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Case report

Right hemiparesis caused by massive otogenic brain abscess in children: Unusual case report and review of the literature

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ABSTRACT

Introduction: Hemiparesis caused by otogenic brain abscess in children is an unusual complication of Chronic Suppurative Otitis Media. Complications can occur when the disease is not treated properly so that the infection in the middle ear spreads intracranially.

Case presentation: We report a case of Chronic Suppurative Otitis Media with cholesteatoma in a 14-year-old boy with complications of right hemiparesis caused by an otogenic brain abscess. His management included open craniotomy, drainage of the abscess, radical mastoidectomy and intravenous antibiotics according to the result of the culture and sensitivity.

Clinical discussion: Commonly, the location of the abscess is closely related to the source of infection. Affected brain lobes usually depend on predisposing factors that cause the development of brain abscesses. In this case, clinical manifestations appear in the form of contralateral hemiparesis even though the source of infection comes from the ear. This can occur due to massive abscesses and the presence of extensive perifocal edema which results in pressure in the subcortex area. The patient underwent radical mastoidectomy in conjunction with an abscess excision craniotomy.

Conclusion: Hemiparesis caused by an otogenic brain abscess is unusual. Rapid and precise diagnosis and treatment can minimize patient mortality and morbidity.

1. Introduction

Chronic Suppurative Otitis Media (CSOM) is one of the neglected diseases, especially in developing countries [1]. Complications can occur when the disease is not treated properly so that the infection in the middle ear spreads intracranially [2,3]. Most complications of middle ear infection are closely related to cholesteatoma. As a result, treating CSOM complications becomes more difficult because the underlying otitic disease must be eradicated optimally to prevent recurrence of complication [4].

We report a case of Chronic Suppurative Otitis Media with cholesteatoma in children with complications of Right Hemiparesis due to an otogenic brain abscess. This work is reported by following the surgical case report (SCARE) guidelines [5].

2. Case presentation

A 14-year-old boy presented to the Emergency Department complaining of a headache and weakness in his right limb. He had been suffering from a headache which was increasing overtime for approximately 3 weeks. The weakness of the right limb started 2 days before admission. The patient also complained of intermittent fever within 2 weeks. A history of purulent, greenish and, smelly discharge from the left ear dated 4 years back was also noted. He also complained of hearing loss in his left ear.

Physical examination revealed fluid in the left ear, odor, and total tympanic membrane perforation, as well as a stiff nape (+). From the upper extremity examination, we found motor strength 1 (right)/5 (left) and motor strength of lower extremities 1/5.

Laboratory tests showed leukocytosis (39,300 g/dL), then the patient was examined for a CT scan. Head CT demonstrates cholesteatoma

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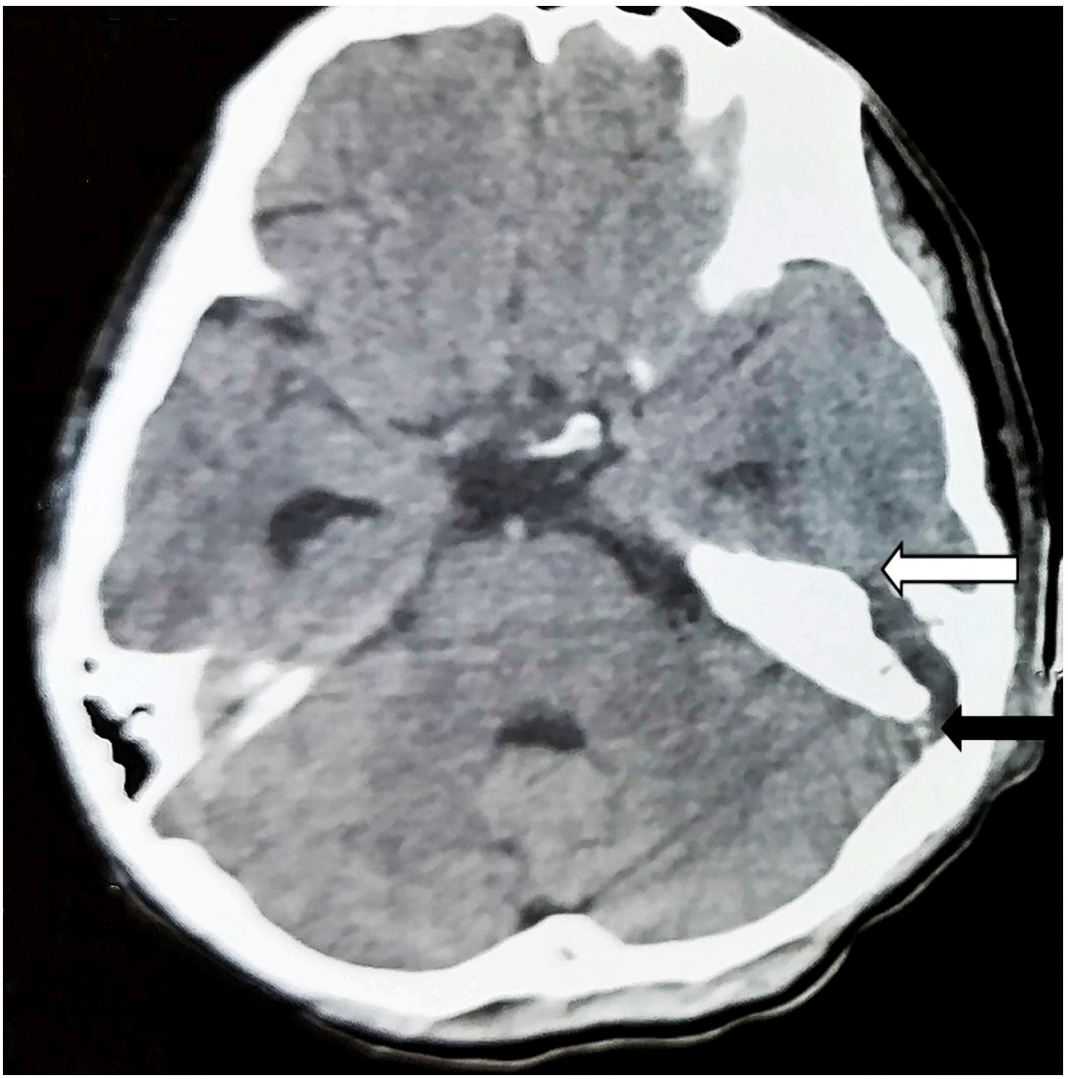

Fig. 1. CT Scan of the temporal bone shows cholesteatoma destroys bone in the area of the sinodura angle (black arrow) and tympanic tegmen (white arrow).

destroys bone in the area of the sinodura angle and tympanic tegmen (Fig. 1), perifocal oedema in the left internal capsule (Fig. 2) and homogeneous round hypointense lesions with a well-demarcated hyperintense ring (volume ± 54 cm^3) in the subcortical area of left frontal and parietal lobe and surrounding perifocal edema that caused a significant mass effect in the form of midline shifting to the right as far as 1 cm (Fig. 3).

Subsequently, the patient received 4 Liters per minute O_2 therapy (Nasal cannula), Metronidazole injection 500 mg/8 h, Ceftriaxone injection 1 g/24 h. The patient was planned for craniotomy and abscess evacuation by a Neurosurgeon and radical mastoidectomy by an Otologist. During a craniotomy, we found 40 cm^3 subgalea abscess, partial destruction of the parietal bone, dural adhesions, and an abscess in the left frontal and parietalcortex ±50 cm^3 (Fig. 4). Then a radical mastoidectomy was performed. During the operation, cholesteatoma was found in the mastoid cavity, attic, and tympanic cavity (Fig. 5), but also the destruction of tegmen, angle of sinodura and, hearing bones. Pus also went out of the fistula in the region of the sinodura angle (Fig. 6). Obliteration was performed using inferior and superior flap bases to close the exposed dura mater and narrow the mastoid cavity. Pus was sent to the laboratory for culture and sensitivity examination.

Clinical examination on the first day after surgery found that the patient could slightly move the right lower limb, but not the upper one. On the second day, the right lower limb could move against gravity, while the upper limb could not. Laboratory examination results showed that leukocyte counts decreased to 15,080 g/dL.

On the 4th postoperative day, it was found that the lower limbs gained normal motor strength while the upper limbs had not been able to move, only slight muscle contraction was noted. The results of the culture examination of the cerebral abscess and mastoid cavities showed Streptococcus pneumonia and *Proteus mirabilis*, and the results of antibiotic sensitivity for both bacteria were Levofloxacine. Furthermore, the patient was given Levofloxacine injection 750 mg/24 h for 1 week, followed by oral administration of the same regimen for 5 weeks. The patient could slightly move his right upper limb on day 5.

The patient was compliant with the procedure, showing strong tolerance for the surgery and post-operative care, which included antibiotics and local treatment. The patient had no complications after surgery, with no facial paralysis, dizziness, or vertigo.

He was discharged from the hospital on the 10th day. 1 month after surgery, the patient gained normal motor strength for both limbs, craniotomy incision wounds and his ear was in good condition.

3. Discussion

Brain abscess is a focal infection of the brain, which starts as a localized area of cerebritis and develops into an accumulation of pus surrounded by well-vascularized capsules [6,7]. Historically, it has been

Fig. 2. Perifocal oedema in the left internal capsule (white arrow).

reported that the percentage of otogenic brain abscesses in children reaches 25%, whereas in adults it is estimated to reach more than 50% [7,8].

Brain abscesses are often associated with hematogenous spread, spread from organs adjacent to the brain, neurosurgical procedures, and penetrating head trauma. The spread of organs adjacent to the brain can be caused by dental, sinus, and ear infections [7,9]. The location of the abscess is closely related to the source of infection. Affected brain lobes usually depend on predisposing factors that cause the development of brain abscesses. The most common lobe involved was the temporal lobe of approximately 67.6% of otogenic abscesses because CSOM became a major predisposing factor. Frontal or ethmoid sinusitis can cause frontal lobe abscesses, sphenoid sinusitis leads to temporal lobes or pituitary gland abscesses, and otitis can cause temporal or cerebellar lobe abscesses [10]. In this case, abscess was found in the subcortical area of the frontal and parietal lobe. This finding is rare compared to its common location in the temporal lobe or cerebellum where the lesion forms as a result of direct spreading of infection within the middle ear into the intracranial cavity via the anterior or posterior part of petrous bone [8,11]. Intraoperative findings indicate that the infection spreads through mastoiditis, creeping along the squamous and parietal bone to eventually pierce the duramater and reach the cortical and subcortical areas of the frontal and partially parietal lobes.

Besides, clinical manifestations of brain abscesses appear to differ. For example, in temporal abscesses, clinical features that appear are aphasia or mild contralateral facial muscle weakness. In large frontal abscesses, seizures or contralateral hemiparesis can be found. Focal sensory and motor seizures, impaired position sense, or homonym hemianopsia are clinical manifestations of parietal abscesses. Coordination and tremor of ipsilateral leg and arm movements can be found in cerebellum abscesses while clinical manifestations of abscesses in the brain stem can be facial weakness and dysphagia, multiple cranial nerve weakness or contralateral hemiparesis [7].

In this case, clinical manifestations appear in the form of contralateral hemiparesis even though the source of infection comes from the ear. This can occur due to massive abscesses in the frontal and parietal lobe and the presence of extensive perifocal edema which results in pressure in the subcortex area. The area is the location of the corticospinal tract, which is the motoric tract that runs from the motor cortex to the brain stem and crosses the medulla oblongata into the spinal cord [12].

The results of culture examination of cerebral abscesses and mastoid cavities obtained Streptococcus pneumonia and *Proteus mirabilis*. This is in accordance with several studies conducted by Sennaroglu and Sozeli in 2000 [11]. Management of brain abscesses aims to reduce space-occupying activities, reduce intracranial pressure, and eradicate pathogenic microorganisms. The location of the abscess, the number and size of abscesses, the stage of abscess formation, the patient's age, and neurological status are all factors that can influence management strategies for brain abscesses [13].

Conservative treatment can be applied in patients who are well

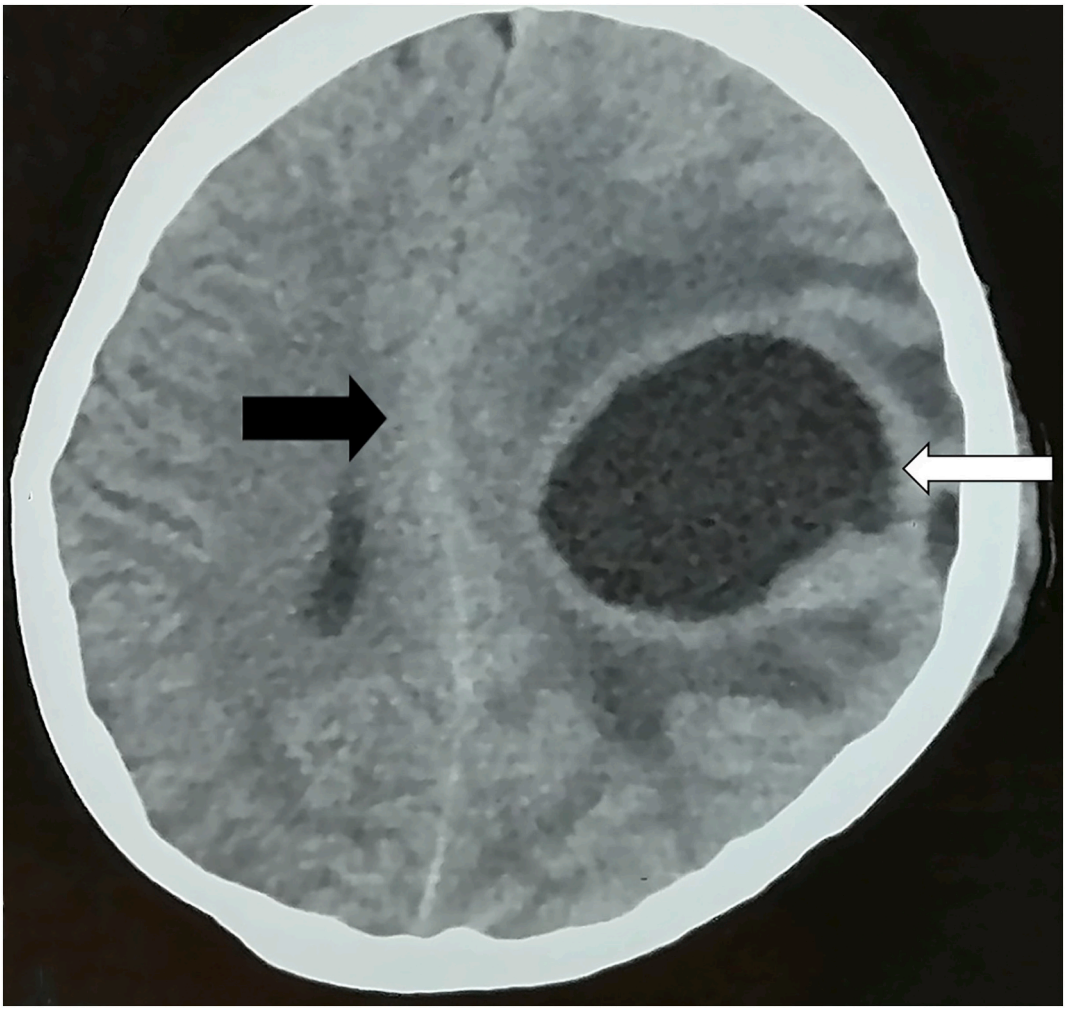

Fig. 3. Homogeneous round hypointense lesions with a well demarcated hyperintense ring (volume ± 54 cm^3) in the left frontal and parietal lobe (white arrow) and surrounding perifocal oedema that caused a significant mass effect in the form of midline shifting to the right as far as 1 cm (black arrow).

conscious, clinically stable, and at high risk for surgery and anesthesia, but medical therapy alone should not be used if a definitive diagnosis is uncertain [14]. Based on the brain abscess management algorithm, antibiotics can be used as the only treatment for 1.5 cm lesions in patients who are neurologically good with a clear source of infection in solitary brain abscesses, or for 2.5 cm lesions if initial therapy for abscesses multiple has identified the etiologic organism [13].

In many cases, surgical drainage is needed for abscess management. Open craniotomy with excision results in lower rates of recurrence and reaccumulation. An open craniotomy is needed for definitive treatment in situations where structural abnormalities underlie the development of an abscess [10]. In otogenic abscesses, radical mastoidectomy is the primary choice for eradicating the source of infection, but there are differences of opinion about when a radical mastoidectomy should be performed. Some researchers state that it should be done at another time after drainage of an abscess, but other researchers state it should be done in conjunction with abscess drainage [8]. In this case, radical mastoidectomy was performed by an otologist in conjunction with an abscess excision craniotomy by a neurosurgeon. This was done by considering that the size of the abscess was more than 3 cm, a significant mass effect and signs of focal neurological deficit were found in the patient and to eradicate the source of infection.

4. Conclusion

Hemiparesis due to otogenic brain abscess is very rare. Rapid and precise diagnosis and treatment can minimize patient mortality and morbidity. In this case, the decision to perform a joint operation between a Neurosurgeon and an Otologist provided a good outcome for the patient.

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Ethical approval

We certify that this kind of manuscript does not require ethical approval by the Ethical Committee of our institution.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Anton Budhi Darmawan: Conception, design of the study, acquisition of the data, drafting the manuscript, final approval of the version to be

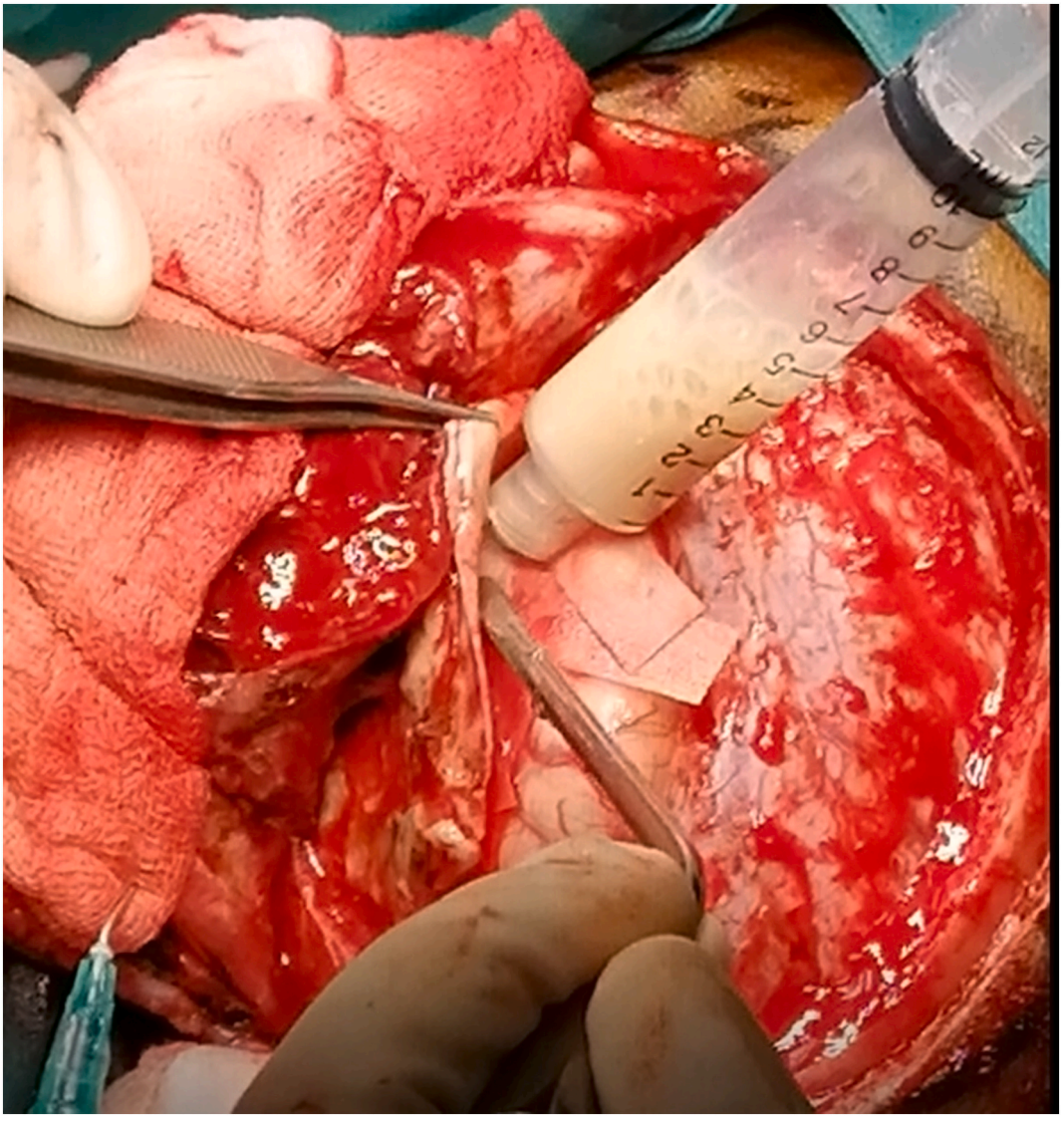

Fig. 4. Abscess in the left frontal and parietalcortex ±50 cm^3.

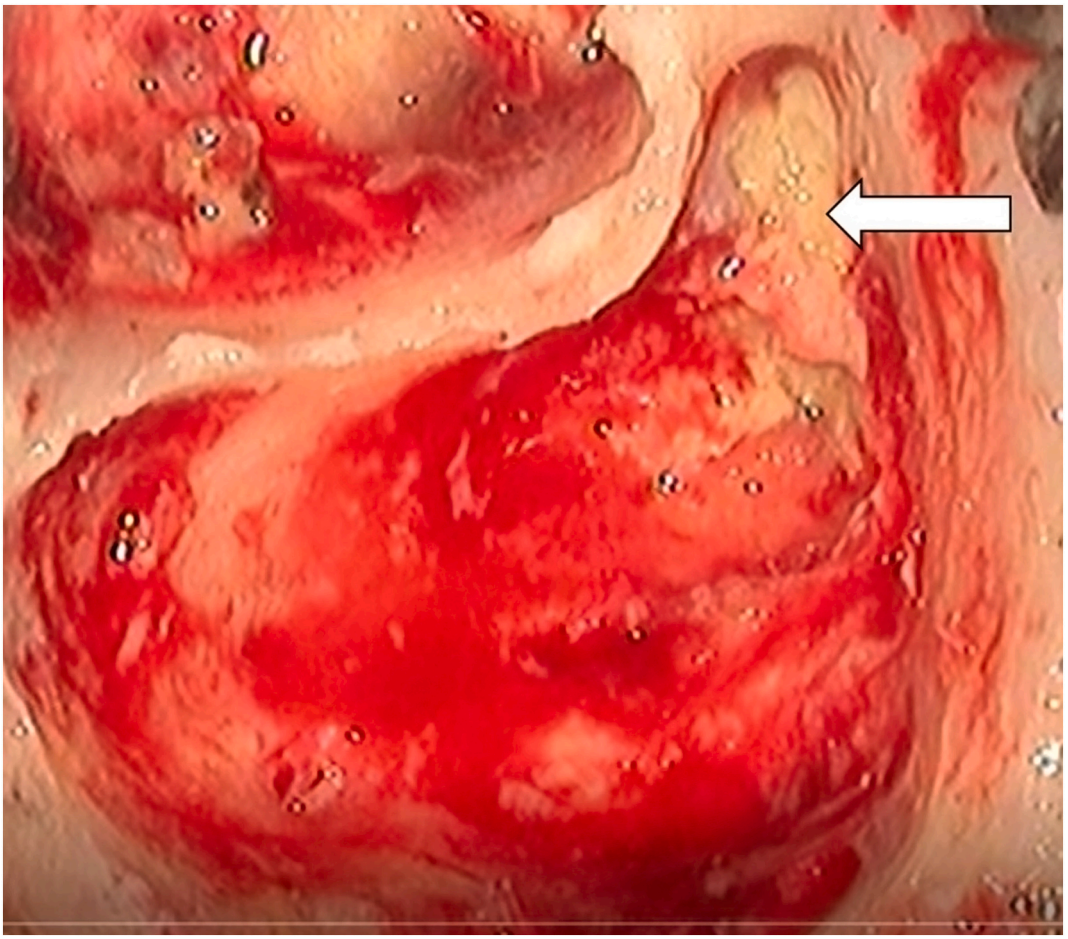

Fig. 5. Cholesteatoma in the mastoid cavity, attic, and tympanic cavity (white arrow).

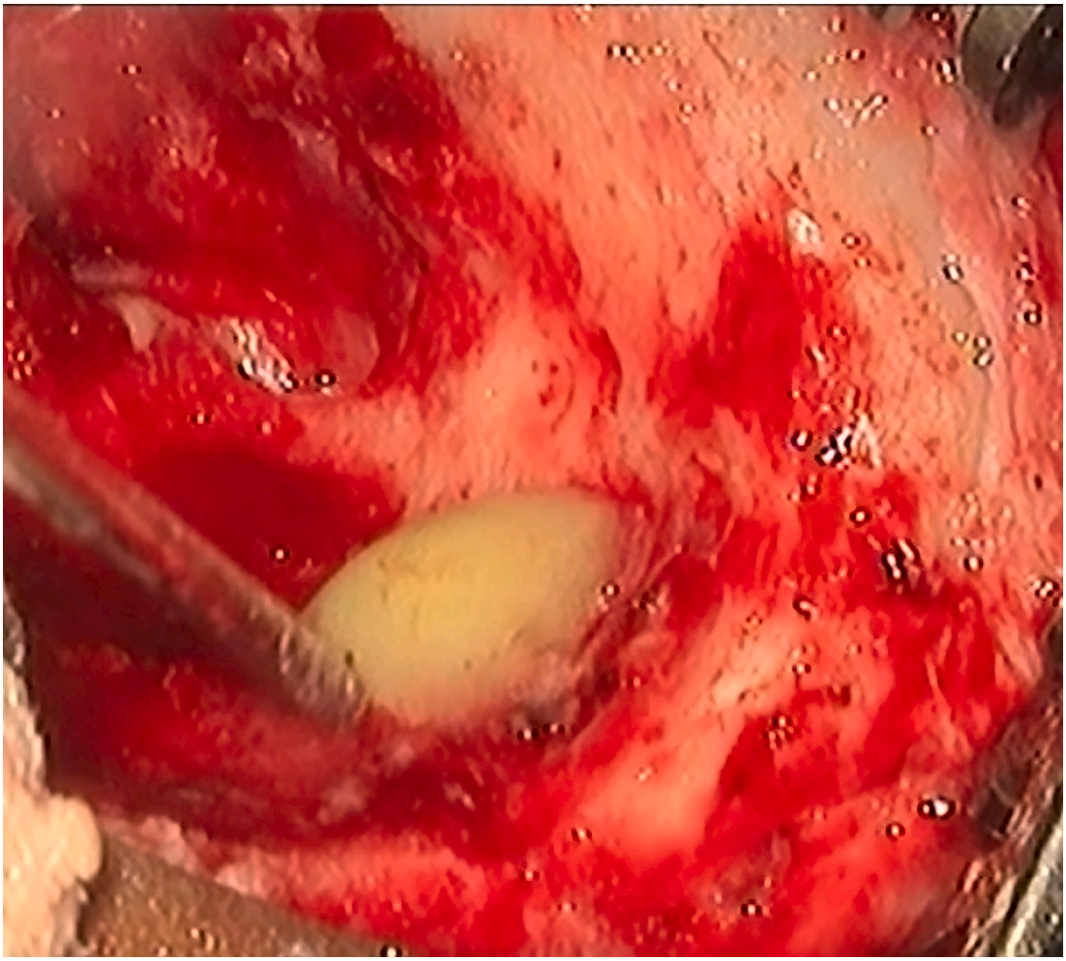

Fig. 6. Pus came out of the fistula in the region of the sinodura angle.

submitted.

Ema Shofiana Azkia: Acquisition of the data, revising the manuscript, final approval of the version to be submitted.

Registration of research studies

This is a case report that does not require a research registry.

Guarantor

Anton Budhi Darmawan.

Provenance and peer review

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Declaration of competing interest

All authors disclose any conflicts of interest.

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