CONCURRENT SURGERY MASTOIDECTOMY AND CRANIOTOMY IN UNSAFE CHRONIC SUPPURATIVE OTITIS MEDIA WITH INTRACRANIAL ABSCESS

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ABSTRACT

Background:
Chronic Suppurative Otitis Media is characterized by persistent secretion from the ear that has been pierced for longer than two months. An attic or posterosuperior cholesteatoma with a history of sparse, pungent otorrhea and hearing loss is a sign of unsafe CSOM. Cholesteatoma can infiltrate and cause bone damage. One of the most frequent intracranial consequences is a brain abscess.
Objective: to learn how to manage and treat patients with risky type CSOM who have brain abscess consequences.
Case Report: A 35-year-old man has been complaining for two months about otorrhea coming from his left ear. Hearing loss, hearing loss that originally felt pounding intermittently, a yellow-green color that is thick and stinks, and a headache that becomes worse after two weeks. Otoscopy observations include a cicatrix in the left retroauricle and a greenish-yellow discharge that is dense and foul-smelling. Results of a CT scan show that the left mastoid's cholesteatoma and tegmen have eroded. The patient underwent a craniotomy and a modified radical mastoidectomy at the same time.
Methods: Using PubMed, Medline, NCBI, manual research to search for the evidence and literature.
Result: CSOM is referred to as a continuation of the initial episode of acute otitis media with the characteristics of persistent secretions from the middle ear through the tympanic membrane perforation.
Conclusion: Ear infection control is important for the management of cases like this, where in the literature review it is explained that mastoidectomy is the main treatment option.

***Keywords*:** Concurrent craniotomy, mastoidectomy, malignant chronic otitis media suppurative with intracranial abscess

Introduction

Chronic Suppurative Otitis Media is characterized by continuous secretion from the middle ear that has been perforated for more than two months, with or without cholesteatoma. An attic cholesteatoma or posterosuperior cholesteatoma with a history of scanty, foul-smelling ear drainage and hearing loss is a sign of unsafe CSOM. In the middle ear or other temporal bone, cholesteatoma is a stratified keratinizing squamous epithelium and an accumulation of desquamating keratin epithelium. It could or might not be connected to an infection. It might be acute or chronic when it exists. However, if the infection is present, the entire middle ear cleft may be affected.[1,2]

Intracranial complications and extracranial complications are two categories of CSOM-related problems. One of the most frequent intracranial consequences, second only to meningitis, is a brain abscess.[3,4]

65 to 330 million persons globally have CSOM, and 39 to 200 million of them (about 60%) have clinically severe hearing impairment. Both congenital (behind an intact tympanic membrane) and acquired cholesteatomas are possible. A 9 per 100,000 population estimate is made for the total incidence. Cholesteatomas are acquired in at least 95% of cases. Children and adults both experience this incidence rate approximately equally.[5]

In the dr. Zainoel Abidin general hospital in Banda Aceh, Ridwan et al. discovered 69 CSOM patients, of whom 29,5% are of a dangerous form. According to several studies, there are 3 to 15 cholesteatomas for every 100,000 people annually. Incidence rates were recorded at 6.8 per 100,000 person-years in Denmark and 9.2 per 100,000 people in Finland on a yearly basis, respectively. 3,874 Danish children (0–15 years) were the subjects of a nationwide study that examined the incidence rate of middle ear cholesteatoma treated surgically between 1977 and 2010. From 1977 to 2002, the incidence rate increased from 8 to 15 per 100,000 person-years, and from 2002 to 2010, it decreased from 15 to 10 per 100,000 person-years. In Fukuoka City, Japan, there were 6.8–10 cholesteatomas per 100,000 people per year, including instances treated non-surgically. The yearly incidence of cholesteatoma was found in radiographic research to be 3 per 100,000 in children and 9.2 per 100,000 in adults, with a sex ratio of 1.4:1 showing a male preponderance. According to data from Dr. Soetomo General Academic Hospital in Surabaya, there are more cases of CSOM with complications treated there each year. 25 cases of CSOM, 9 cases of CSOM with intracranial sequelae, and 3 cases of cerebellar abscess were described by Artono et al. in their research. In general, socioeconomy and racial characteristics have an impact on occurrence. Low

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socioeconomic position, living conditions in slums, lack of education, poor health, and inadequate nutrition are risk factors that contribute to the rise in instances of CSOM with complications. [3,6,7,8,5]

AOM or COM can cause otogenic brain abscesses. Most instances are now caused by cholesteatoma instead than AOM. Anaerobes often make up a substantial percentage of the polymicrobial illness. Bacteria can move from the mastoid to the brain parenchyma as a result of venous thrombophlebitis.[9]

The participant often had cerebral abscess, cerebellar abscess, and sigmoid sinus thrombosis as intracranial sequelae. These results line up with various previous investigations. The most difficult CSOM consequence is brain abscess. The temporal lobe and cerebellum are the parts of the brain that are commonly impacted by abscess problems. Parenteral antibiotics were administered intravenously to all patients prior to surgery in accordance with the treatment of CSOM problems in this research. Prior to surgery, parenteral antibiotics aid in the management of the infection process. The primary surgical finding in CSOM complications is cholesteatoma. The spread of cerebral illness is also significantly aided by granulation tissue. Cholesteatoma is a signiffigureicant risk factor for CSOM and can lead to serious intracranial complications after surgery. (3)

In underdeveloped nations, chronic suppurative otitis media (CSOM) is still a frequent condition that can be challenging to treat. Even when there are more powerful antibiotics available, other problems can still arise. AOM and CSOM problems were quite prevalent in the pre-antibiotic era and contributed significantly to high death rates. Even though the incidence of CSOM complications originally decreased due to increased antibiotic use, they are still on the rise. Particularly in poor nations, CSOM continues to be a dangerous illness, and its consequences are still thought to be fatal.[10]

The goal of writing this case report is to learn how to handle patients with dangerous type CSOM who have intracranial abscess problems so that the best course of therapy and surgery may be chosen to minimize potential consequences.

Case Report

A 35-year-old male patient who had been experiencing otorrhea from the left ear for two months was seen by the neurosurgery department. The discharge is intermittent, heavy, yellow-green in color, and foul-smelling. In addition to discharge from behind the ear, the patient had already experienced this 25 years before. The patient additionally expressed concern about his left ear's hearing.

The patient reported a left-sided headache for these three months, which started off feeling throbbing intermittently but got worse after two weeks. Despite the patient using painkillers, the headache remained and did not get better. Fever has already occurred. The occurrence of the previous unconsciousness was disputed. Vomiting is not history. Leg weakness in the past was disputed.

Previous medical history: On December 24, 2020, the neurosurgery division performed surgery on the patient for VP-shunt a.i. hydrocephalus + cerebral abscess. This patient has no known family history. Only prescription painkillers are consumed by the patient. Patients with low personal hygiene and little interaction with family members.

Otoscopy findings revealed that the auris dextra and auris sinistra were both normal and that the externa canalis acoustics was present. In addition, the tympanic membrane was marginally perforated, and the left retroauricular cicatrix was discovered. without paralysis of the facial nerve.

The laboratory was normal, Thorax X-ray was normal, and the head CT scan showed the impression of a left cerebellar hemisphere cystic mass and a dilated ventricular image.

Figure 1. Head CT scan

CT scan findings reduce pneumatization of air cell mastoid, erode mastoid tegmen, erode ossicular, and cholesteatoma appears on the left mastoid.

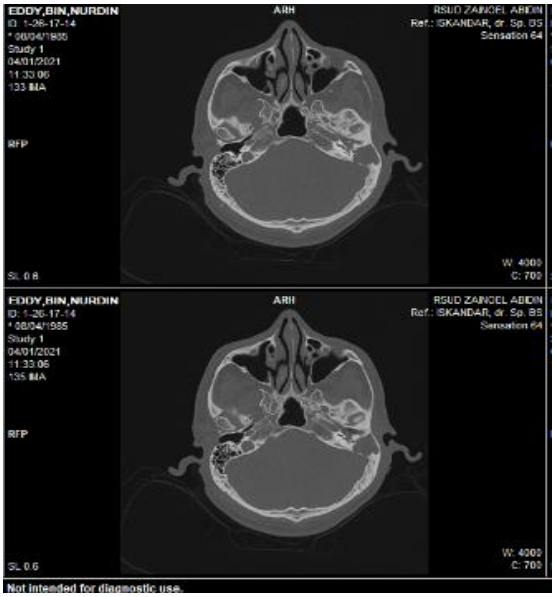

Figure 2. Mastoid CT-Scan

The patient had a VP shunt by the neurosurgery department, then a CT scan was performed again after the VP shunt one week. It was found that there was a hypodense lesion in the left cerebral that pressed the IV ventricle. When compared to the initial CT scan on December 22, 2020, the hypodense lesion in the left cerebellum was expanding and the ventricles were not visible.

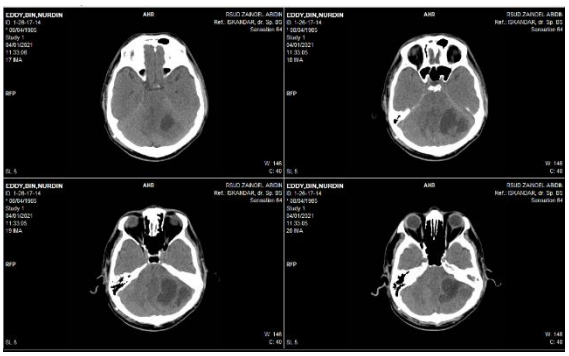
Figure 3. CT Scan of the head post-VP shunt

The audiometric examination was found in the auris dextra with a hearing threshold within normal limits, while the auris sinistra obtained a severe degree of conductive hearing loss with a hearing threshold of 73.75 dB.

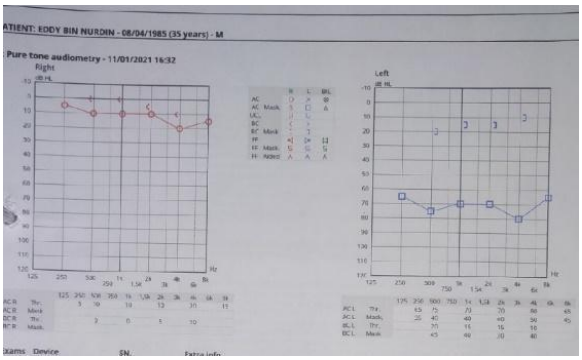

Figure 4. Audiometry

Based on anamnesis, physical examination, and supporting examination, the patient was diagnosed with Unsafe CSOM left ear + left cerebellar abscess + post-VP shunt for indications of non-communicating hydrocephalus.

In the treatment, the patient received an aural toilet with 3% H2O2, topical antibiotic Ofloxacin 2x 4 drops, and 2 types of parenteral antibiotics, Ceftriaxone 2 grams/12 hours and Metronidazole 500 mg/8 hours. Management for the patient from the ENT department, we planned to modify radical mastoidectomy. During the operation there was a cholesteatoma that filled the tympanic and mastoid cavities which were then cleaned, the malleus was eroded, the incus was absent and the stapes head was eroded, leaving only the stapes foot. The tympanic tegmen and mastoid tegmen were eroded, then an underlay graft was placed on the footstapes.

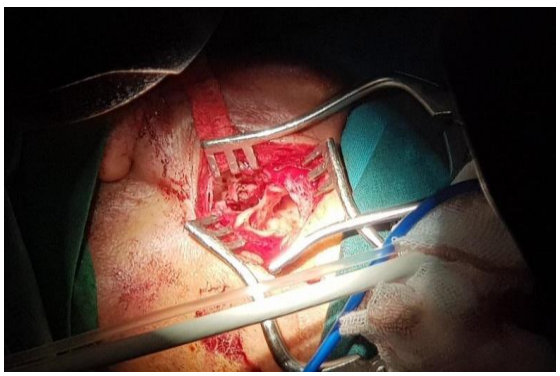
Figure 5. Cholesteatoma filling the mastoid antrum and tympanic cavity

Then a joint craniotomy operation with the neurosurgery department was performed to evacuate the cerebral abscess. In this operation, a cerebral abscess was aspirated and ±40 cc of pus was obtained, which is then examined in the microbiology laboratory for culture and antibiotic sensitivity.

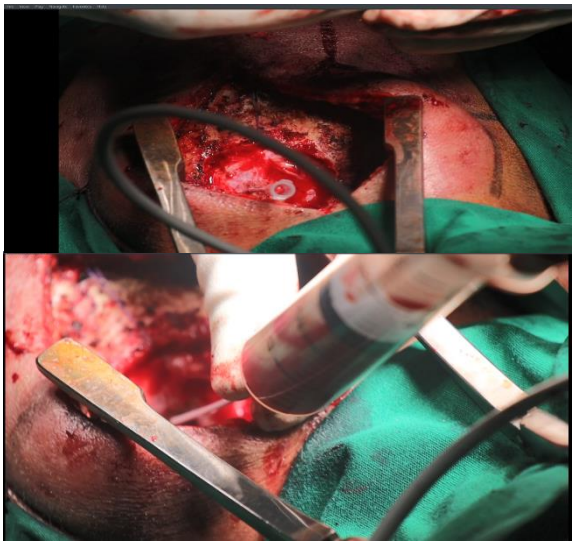

Figure 6. Aspiration of cerebral abscess

Postoperatively the patient was treated with Meropenem 1 gram/8 hours (IV) and Amikacin 500 mg/12 hours (IV), and Paracetamol 1 gram/8 hours (IV).

Postoperative 1 to 4 days the patient complains of pain in the head area, vital signs are normal. From the maxillofacial examination, we found House Brackmann II, then given Methyl Prednisolone (IV) 125 mg/ 8 hours and tapering off every 3 days, and evaluated House Brackmann examination per day. The results of microbiology from the cerebellum showed no growth of bacteria.

Figure 7. House Brackmann II (post-operative

Postoperative day 6, obtained on examination of the maxillofacial house Brackmann 1.

Figure 8. House Brackmann I (Postoperative sixth day)

The patient underwent outpatient treatment after POD 8, and was educated when bathing to keep the ears from getting water, not to dive, to seek treatment immediately if there were symptoms of cough and runny nose, not lifting weight, not straining, and control to the ENT polyclinic. On the 14th postoperatively, the left CAE tampon was removed and the blood (-), secretions (-), and graft was attached well. Until now, there is no complaint of discharge from the ear and no improvement in hearing loss.

Methods

The terms "Concurrent craniotomy," "mastoidectomy," and "malignant chronic otitis media suppurative with intracranial abscess" were used in a literature search on August 1st, 2022. For research, Medline, PubMed, and manual searches were all used.

The following inclusion criteria were used in the literature search: 1) Concurrent craniotomy; 2) mastoidectomy; and 3) risky chronic otitis media with abscess inside the skull. The analysis does not include the literature on alternative treatments.

Result

According to the literature, the patient was identified as having CSOM, a middle ear condition marked by persistent inflammation of the mastoid and tympanic membranes with sporadic purulent discharge (otorrhoea). As a continuation of the original episode of acute otitis media, CSOM is characterized by persistent secretions coming from the middle ear via the rupture in the tympanic membrane. It is possible to classify a condition as chronic if it recurs frequently or lasts for two months or longer.

According to a systematic review by Duarte et al. (2018), 11 out of 29 studies discussed the importance of ear infection control for the management of instances like this, where the

main treatment option is mastoidectomy. The radical mastoidectomy procedure was known to be used in 10 out of 11 papers, and one article documented intact or collapsed wall tympanoplasty in cases with otogenic brain abscess.[4]

Discussion

This is a story of a 35-year-old man who complained of a discharge coming from his left ear for the last two months, headache, and hearing loss. Unsafe Chronic Suppurative Otitis Media (CSOM) with intracranial abscess was the patient's diagnosis.

According to various studies, young individuals between the ages of 20 and 40 were most typically affected by sickness. Male predominance was seen since there were 1.35 more men than women. Social isolation can result from foul ear discharge in young adults. They typically seek early medical advice since they are independent.[11]

Otogenic infections are among the highest risk factors for brain abscess, according to Chetty et al., and chronic suppurative otitis media (CSOM) is one of the conditions that can lead to cerebellar brain abscesses.[12]

According to the examination, the patient's otorrhea from the ear was never addressed. Otorrhea intermittently appears, is thick, yellow-green in color, and stinks. 25 years prior, the patient also had discharge coming from behind the ear. A left ear hearing loss complaint has been made. The patient reported a left-sided headache for three months, first describing it as throbbing, intermittent, and getting worse two weeks before admission, where the pain was felt to remain and did not go away despite the patient taking medicine. Fever has already occurred. The occurrence of the previous unconsciousness was disputed. Vomiting is not history. Leg weakness in the past was disputed.

A little rupture of the left tympanic membrane with limited yellowish viscous secretions was found during a physical examination of the ear following an otoscopy. Additionally, the CT scan of the mastoid revealed cholesteatoma and chronic left mastoiditis in the left mastoid. Additionally, a mixed degree of severe hearing loss was found in the left ear during an audiogram evaluation.

Chronic inflammation of the middle ear and mastoid cavity, together with recurrent ear fluid discharge (otorrhea) through the perforated tympanic membrane, are all symptoms of chronic suppurative otitis media (CSOM).

The condition typically manifests itself as a spontaneous tympanic perforation in children as a result of an acute middle ear infection or as a complication of otitis media. Mixed hearing loss was noted in 36% of individuals with hazardous CSOM, according to Moruskar et al. The lengthening of middle ear illness exacerbates hearing loss. At all frequencies, hearing loss caused by a diseased ear's bone conduction threshold was connected to aging, but only at higher frequencies with a disruption of the ossicular chain. A longer period of middle ear illness was associated with more severe sensory-neural hearing loss. The preferred course of therapy was surgery, which aimed to completely eradicate the illness while preserving or, to the extent feasible, restoring hearing.[8],[13]

A CT scan of the patient's head revealed a cystic mass in the left cerebellar hemisphere and a dilated ventricle. The patient had been seen by the neurosurgery department due to a problem with stinky otorrhea coming from the left ear. A VP-shunt was implanted to lower intracranial pressure since, at first inspection by the neurosurgery department, the patient seemed to have increased intracranial pressure. Then, one week later, a second head CT scan was done to determine the size of the brain abscess. This time, the results gave the appearance of a hypodense lesion, maybe an abscess, that was growing in the left cerebellum but hiding the ventricles.

On the same day (within 24 hours), the patient received a modified radical mastoidectomy by the otologist consultant ENT department, followed by a craniotomy to drain brain abscesses by the neurosurgery department.

Based on the patient's medical history, physical examination, and supporting tests, it was determined that the patient had hazardous CSOM with cerebellar abscess sequelae. According to the literature, the patient was identified as having dangerous CSOM, a kind of bone-eroding illness that might either be cholesteatoma or granulations. The risk of consequences from bone erosion that might be fatal makes the diseased ear dangerous. A CT scan of the mastoid in this patient revealed a cholesteatoma, and after surgery, the cholesteatoma filled the mastoid and tympanic cavity and damaged the auditory ossicles. According to the pathophysiology of the hazardous form of CSOM, which includes the presence of cholesteatoma and ossicular degeneration beginning at the longus incus process and impacting the stapes superstructure, the manubrium malleus and finally the entire ossicular structure. According to the study by Gulati et al., acquired cholesteatomas can be categorized as either "primary" or "secondary" depending on the underlying pathogenesis. The primary variety is seen behind the pars flaccida of an intact retracted tympanic membrane, while the secondary variety grows into the middle ear through the perforated pars tensa part of the tympanic membrane. Osteoclasts' production of enzymes that break down bone is the cause of bone deterioration in cholesteatomas. The cholesteatoma can lead to major intracranial and extracranial problems due to its propensity to destroy bone. [14]

The most frequent reason for hospital visits is a headache, which can also be a sign of elevated intracranial pressure brought on by the pressure of a brain abscess. The development of a brain abscess can block the cerebrospinal fluid channel, leading to non-communicating hydrocephalus and a rise in intracranial pressure. Because this illness can progress and possibly result in brain herniation and death, it needs fast and suitable treatment. The level of a patient's brain abscess may be assessed by looking at the increase in intracranial pressure alone. It may be determined that these people have a stage 3 or evident abscess.[15]

Otitis media complications are a widespread issue in underdeveloped nations. In poor nations, issues including poverty, illiteracy, a lack of healthcare services, and ignorance of auditory symptoms may contribute to such difficulties. Antibiotic resistance, however, may result in issues in wealthy nations.[16]

Extracranial and intracranial CSOM complications are distinguished from one another. In their study, Borgohain et al. observed that brain abscess was the most frequent intracranial consequence while mastoiditis was the most

frequent extracranial complication. Only a small percentage of patients with brain abscesses appear with the traditional triad of headache, fever, and localized neurological impairment in their clinical presentation. Even radiological characteristics can occasionally be mistaken for brain tumors. [12,16]

Pus builds up in the cerebrum or cerebellum and is known as an intracranial abscess. A pyogenic bacterium that develops as a result of an inflammatory process in the middle ear cavity is the cause. Direct extension channel and hematogenous pathway are two potential routes by which an intracranial abscess might spread. Infection that has spread directly through the osteitic bone is the most frequent cause of these problems. In contrast to many varieties, autogenic brain abscess often manifests as a single abscess. After that, the temporal lobe experiences the infection 2-4 times more frequently than the cerebellum. The site of the abscess, however, has been reported in a variety of ways. Erosion of the tympanic and mastoid tegmen, which may serve as a pathway for the spread of the disease, was discovered in this patient during an examination following surgery. Tegmen erosion might be brought on by acute infection-induced demineralization and subsequent resorption. A cerebellar abscess may result from an infection that has progressed through venous thrombophlebitis in the dura and bone. The mastoid bone wall and mastoid cells were removed during the procedure. However, the patient had problems. As a result, venous thrombophlebitis is thought to be a frequent cause of instances of cerebellar abscess. An area of bone in Trautmann's triangle that serves as the entry site for an intracranial infection has been eroded and destroyed. According to the literature, a middle ear infection frequently spreads to the cerebellum when the middle ear suppurates, resulting in osteomyelitis in Trautmann's triangle, retrograde venous thrombophlebitis, and Virchow Robin periarterial space.[4,17]

Two pus samples from the patient's brain abscess and ear secretions were used for the microbiological analysis. Both analyses revealed no evidence of microbial development. The impact of administering antibiotics before a microbiological investigation may have an impact on this outcome. According to Combade et al.'s study, bacterial growth was seen in 82,4% of cases, whereas 17,6% of cases exhibited no growth. The most frequent germ isolated was Pseudomonas aeruginosa (55,8%), followed by Staphylococcus aureus (27,5%).[18]

In order to treat this patient, neurosurgery first installed a VP-shunt to lower intracranial pressure and administered medical treatment. They then reevaluated the patient with a head CT scan to see if the abscess was growing, taking into consideration that the patient had symptoms of increased intracranial pressure. Therefore, it was decided to take additional action and perform a modified radical mastoidectomy followed by a craniotomy to remove the brain abscess the next day. The primary method for making a rapid and accurate diagnosis of otogenic brain abscess is a CT scan. The location and size of the abscess can be determined via a CT scan. On a CT scan, a brain abscess may appear as a hypodense image that is encircled by a ring and has a hypodense region around it due to cerebral edema.[19]

Immediate abscess decompression, infection eradication, and abscess recurrence avoidance are the cornerstones of therapy for hazardous-type CSOM with brain abscess sequelae.[23] If therapy is initiated when the cerebritis stage, the lesion size is less than 2.5 cm, and if symptoms recover within two weeks, medical treatments with antibiotics for instances of brain abscess are more successful. If the abscess has grown into a capsule, antibiotics are ineffective, necessitating surgery. Patients with increasing neurological impairments brought on by a brain abscess may consider emergency decompression using a VP-Shunt. Although there is substantial dispute, many surgical techniques have been utilized to treat brain abscesses. In the days before antibiotics and CT scans, craniotomies were frequently advised, along with other possible treatments including aspiration and draining of abscesses and excision of the capsule. However, if there is increased intracranial pressure, the abscess is the consequence of a traumatic injury, the lesion is in the posterior fossa or cerebellum, and a fungal infection is suspected, a craniotomy is preferable with a combination of medical therapy and evacuation of the abscess.[4,20]

There is ongoing debate regarding the surgical management phases between otologists and neurosurgeons. The rapid mastoidectomy (within 24–48 hours) with neurosurgical abscess drainage has been emphasized by several writers as a decrease in mortality and maximizes the benefits of antibiotic therapy. Another research, however, found that the two alternatives, whether given simultaneously or not, did not vary in the treatment outcomes. Otology and neurosurgery, on the other hand, can be done simultaneously to prevent repeated infections and reduce the patient's time in the hospital. Following drainage, mastoidectomy seeks to remove the source of infection from brain abscesses and prevent recurrence. Almost all the patients with brain abscesses in Laulajainen-hongisto's dissertation (2016) treated patients with a diagnosis of malignant type CSOM with intracranial complications and received surgery. However, for the underlying infection (CSOM) action is taken after the patient is completely stable after undergoing surgery for his brain abscess.[21,22]

It was discovered that there was facial nerve paresis during the recovery phase. One of the iatrogenic side effects of mastoid surgery is facial nerve paresis. These issues may develop owing to several things, including the surgeon's surgical experience, aberrant anatomical structures, the CSOM procedure itself, or surgically induced facial nerve swelling. If the facial nerve paresis is partial, the prognosis is favorable; however, if the paresis is total, the prognosis is bad. Steroids are the primary treatment option for this disorder. In cases of facial nerve paresis with a House-Brackmann scale of 1-2, Geral et al. (in Havaldar et al., 2020) observed that the use of postoperative steroid medication and tapering-off within a few days can aid in recovery. If the facial nerve paresis is partial, the prognosis is favorable; however, if the paresis is total, the prognosis is bad. Steroids are the primary treatment option for this disorder. In cases of facial nerve paresis with a House-Brackmann scale of 1-2, Geral et al. (in Havaldar et al., 2020) observed that the use of postoperative steroid medication and tapering-off within a few days can aid in recovery.[23,24]

In a case that was reported, a contemporaneous craniotomy and mastoidectomy were carried out in an unsafe

CSOM with an intracranial abscess, and the patient was given the right medications to treat the infection. The patient had therapy on the same day with the intention of curing the illness and draining the brain abscess. The procedure went without a hitch, but because there was no bone erosion that created a direct pathway to the cerebellum, it was assumed that the infection's spread was hematogenous, namely retrograde thrombophlebitis. With adequate care, this case can be used as a model for managing CSOM and preventing intracranial problems.

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