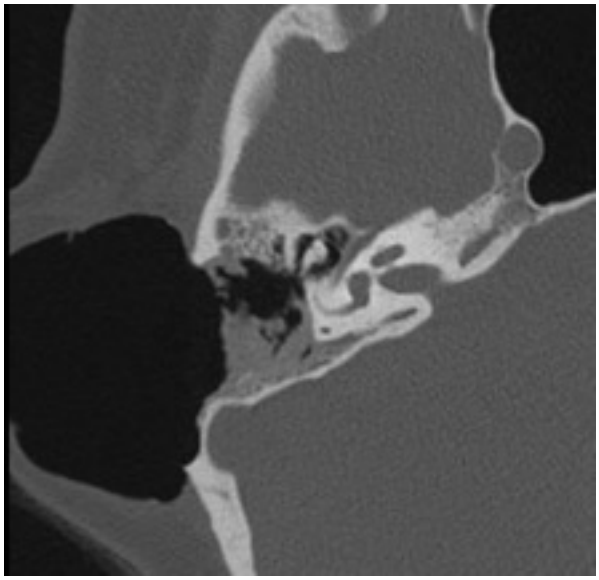

Figure 5. High-resolution temporal bone CT-scan (axial slice) (right ear): Persistence of an air mass in the retroauricular area, pushing the pinna forward.

This retro-auricular air mass inflated again during Valsalva maneuvers. Then a myringotomy tube was inserted. Since then, she has had no retro-auricular swelling any more, this favorable healing persisted after spontaneous extrusion of the grommet.

The patient give her written informed consent to participate this study.

Discussion

We present a rare case of post-operative pneumocephalus after transmastoid plugging of a SSCD.

A SSCD is often concomitant with a dehiscence of the tegmen. [5] This is in agreement with probable etiology of SSCD being congenital or due to a developmental disorder of the tegmental bone in early life [6].

Manipulation around the tegmen or posterior fossa to plug the SCD appears to be a risk factor for complications such as pneumocephalus.

Preoperative imaging should be performed to assess the level of the dural position and the possible dehiscence of the tegmen before canal plugging. It could help to prevent complications such as pneumocephalus during transmastoid surgery for SCD plugging.

In a recent anatomical analysis of tegmen slopes and shapes, 92.4% present a slight overhang of the dura. In this case, we can expose the dura and use a bipolar coagulation to shrink, stretch and elevate the dura. Medial dural elevation has to be avoided in order to prevent disruption of the membranous labyrinth [7].

We present an exceptional case of a postoperative mucosal veil that had formed in the middle of the mastoid cavity. A valve mechanism seems to be at the origin of the air mass present behind this mucous veil and bulging under the skin. This situation can be compared with what happens when one has a pneumothorax.

The pressure generated within this mastoid cavity caused an air leak via the described veil acting as a valve and leakage occurred to the mastoid, a subcutaneous pocket and even to a restricted extradural area where a dehiscence of the tegmen is located and created a pneumocephalus.

This veil mucous recurred despite a new filling of the mastoid cavity with Bone Pâté. For plugging material, we prefer fascia in the lower part of the opening followed by Bone Pâté mixed with Fibrin Glue to seal and occlude the canal in its upper part. In animal studies, Bone Pâté seems to have the best hearing outcome and the highest degree of periosteal osteoneogenesis at the occlusion site compared with bone wax and muscle [8].

Conclusion

We present a rare case of post-operative pneumocephalus following the formation of a mucous veil in the middle of the mastoid cavity. A valve-like mechanism seems to be at the origin of the air mass present behind this mucous veil, the subcutis and subdural areas. The pathogenesis can be compared with that of a pneumothorax.

Preoperative imaging should be performed to assess the tegmen and to prevent complications such as pneumocephalus during transmastoid surgery for SCD plugging.

Conflicts of Interest: All authors declare no conflict of interest.

Financial Disclosure: The authors declared that this study has received no financial support.

Informed Consent: The patient give her written informed consent to participate this study.

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