

Iatrogenic meningoencephalic herniation of the temporal bone – a case report

Jatrogenna przepuklina oponowo-mózgowa kości skroniowej – opis przypadku

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ABSTRACT: This article presents a case of 42-year-old woman with the iatrogenic transtemporal meningoencephalic herniation. The patient was treated surgically because of chronic otitis media without an expected improvement. Despite new signs and symptoms that appeared after the surgery, no radiological assessment was performed and for another years a wrong treatment was conducted. The authors present diagnostic problems and surgical treatment of meningoencephalic herniation of the temporal bone.

KEYWORDS: meningoencephalic herniation, temporal bone, cerebrospinal fluid leak

STRESZCZENIE: Artykuł stanowi opis przypadku 42-letniej kobiety z jatrogenną przepukliną oponowo-mózgową kości skroniowej. Pacjentka była leczona operacyjnie z powodu przewlekłego zapalenia ucha środkowego bez uzyskania spodziewanej poprawy. Pomimo pojawienia się nowych objawów pooperacyjnych, nie przeprowadzono oceny radiologicznej i przez kolejne lata stosowane były niewłaściwe leczenie. Autorzy omawiają problemy diagnostyczne i chirurgiczne leczenie przepukliny oponowo-mózgowej kości skroniowej.

SŁOWA KLUCZOWE: przepuklina oponowo-mózgowa, kość skroniowa, płynotok uszny

INTRODUCTION:

Meningoencephalic herniation of the temporal bone is a rare disease with a potentially dangerous course for the patient's health and life, requiring surgical intervention. The essence of the disease is the displacement of the contents of the cranial cavity to the temporal bone space, and its gates are cavities in the base of the skull. The contents of the hernial sac can be the brain (hernia) or the meninge along with the cerebral tissue (meningoencephalic herniation) [1]. Meningoencephalic herniation of the middle cranial fossa occurs in the place where the bone tissue is the thinnest, i.e. at the level of the process or the tegmen of the tympanic cavity, there also occurs direct pressure due to the weight of the temporal lobe of the brain. Hernia of the posterior cranial fossa is definitely less frequent [2].

The presence of direct contact between the middle ear and the subarachnoid space can lead to meningitis, encephalitis and brain abscess. Brain tissue trapped in the hernial sac can be the cause of epilepsy [2-4]. Currently, thanks to antibiotic therapy, modern methods of radiological imaging and microsurgery, these complications can be avoided. The article presents a case report of the acquired meningoencephalic herniation of the temporal bone, which arose in the course of surgical treatment of chronic simple otitis media.

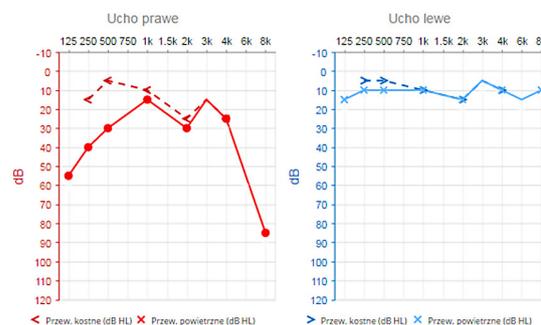
CASE REPORT:

A 42-year-old female patient was admitted to the Otolaryngology Clinic of the Medical University of Warsaw for the purpose

of the surgical treatment of meningoencephalic herniation of the right temporal bone. Since 2009, the patient has been treated for conductive hearing loss and ear pain on the right side, in the course of chronic simple otitis media. In 2010, in one of the centers, closed tympanoplasty was performed. The operation did not bring any improvement in hearing and for this reason, the patient was reoperated a year later, also without any improvement. The patient, shortly after the last surgery, presented additional symptoms: constant presence of exudate in the middle ear, low frequency ear noise and a feeling of ear fullness in the right ear. The patient was referred for further treatment to another center where chronic otitis media with effusion of the right middle ear was diagnosed. During the next 5 years, ventilatory drainage on the right side and septoconchoplastic were performed four times. Treatment did not bring the expected improvement. The following symptoms were added: the feeling of pulsating in the ear, dizziness, headache, constant leakage of colorless fluid from the right ear and the facial nerve paresis assessed as the second degree in the House-Brackmann scale. The severity of complaints was the basis for imaging examinations. Computed tomography showed on the right side a cavity in the ceiling of the temporal bone pyramid up to 15-mm wide, through which the hypodense brain tissue area with dimensions of 22x18mm with cerebrospinal fluid protruded into the pyramid. In the MR study performed, the bone loss of the upper surface of the temporal bone pyramid and the presence of meningoencephalic herniation was confirmed.

At the admission to the Department of Otolaryngology at the Medical University of Warsaw, the main complaints reported by the patient were low frequency tinnitus, right-sided hearing loss, ear fluid and feeling of substrate instability. The otoscopic examination revealed the presence of a Paparella ventilation tube in the eardrum and a constant, pulsating outflow of a colorless liquid. During the laryngological examination, no facial nerve dysfunction was found. Pure-tone audiometry revealed hearing loss of a mixed middle-degree type. Repeated MR examination showed herniation of the dural sac (about 14 mm) with cerebrospinal fluid and the nervous tissue (2-3 mm below the ring of hernia) to the back of the tympanic cavity and the mamillary process through the bone cavity of the middle cranial fossa (about 10 mm). No other pathologies within the brain were found. In the performed computed tomography examination, a small amount of fluid in the tympanic cavity was found at the tympanic membrane and the compression of the ossicular chain through the hernial sac could not be ruled out. Structure of the inner ear without abnormalities.

After the preparation of the patient, a closed type tympanoplasty was performed under general anesthesia. During the



Audiometria tonalna (komentarz):

Ucho prawe badano z maskowaniem.

Fig. 1. Result of tonal audiometry showing conductive hearing loss

procedure, a large meningoencephalic herniation filling the mamillary process was found. The hernia was drained, the auricular cartilage and the temporal muscle were used to reconstruct the bone defect. The drainage tube was removed from the eardrum. After surgery, the patient did not report any features of ear liquorrhea, denied pain, dizziness. On the eighth postoperative day, the patient was discharged from the Clinic inClinic in a good general and local condition.

DISCUSSION:

The division of hernia distinguishes spontaneous hernia from acquired ones. The first group is congenital hernia revealed in childhood, as well as hernia diagnosed accidentally in adults. Temporal bone dehiscence in adults may have idiopathic origin. Increased intracranial pressure favors thinning of bone tissue [1, 5, 6]. The second group includes hernias occurring as a result of chronic otitis media (with or without cholesteatoma), head injury with bone fracture, following middle ear surgery or cancer [2, 5, 6].

Meningoencephalic herniation of the temporal bone is characterized by a feeling of fullness in the ear, deterioration of hearing, otorrhoeaotorrhea, the presence of pulsating tissue within the temporal bone or symptoms of exudative otitis media [2-4]. The less common symptoms are tinnitus, facial nerve paresis, convulsions, headache, trigeminal neuralgia, balance disorders, blurred vision [2, 4, 5, 6]. In particular, vigilance should be triggered by permanent otorrhoeaotorrhea and accompanying episodes of meningitis or encephalitis associated with the above symptoms [1-3, 5]. At the same time, one should always consider the possibility of meningoencephalic herniation in patients with the mentioned symptoms, in whom, in the past, there occurred factors that could promote the development of acquired hernia. A typical image in an otoscopy is

the pulsatile mass or leakage from the middle ear. However, in patients who have undergone previous surgical treatment, diagnosis may be difficult due to the non-specific clinical picture. The results of audiological tests most often show conductive hearing loss due to the presence of cerebrospinal fluid or the content of the hernia itself in the tympanic cavity [2]. Symptoms and the results of audiological tests can be misleading and quite often there is a misdiagnosed diagnosis of chronic exudative otitis media. For this reason, as in the case described above, one may come across patients with a drainage tube [7].

In any case of suspicion of meningoencephalic herniation, herniation, it is important to perform detailed diagnostic imaging. High resolution computed tomography (HRCT) allows to accurately examine the bone structure of the skull base. The axial cross-sections are more precise in the visualization of meningoencephalic herniation of the middle cranial fossa, while the frontal cross-sections allow for the visualization of rare hernixes hernias of the posterior cranial fossa [1, 2, 4, 5, 8]. Unfortunately, this is a non-specific study and does not allow to distinguish the meningoencephalic herniation from other soft tissue changes in the middle ear such as cholesteatoma, granulation tissue or cholesterol granuloma [2, 4, 8]. Therefore, the best test in the diagnosis of meningoencephalic herniation is magnetic resonance imaging (MR). In all cross-sections, the hernia is pictured as non-amplifying mass, isointense isointense in relation to the brain tissue [2, 4]. Usually, the frontal cross-sections in the T2-dependent sequence are most useful for the diagnosis of meningoencephalic herniation of the middle cranial fossa [2].

The choice of the surgical method for the meningoencephalic herniation depends on the etiology, location and size of the temporal bone defect. The pre-operative pure-tone audiometry, the presence of chronic inflammation of the middle ear and active cerebrospinal fluid leakage during surgery are also important. The following approaches to the surgical provision of a hernia apply: via the mamillary process, through the middle cranial fossa, access connecting both of the above approaches and lateral petrosectomy [9].

Sanna et al. suggest using access via the mamillary process for small and single cavities of the tegmen, and if the ossicular chain is preserved. In this case, the hernia itself is also small, despite the more severely exposed dura mater. This allows for the coagulation of entrapped tissues and reconstruction of bone defect using cartilage, bone dust and fascia [2].

Access through the middle cranial fossa gives the operator the ability to control the front part of the temporal bone tegmen. The advantage is also protection of hearing as a result of the

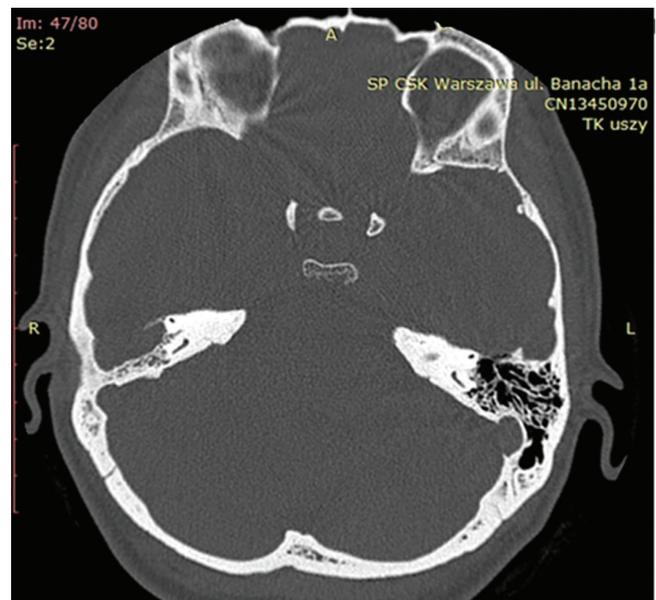


Fig. 2. CT scan, axial view, showing the bony defect of the middle cranial fossa floor

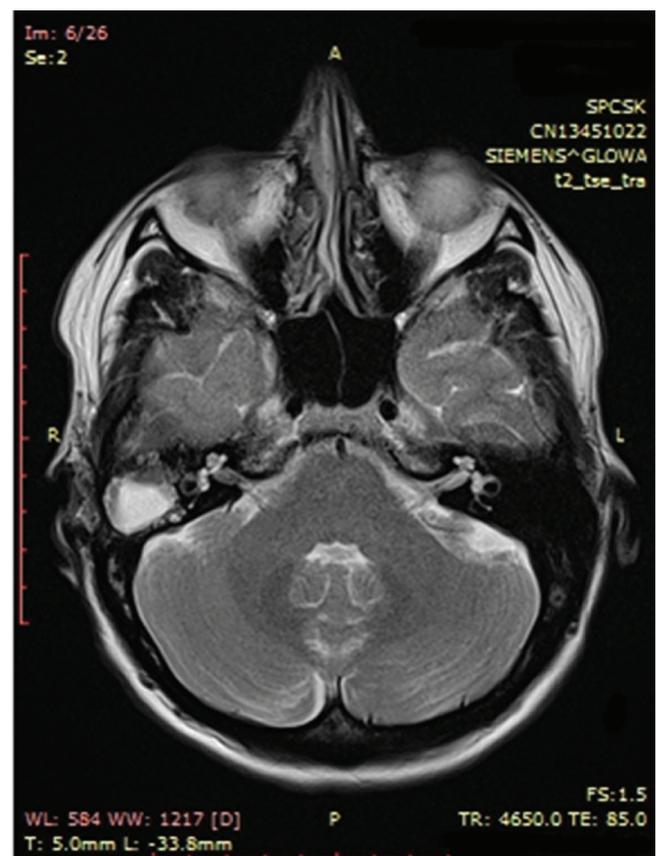


Fig. 3. T2-weighted MRI of the head, axial view, showing a meningoencephalic herniation on the right side

lack of manipulation at the ossicular chain and a lower risk of infection from the potentially existing inflammation of the middle ear [2, 6]. It is performed at numerous and large cavities of the skull base, the surface of which exceeds 2 cm². Defects of the anterior and medial parts of the tegmen are also an indication for this access [3]. Due to the greater invasiveness, many authors recommend the use of the above approach only for spontaneous hernias with well-preserved hearing [2].

Connected access, via the middle cranial fossa and the mamillary process, is proposed for large meningoencephalic herniation with simultaneous inflammation of the middle ear [6]. Some authors first perform mastoidectomy masto-dialectomy to confirm the presence and location of the hernia. This is followed by craniotomy of the middle cranial fossa to accurately visualize the temporal bone tegmen during the removal of the hernia [10]. It is also possible to perform this type of surgery in reverse order, initially temporal craniotomy, followed by mastoidectomy [11]. Sanna et al., however, are of the opinion that this approach has no advantage over the others, and that placing the cartilage via microcraniotomy microcraniotomy without direct control poses a risk of damage to the dura mater and bleeding [2].

Lateral petrosektomy petrosektomy is used in the case of extensive meningoencephalic herniation with a simultaneous inflammatory process in the middle ear. According to many authors, it is the safest and the most effective method available [2]. Closing of the external acoustic duct, obliteration of the auditory tube and filling the post-operative cavity with autologous adipose tissue reduce the risk of infection and recurrence of the disease. After this type of operation, a periodic check is required as well as imaging examinations (CT and MR) one year after the procedure [12].

In the reconstruction of the bone defect and the dura mater, it is possible to use different tissues. The best results can be ob-



Fig. 4. Intraoperative view

tained via the use of the fascia and temporal muscle, cartilage or bones laid in multiple layers [7]. The content of hernia can be removed or placed again in the skull cavity [6]. Gubbels and Nahas describe the use of hydroxyapatite cement to reconstruct bone defects [10, 13].

SUMMARY

The presence of meningoencephalic herniation is a rare, but dangerous health pathology of the middle cranial fossa requiring surgical intervention. The main symptoms are the feeling of fullness in the ear, hearing impairment, ear fluid, the presence of pulsating tissue within the temporal bone and the symptoms of exudative otitis media. Diagnostic imaging is based on high resolution computed tomography and magnetic resonance. There are several methods of surgical treatment, and the final choice depends on the location and size of the hernia, level of hearing loss, the presence of inflammation in the middle ear.

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