

The Unsafe Type of Chronic Suppurative Otitis Media (CSOM) with profound sensorineural hearing loss: Therapy options

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Abstract

Background: Chronic suppurative otitis media (CSOM) is a serious problem in children and adolescents because leading to permanent hearing loss which can have physical, social and psychological impacts. An untreated CSOM can cause Sensorineural Hearing Loss (SNHL), which is a form of intra-temporal complication of CSOM.

Objective: To report a case of a unsafe type of CSOM patient with profound sensorineural hearing loss in left ear and further treatment options.

Case: Reported a 17-year-old female patient who was diagnosed as a patient with unsafe type of CSOM and profound sensorineural hearing loss in left ear. The patient underwent a radical mastoidectomy and used Bone-Anchored Hearing Aid (BAHA) on the left ear.

Conclusion: The diagnosis of the patient is based on anamnesis, physical examination, and supporting examinations. Management of the unsafe type of CSOM aims to remove all pathological tissue, leaving the operating dry cavity and preventing more severe complications. Subsequent planning for post-radical mastoidectomy patients can use hearing aid.

Keywords: Unsafe type of CSOM; Sensorineural hearing loss; Radical mastoidectomy; Bone-Anchored Hearing Aid

1 Introduction

Chronic suppurative otitis media (CSOM) is a serious problem in children and adolescents because leading to permanent hearing loss which can have physical, social and psychological impacts. CSOM that continues for more than 10 years, if untreated, can cause Sensorineural Hearing Loss (SNHL), even life-threatening infectious complications. The prevalence of Otitis media is suspected to be the cause of death of 50,000 children under five per year due to complications of CSOM in developing countries, but this rarely occurs in developed countries. It is estimated that CSOM has an incidence of 65-330 million worldwide, 60% of whom experience hearing loss [1]. Some studies report that in low and middle income countries, 50 percent of otitis media cases lead to incident of hearing loss, although some studies have reported estimates as high as 60-100 percent. The degree of hearing loss associated with otitis media is generally mild. Depending on the degree of hearing loss and the nature of the fluctuations in the middle ear fluid. Speech sounds may be distorted and speech intelligibility may be impaired, which can significantly delay child's ability to acquire speech and language. In addition, auditory processes such as localization and the ability to hear in the presence of noise can adversely affect children's learning [2]. Hearing loss associated with CSOM is primarily conductive due to perforation of the tympanic membrane and a consequence of chronic inflammation. Conductive hearing loss occurs in about half of children with

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CSOM and one fifth results in sensorineural hearing loss. Sensorineural hearing loss is a problem for millions of people [3,4].

Chronic suppurative otitis media can produce inflammatory changes in the round window membrane (RWM) and inflammation of the adjacent scala tympani. This can result in loss of inner and outer hair cells in the basal area and reduction of the stria vascularis area which causes Sensorineural Hearing Loss (SNHL) [5]. Cochlear damage due to untreated CSOM will worsen with time, it is suspected that older children will experience more severe SNHL [5]. CSOM can cause a shift in the threshold at high frequencies. The risk factors for SNHL in CSOM are influenced by the patient's age, duration of otorrhoea, and cholesteatoma. The dangerous type of CSOM tends to produce a more severe degree of deafness. This is because the unsafe type of CSOM tends to be accompanied by the formation of granulation tissue, edema, cholesteatoma, which will cause erosion of the ossicles [6,7]. The presence of cholesteatoma is an indication for radical mastoidectomy. Radical mastoidectomy surgery is performed on unsafe type of CSOM with infection or widespread cholesteatoma. In this operation the mastoid cavity and tympanic cavity are cleaned of all pathological tissue. The boundary wall between the external ear canal and the middle ear with the mastoid cavity is torn down, so that the three anatomical areas become one room. A radical mastoidectomy with a wide meatoplasty is expected to have a permanently dry operating cavity, but there is an anatomical defect which the external ear canal meatus becomes wide. The advantages of radical mastoidectomy are lower recurrence and complications than intact wall tympanoplasty and the need for a second operation is not required. The drawbacks are poor hearing improvement, difficulty using hearing aids, requiring more frequent controls [8,9]. Patients after radical mastoidectomy will experience poor feedback problems when wearing conventional hearing aids because the difficulty in fitting ear molds that are appropriate for their anatomical conditions. For this problem, hearing aid is the solution [10].

The following paragraph is a case of unsafe type of CSOM with profound sensorineural hearing loss and cholesteatoma in a 17-year-old female patient who was treated by radical mastoidectomy on the left ear. A radical mastoidectomy with a wide meatoplasty are expected to have a permanently dry operating cavity, but with a wide external ear canal meatus that makes it difficult to place an appropriate ear mold. Hearing aid the solution for hearing improvement in this case.

2 Case study

A 17 year old female patient came to the ENT-Head and Neck polyclinic at Dr. Zainoel Abidin hospital with the complaints of discharge from the left ear, greenish yellow liquid, thick, smelly, and intermittently. Complaints of the discharge have been felt since 10 years ago. According to the patient, this complaint relapsed if the patient coughs and has ranny nose or gets water in the ear while bathing, however, the complaint decreases if the patient takes medicine obtained from an ENT-Head and Neck specialist. Pain in the left ear has also been felt since 6 months ago, the pain is throbbing and intermittent. The patient also complained of intermittent headaches for the past 6 months. The patient also confessed to have decreased hearing in the left ear which has been started since 4 years before entering the hospital. Complaints of decreased hearing are felt mild at first, but getting worse over time, making difficulty for the patients to hear and communicate with other people. Dizziness (+) like going on a ship has been felt since 2 months, suddenly and repeatedly. History of vomiting, seizures denied. History of drug use is Ofloxacin ear drops and H₂O₂ 3% ear drops.

Physical examination of the ear were revealed a field of Canalis Acusticus Externa (CAE) in the left ear, yellow-green discharge and visible granulation, total perforation of the tympanic membrane, no cholesteatoma and light reflex. Ear otoscopic examination showed granulation of the medial third of the left CAE, the impression was not easy to bleed, the tympanic membrane was completely perforated, the middle ear mucosa was not hyperemic, granulations were found in the middle ear. While the right ear looks normal. CT Scan examination of the right mastoid was within normal limits while the left mastoid showed a picture of left cholesteatoma destroying the left mastoid and left tympanic membrane, left tympanic cavity, left epitympanic recess and left auditory bones (malleus, incus, stapes), part of the left cochlea and left semicircular canal. The tympanic tegmen was intact, there was no intracranial extension. The audiometric examination revealed profound sensorineural hearing loss in the left ear.

The patient was diagnosed with the unsafe type of Chronic Suppurative Otitis Media (CSOM) auris sinistra + profound sensorineural hearing loss in the left ear. A radical mastoidectomy operation was performed on left ear in July 1, 2021.

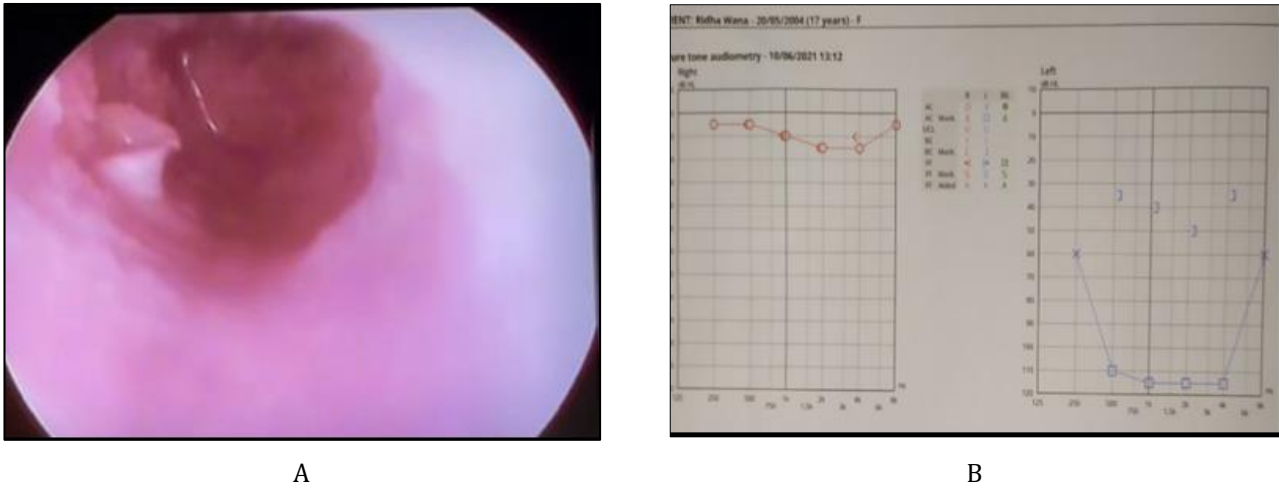


Figure 1 (A) Physical examination of the ear/Otoendoscopy of the left ear. (B) Audiogram



Figure 2 (A) First day post surgery. Complaints of headache and pain in the operation area. Physical examination found: left ear still attached with gauze with minimal blood seepage. House brackmann I. The patient was diagnosed with post radical mastoidectomy auris sinistra on indication of unsafe type of Chronic Suppurative Otitis Media auris sinistra + profound sensorineural hearing loss in the left ear. The patient received ringer lactate 20 drops/minute, meropenem 500 mg/12 hours iv, ketorolac 3% 30 mg/8 hours iv, and transamin 500 mg/8 hours iv. (B) Post surgery on the third day. Complaints of headache decreased, pain in the operating area was minimal and the left ear felt full. Physical examination found: left ear still attached with gauze with minimal blood seepage. House Brackmann I. The patient received ringer lactate 20 drops/minute, meropenem 500 mg/12 hours iv, ketorolac 3% 30 mg/8 hours iv, and transamin 500 mg/8 hours iv. (C) Post surgery on the seventh day. Complaints left ear feels full. Physical examination found: visible wound in the dry left retroauricular region. House brackmann I. The patient received levofloxacin 2x500mg and diclofenac sodium 2x50mg. Plan for the next visit Aff hecting and tampon in the left ear canal. (D) Post operation on the fourteenth day. Complaints left ear feels full. Physical examination found: scar in the left retroauricular region getting better. House brackmann I. The patient received 2x6 drops of ofloxacin in the left ear. Plans to install bone conduction hearing aids with a special design, (Bone-Anchored Hearing Aid) BAHA

3 Discussion

The patient came with the complaints of discharge from the left ear, greenish-yellow liquid, thick, smelling that has been felt intermittently since 10 years ago. According to the patient, this complaint of runny ears recurs if the patient coughs and has a runny nose or gets water in the ear while bathing, but the complaint decreases if the patient takes medicine. Pain in the left ear has also been felt since 6 months ago, the pain is throbbing and intermittent. The patient also complained of intermittent headaches for the past 6 months. The diagnosis of the unsafe type of CSOM is made based on the history, physical examination and supporting examinations. Based on the literature, the patient was diagnosed with CSOM or "Chronic inflammation of middle ear, mastoid, and tympanic membrane disease". CSOM is referred to continuation of the initial episode of acute otitis media with the characteristics of persistent discharge (otorrhea) from the middle ear through a tympanic membrane perforation. If this disease comes and goes or persists for 2 months or more, it can be called chronic. The complications that arise from the unsafe type of CSOM are quite dangerous. In advanced cases, retroauricular abscesses or fistulas (behind the ear) can be seen, polyps or granulation tissue in the external ear canal originating from the middle ear which can be characterized by the discharge in the form of blood, visible cholesteatoma in the middle ear, pus-shaped and smelly secretions (cholesteatoma aroma) [11-14].

The patient also confessed having reduction of hearing ability in the left ear which had been felt since 4 years before entering the hospital. Complaints of decreased hearing are initially felt mild, but getting worse over time, making difficulty for the patients to hear and communicate with other people. Audiometry obtained AD: 11.25 dB and AS: 113.75 dB with the impression of profound sensorineural hearing loss auris sinistra. Sensorineural hearing loss itself is one of the intratemporal complications of CSOM. The presence of BC elevation on the audiogram of CSOM patients indicates a sensorineural factor. Significant difference in BC threshold compared to controls that obtained in the study indicates a role for the cochlea in hearing loss. The difference BC threshold of more or equal to 20 dB at a frequency of 500-4000 Hz in the sick and healthy ear is defined as SNHL related to CSOM [15]. Patient was diagnosed with the unsafe type of CSOM with Profound SNHL because left auris audiometry results of 113.75 dB. The unsafe type of CSOM tends to produce a more severe degree of deafness. This is because the unsafe type of CSOM tends to be accompanied by the formation of granulation tissue, edema, cholesteatoma, which causes erosion of the ossicles. Several studies that found cholesteatoma to be a risk factor for cochlear function impaired in CSOM argue that the presence of cholesteatoma is often associated with prolonged middle ear inflammation [7].

Cholesteatoma can be a sign of CSOM aggressiveness with indicators of the emergence of SNHL. Based on several theories, the pathophysiology of cochlear function damage in CSOM is the entry of bacterial toxins and inflammatory mediators from the middle ear into the cochlea through Round Window Membrane (RWM). Cholesteatoma is an excellent medium for bacterial growth, so that the infection becomes persistent. Chronic infection can result in the accumulation of inflammatory mediators tumor necrosis factor- α (TNF- α), and Interleukin-1 β which increases RWM permeability, so these materials will more easily enter the cochlea. Cholesteatoma also cause bone damage in the semicircular canal area, then the inflammatory mediators can also enter the open section [7]. Non-contrast temporal CT scan showed left cholesteatoma, which destroyed left mastoid, left tympanic membrane, left tympanic cavity, left epitympanic recess and left auditory bones (malleus, incus, stapes), part of left cochlea, and left semicircular canal. The tympanic tegmen is intact, there is no intracranial extension. CT scan of the temporal bone in CSOM is usually done when there is a suspicion of a cholesteatoma. CT scan of the temporal bone demonstrates whether there is erosion or destruction of the lateral wall of the attic (scutum), erosion of the adductal wall of the antrum, displacement and erosion of the ossicles, fistula of the labyrinth, erosion of the facial canal, destruction of pneumatized mastoid cells, erosion of the tympanic tegmen and sigmoid sinus plate. CT scan of the temporal bone can also demonstrates both intracranial and intratemporal abscesses [16].

Microbiological examination of this patient's ear secretions found the organism *Pseudomonas aeruginosa* with the suggestion of antibiotics was meropenem. This is in accordance with the literature that the factors caused otitis media to become chronic are inadequate therapy, high virulence of germs, low patient resistance, and poor patient hygiene [17-20]. The causative bacteria which often found in patients with CSOM from various studies is *Pseudomonas aeruginosa*. (22-44%), *Staphylococcus aureus* (17- 37%), *Klebsiella pneumoniae* (4-7%), *Proteus mirabilis* (3-20%), *Escherichia coli* (1- 21%) and *Proteus vulgaris* (0,9- 3%) [13,21,22]. Other causative bacteria are *Streptococcus haemolyticus*, *Haemophilus influenza* which are the most common causes in children under 5 years old [11,19]. Research in India found an increase in the incidence of SNHL with CSOM after five years of duration. The duration of otorrhoea is associated with an ongoing bacterial infection, particularly the bacterium *Pseudomonas aeruginosa* which has an important influence on inner ear function. This theory is in accordance with this case which experienced otorrhoea for 10 years and the result of microbiological examination was *Pseudomonas aeruginosa* [21].

This patient was selected for radical mastoidectomy or also called canal wall down tympanoplasty. According to the literature, it is stated that the operation chosen for the unsafe type of CSOM is canal wall down tympanoplasty due to the presence of cholesteatoma. The presence of a cholesteatoma is an indication for radical mastoidectomy. The advantages of radical mastoidectomy are lower recurrence and complications than intact wall tympanoplasty. The drawbacks are poor hearing improvement, difficulty using hearing aids, requiring more frequent controls [8]. In this patient, a radical mastoidectomy with meatoplasty was performed. Meatoplasty is the final and important step in performing an effective canal wall down mastoidectomy (CWD) for CSOM sufferers. Meatoplasty creates a sufficiently large CAE and leaves a smaller mastoid chamber which can be easily cleaned and examined unhindered. Large meatoplasty accelerates epithelialization. If meatoplasty is not performed, it can lead to the formation of cholesteatoma, chronic secretions, and postoperative canal stenosis. Patients after radical mastoidectomy with meatoplasty will experience poor feedback problems when wearing conventional hearing aids because they will have difficulty fitting ear molds that are appropriate for their anatomical conditions. For this problem, the installation of hearing aid “Bone-Anchored Hearing Aid (BAHA)” is the solution. This type of hearing aid does not cover the air mold to prevent moisture and skin irritation which will reduce the risk of infection so that dry ear conditions after radical mastoidectomy can be maintained and the patients can hear better [10,22].

4 Conclusion

It has been reported that a 17-year-old female patient, based on anamnesis, physical examination and supporting examinations, the patient was diagnosed with unsafe type of CSOM and profound sensorineural hearing loss in the left ear. Radical mastoidectomy was performed to the patient. This patient had a very severe degree of SNHL due to the long duration of otorrhoea and *Pseudomonas aeruginosa* was found on microbiological examination. Cholesteatoma found in the middle ear and mastoid cavity for a long time. It can also erode the ossicles and the cochlea. Radical mastoidectomy is expected to be achieved in order to produce dry ears and prevent severe complications. Disadvantages of this operation are poor hearing improvement, difficulty wearing hearing aid, requiring more frequent controls. For this problem, installing hearing aid is the solution, because conventional hearing aid will have difficulty fitting ear molds that are suitable for their anatomical conditions. Thus, hearing aid that can be used is Bone-Anchored Hearing Aid (BAHA). This type of hearing aid does not cover the air mold to prevent moisture and skin irritation.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors have declared that no competing interests exist in this study.

Statement of informed consent

All authors declare that informed consent was obtained from all individual participants included in the study.

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