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Swimming As A Risk Factor for Acute Suppurative Otitis Media in A Patient with Contralateral CSOM: A Case Report

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ABSTRACT

Background: Acute suppurative otitis media (ASOM) is a short-lived middle ear infection often triggered by Eustachian tube dysfunction. Swimming, especially in unsterile waters, can be a risk factor for ASOM due to the ingress of contaminated water or pressure changes that disrupt middle ear ventilation. Individuals with contralateral chronic suppurative otitis media (CSOM) are at higher risk due to pre-existing anatomical changes and decreased mucociliary defense. **Case Report :** A 36-year-old man, a physical education teacher, presented with severe pain in his right ear for one week, worsening the previous night, accompanied by otorrhea and hearing loss. The complaints arose after water entered the patient's ear while teaching swimming. Otoscopic examination revealed a 40–50% tympanic membrane perforation with hyperemia in the right ear, and a 20–30% perforation without hyperemia in the left ear. Tuning fork and audiometric examinations confirmed bilateral conductive hearing loss (mild in

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the right ear, moderate in the left ear). The patient was diagnosed with ASOM dextra and inactive chronic otitis media sinistra, then given therapy with Burow's tampon, oral ciprofloxacin, methylprednisolone, acetylcysteine, and education regarding the possibility of operative measures. **Discussion :** This case demonstrates a relationship between water exposure during swimming and the development of ASOM in a patient with contralateral CSOM. The underlying mechanisms involve Eustachian tube dysfunction, impaired middle ear ventilation, and bacterial colonization due to decreased mucociliary defense. The CSOM condition on one side can be a predisposing factor for acute infection on the other side through tube dysfunction and cross-colonization. Comprehensive management includes eradication of infection, control of inflammation, improvement of middle ear ventilation, and patient education to prevent complications such as permanent hearing loss. **Conclusion :** Swimming in unsterile waters can be a gateway for infection causing ASOM, especially in individuals with contralateral CSOM. Early and comprehensive treatment is crucial to prevent complications and preserve hearing function.

Keywords: Swimming, Conductive hearing loss, Tympanic membrane perforation, Acute suppurative otitis media, Contralateral chronic suppurative otitis media

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INTRODUCTION

Otitis media is an inflammation of part or all of the middle ear mucosa, Eustachian tube, mastoid antrum, and mastoid cells. The middle ear is generally sterile, although various microorganisms are present in the nasopharynx and pharynx. Physiologically, there are defense mechanisms that prevent the entry of germs into the middle ear, including the ciliary movement of the Eustachian tube mucosa, as well as the role of enzymes and antibodies. Obstruction or blockage of the Eustachian tube is the main causal factor for acute otitis media. Thus, the primary barrier against bacterial invasion is lost, and bacterial species that are not usually pathogenic can colonize the middle ear, attack tissues, and cause infection. The most commonly encountered bacteria include *Streptococcus pneumoniae*, *Haemophilus influenzae*, and beta-hemolytic *Streptococcus*. By far, *Streptococcus pneumoniae* is the most frequent causative organism in all age groups. [1,2,3,4]

Acute suppurative otitis media (ASOM) is a middle ear infection that occurs acutely and lasts for a short period. This disease can affect all age groups, but its incidence is quite high in populations that frequently experience upper respiratory tract infections and those frequently exposed to water while swimming, who have a higher risk of experiencing disease symptoms, especially ear infections, compared to those not in direct contact with water (young, et al 2023).5,6 ASOM occurs because the body's defense factors are compromised. Obstruction of the Eustachian tube is the main causal factor for otitis media. Because the function of the Eustachian tube is impaired, the prevention of germ invasion into the middle ear is also disrupted, allowing germs to enter the middle ear and inflammation to occur.[1,4]

Swimming, especially in pools or unsterile waters, particularly in the presence of contralateral CSOM, is one of the risk factors for ASOM. Water exposure can facilitate the entry of bacteria into the middle ear through two main mechanisms: impaired Eustachian tube function due to pressure changes and the entry of water through a pre-existing tympanic membrane perforation or due to micro-trauma. Furthermore, water exposure can worsen the condition of an ear that already

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has a history of chronic infection, thereby triggering recurrence.[5,7]

Tympanic membrane perforation in ASOM can be unilateral or bilateral. Bilateral perforation is relatively rare in acute ASOM and is generally found in patients with a history of chronic otitis media in one ear. This condition can cause conductive hearing loss of varying degrees, depending on the size of the perforation and the involvement of other middle ear structures.[9,10]

This case report presents an adult male who experienced ASOM in the right ear due to water exposure while swimming, with a finding of bilateral perforation where one ear had active inflammation and one ear was in an inactive phase. This report aims to describe the relationship between swimming and the incidence of ASOM, the mechanism of bilateral perforation, and the importance of comprehensive management to prevent complications and permanent hearing loss.

CASE REPORT

A 36-year-old man came to the ENT polyclinic at RSUD Haji with complaints of severe ear pain in the right ear for 1 week, which had worsened since the previous night, making it difficult to sleep due to pain radiating to the head, accompanied by clear discharge from the right ear. Initially, water entered the patient's ear while teaching his students to swim, then pain arose behind the ear that night but was ignored until the next day when there was bleeding, yet the patient still left it for a week. The complaints were accompanied by tinnitus and hearing loss. Other complaints were denied.

The patient did not complain of high fever, cough, cold, or previous upper respiratory tract infection symptoms. There was no history of head trauma, impact to the ear, or use of ear-cleaning tools. The patient also denied a history of deep-sea diving, flying, or traveling to areas with extreme air pressure. A history of sore throat, allergies, and systemic diseases was also denied.

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Physical examination revealed a general state of appearing mildly ill, consciousness compos mentis, blood pressure 122/80 mmHg, pulse 77x/minute, respiration 20x/minute, and temperature 36.5°C. Otoscopic examination found the tympanic membrane in the right ear had a 40-50% perforation, was hyperemic, and the light reflex was absent. Meanwhile, the left ear also had a 20-30% perforation without hyperemia (figure 1).



Figure 1. Otoscopic examination of the right and left ear

Ancillary examinations in this case included a tuning fork examination, which yielded bilateral Rinne negative, Weber lateralization to the left, and prolonged Schwabach in both ears. This was followed by an audiometric examination, which found mild conductive hearing loss in the right ear and moderate conductive hearing loss in the left ear (figure 2). The patient was diagnosed with acute suppurative otitis media dextra and inactive otitis media sinistra and was given management with Burow's tampon, Ciprofloxacin 2 x 500 mg, Methylprednisolone 2 x 4 mg, Acetylcysteine 3 x 200 mg, and the patient was given education for a surgical plan.

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Table 1. Audiometric Examination Results

		250 Hz	500 Hz	1000 Hz	2000 Hz	3000 Hz	4000 Hz	6000 Hz	8000 Hz
D (Right)	AC	40	40	35	15	20	35	35	45
	BC	5	5	5	10	10	10	5	5
S (Left)	AC	60	60	55	25	35	40	25	40
	BC	0	0	10	15	5	0	0	0
MASKING									
D (Right)	AC	45	45	-	-	-	-	-	-
	BC	10	10	10	-	15	15	10	10
S (Left)	AC	65	65	60	-				
	BC	10	10	15	20	10	10	5	10

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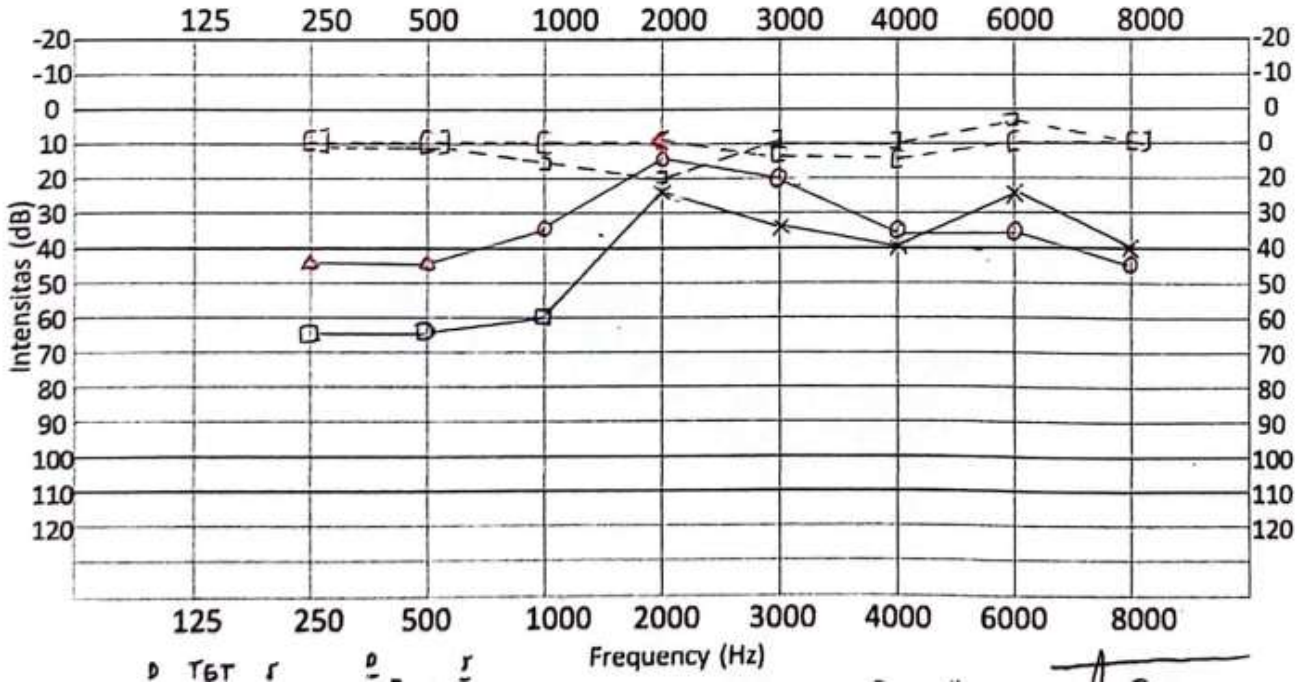


Figure 2. Audiometric Examination Results

DISCUSSION

Otitis media is an inflammation of part or all of the middle ear mucosa, Eustachian tube, mastoid antrum, and mastoid cells.[1] Acute suppurative otitis media (ASOM) is an acute infection of the middle ear within a short time.[4] This disease generally begins with impaired Eustachian tube function due to an upper respiratory tract infection or the entry of water containing pathogenic germs into the ear.[5,6] Eustachian tube blockage is the main causal factor for otitis media. Because the function of the Eustachian tube is impaired, the prevention of germ invasion into the middle ear is also disrupted, allowing germs to enter the middle ear and inflammation to occur.[1] In this case, the patient is a 36-year-old man who works as a physical education teacher and experienced severe pain in the right ear after water entered while teaching swimming. The complaints developed into severe pain radiating to the head, accompanied by discharge from the ear, tinnitus, and hearing loss. This reflects a sufficiently severe and active inflammatory process characteristic of ASOM.[6,11,12]

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Pathophysiologically, infection entering the middle ear cavity via the Eustachian tube causes inflammation, exudate accumulation, and increased pressure within the ear cavity. This pressure then causes rupture or perforation of the tympanic membrane, allowing secretions to exit through the ear canal. On otoscopic examination, a 40–50% tympanic membrane perforation was found in the right ear and 20–30% in the left ear. This corresponds to the clinical findings of active ASOM in the right ear and inactive chronic otitis media in the left ear. This can be explained by the possibility that the left ear had experienced inactive chronic otitis media or an old perforation that the patient was unaware of, while the right ear experienced acute ASOM that had just occurred due to water exposure while swimming. The loss of the light reflex in the right ear indicates a change in the tympanic membrane structure due to edema and inflammation. The central perforation found in both ears is consistent with perforation due to an infectious process, where the tear occurs in the pars tensa due to increased pressure.[12,13,14]

The tuning fork examination showed bilateral Rinne negative, Weber lateralization to the left, and prolonged Schwabach, which points to conductive hearing loss. Audiometry also confirmed the presence of mild conductive hearing loss in the right ear and moderate in the left ear. The mechanism of conductive hearing loss in ASOM is caused by impaired sound transmission from the outer ear to the inner ear due to tympanic membrane perforation and the accumulation of secretions in the tympanic cavity.[15,16]

The diagnosis for this patient was Acute Suppurative Otitis Media dextra and Inactive Chronic Otitis Media sinistra, which was established based on anamnesis, ENT physical examination, otoscopy, and audiometric hearing examination. This diagnosis is consistent with the clinical guidelines from Soepardi et al. (2018), which state that ASOM is characterized by ear pain, otorrhea, and conductive hearing loss due to tympanic membrane perforation.[1,12]

The management principles for ASOM include eradication of infection, control of inflammation, improvement of middle ear ventilation, and prevention of complications.

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Management in this patient included giving a Burow's tampon to control secretions, the antibiotic Ciprofloxacin 2 x 500 mg to treat bacterial infection, especially *Pseudomonas aeruginosa* and *Staphylococcus aureus*, which are often associated with infections from swimming. Methylprednisolone 2 x 4 mg was given as a systemic anti-inflammatory to reduce edema and pain, and acetylcysteine 3 x 200 mg as a mucolytic to help expel secretions. If improvement (resolution) does not occur, discharge will usually be seen from the external ear canal due to perforation of the tympanic membrane. This condition can be caused by persistent edema of the middle ear mucosa. In such situations, antibiotics can be continued for up to 3 weeks. If after 3 weeks of therapy, secretions are still abundant, it is possible the patient has developed mastoiditis. Additionally, the patient was also educated about the possible need for operative measures if the perforation does not close spontaneously, such as myringoplasty or tympanoplasty.[1,17,18]

In general, the prognosis for ASOM is good if treated appropriately and early. Appropriate management can prevent serious complications such as mastoiditis, brain abscess, and meningitis. In this case, the patient was treated with medical therapy and periodic monitoring was carried out to ensure the healing process and to consider surgical management if necessary.[1,12]

This case shows a clear relationship between swimming and the incidence of ASOM, with a unique clinical manifestation of bilateral perforation, one found to be acute and one inactive. The relationship between chronic suppurative otitis media (CSOM) in the left ear and acute suppurative otitis media (ASOM) in the right ear can be explained through interconnected physiological and immunological pathways. CSOM that has been present for a long time in one ear (e.g., the left) causes anatomical and functional changes in the middle ear mucosa as well as Eustachian tube dysfunction. This chronic condition indicates ciliary epithelial damage, decreased protective mucus production, and persistent pathogenic bacterial colonization, such as *Pseudomonas aeruginosa* or *Staphylococcus aureus*. Consequently, the local immune system in the nasopharynx and Eustachian tube becomes compromised, leading to a weakened mucociliary response. When the patient is exposed to water while swimming, especially in unsterile conditions, bacteria and microorganisms

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can easily enter through the Eustachian tube or directly into the tympanic cavity of the contralateral (right) ear. Furthermore, pressure changes during swimming can worsen Eustachian tube dysfunction, creating negative pressure in the middle ear that facilitates the aspiration of pathogens from the nasopharynx. This combination of factors triggers acute inflammation in the right ear, causing mucosal edema, exudate accumulation, increased intratympanic pressure, leading to tympanic membrane perforation and the formation of ASOM. Thus, CSOM on one side acts as a systemic and anatomical predisposing factor that increases susceptibility to acute infection on the contralateral side due to impaired ventilation balance and cross-bacterial colonization.[1,5,6,7]

Comprehensive management that includes eradication of infection, control of inflammation, and patient education is crucial to prevent complications and permanent hearing damage. Preventive education must be an integral part of management, especially for individuals who are frequently exposed to water in their daily activities.

CONCLUSION

Swimming, especially in unsterile waters, is proven to be a risk factor for acute suppurative otitis media (ASOM), particularly in individuals with contralateral chronic suppurative otitis media (CSOM). The main mechanisms involve Eustachian tube dysfunction and decreased mucociliary defense due to exposure to contaminated water. This case confirms that seemingly mild environmental exposure like swimming can trigger an acute ear infection in individuals with anatomical predispositions or a history of chronic infection.

Comprehensive management including antibiotic therapy, anti-inflammatories, local care, and preventive education is the key to success in preventing complications such as permanent hearing loss. Patient education regarding the importance of maintaining ear hygiene and avoiding swimming without protection becomes a primary preventive step to reduce the incidence of ASOM in at-risk populations.

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