CASE REPORT

Intisari Sains Medis 2024, Volume 15, Number 1: 1-4
P-ISSN: 2503-3638, E-ISSN: 2089-9084

Intisari Sains Medis

Published by Intisari Sains Medis

Canalplasty using osteotome in a unilateral ear auditory exostoses (EAE) without cold water exposure: a case report

Made Dyanti Enantya Suparta[1*], Hamsu Kadriyan[1], Dita Mutia[1], Hilda Santosa[1], Baiq Ratna Kumaladewi[2]

[1]Department of Ear, Nose and Throat, Faculty of Medicine, Universitas Mataram, West Nusa Tenggara General Hospital, Mataram, Indonesia
[2]Department of Anatomical Pathology, West Nusa Tenggara General Hospital, Mataram, Indonesia

*Corresponding to:
Made Dyanti Enantya Suparta; Department of Ear, Nose and Throat, Faculty of Medicine, Universitas Mataram, West Nusa Tenggara General Hospital, Mataram, Indonesia;
supartadea97@gmail.com

Received: 2023-10-02
Accepted: 2023-11-12
Published: 2024-01-04

ABSTRACT

Background: Ear auditory exostoses (EAE) or surfer's ear is a slow benign bony growth within the external auditory canal (EAC). The exact etiology of EAE remains unclear but it is commonly associated with chronic exposure to cold water or wind. The technique of surgery can be transcanal, endaural, or postauricular approach, based on the surgeon's experience. To our knowledge, this is the first documented report of a patient with recurrent EAE without cold water exposure. The purpose of this study is to present a rare case report about a woman with unilateral EAE without cold water exposure with transcanal osteotome surgical approach.
Case presentation: A 29-years-old woman was referred to the Ear, Nose, and Throat Department, West Nusa Tenggara General Hospital, Mataram, Indonesia with left ear fullness since one week ago. The patient was told that she had a lump within the ear canal since 2013 but she had no symptoms. There was no history of recurrent ear infection or participating in water activities. Otoscopy of the left ear revealed a lump rising from EAC that covers 90% of EAC. We could not visualize the left tympanic membrane. The CT scan of her temporal bone demonstrated a hard density mass in the left EAC. The patient was done surgically with a transcanal approach. Indication for this patient was the occlusion of more than 80% of EAC. Transcanal with osteotome was chosen because of its less complication than others.
Conclusion: It is unusual that our patient developed EAE without the usual precipitating factor. The surgery was done with a transcanal approach with an osteotome to prevent complications postoperative. Future experimental studies should be performed.

Key Words: exostoses, osteotome, surfer's ear, transcanal approach.
Cite This Article: Suparta, M.D.E., Kadriyan, H., Mutia, D., Santosa, H., Kumaladewi, B.R. 2024. Canalplasty using osteotome in a unilateral ear auditory exostoses (EAE) without cold water exposure: a case report. *Intisari Sains Medis* 15(1): 1262-1265. DOI: 10.15562/ism.v15i1.1930

INTRODUCTION

Ear auditory exostoses (EAE) or surfer's ear is a slow benign bony growth within the external auditory canal (EAC). The exact etiology of EAE remains unclear but it is commonly associated with chronic exposure to cold water or wind.[1-3] Incidence of EAE around 0,3% with prevalence of EAE is 6.3 per 1000 people with surfers having the highest risk to EAE apart from other watery activities. The ratio of men to women varies from 6/1 to 14/1 with men having higher risk to develop EAE. The length of time a person surfs affects the incidence of EAE and the severity of exostosis. EAE is often found in people who have been surfing regularly for more than 20 years compared to people who surf for less than 5 years.[3-5] Study a in population of 307 surfers found EAE around 61,1% in surfers who surfed for 10 years or less and 82% reported severe EAE who surfed more than 10 years. Temperature of the water is also related to EAE especially if the temperature is below 19°C. It will increase the incidence of EAE on swimmers who swim almost every day in cold water (18-20°C). It is also mentioned that genetic factors also play a role in the formation of EAE.[6-8]

Some other possible etiologies are alcoholism, ear piercing, mastication stress, cranial deformation, chronic infection, chronic irritation, gout, rheumatism, bathing, cold water, swimming, and genetics. Since the 19th century, the cause of EAE has been thought to be genetic, but several studies that support this hypothesis also said that mechanical or chemical stimuli can cause irritation of the auditory canal that causes the formation of EAE. Current researchers agree that EAE is most likely caused by environmental factors, while genetic factors only play a small role.[6,9] The exact pathogenesis of EAE is barely known but it is likely caused by repeated irritation of the external auditory canal. The skin layer of the external auditory canal is very thin because there is no adnexal structure so

the distance between periosteum layer and skin surface is quite small. If there is chronic irritation to the skin such as cold water exposure below 19^{0}C. It causes prolonged redness and local hyperemia on the ossification part, causing a cellular inflammatory process that initiates a repair response. Repair response result from the action of osteoblast and osteocytes that work together to create new bone called exostoses.[6,10] The uncontrolled coordination of osteoblast-osteoclast activity causes histology of EAE inconsistently varies from compact bone tissue with some Haversian canals to spongy centered protuberances.[10]

EAE are usually asymptomatic and discovered incidentally through otoscopy examination. However, EAE can be symptomatic if the stenosis is greater than 80% covering the external auditory canal. The patient may develop conductive hearing loss, repeated wax retention, ear fullness, recurrent otitis externa with otalgia or tinnitus.[1-3] The grading system of EAE through otoscopy examination from grade 0 (not identified), grade I (≤33% obstruction), grade II (34-66% obstruction), and grade 3 (≥67% obstruction).[11,12] The gold standard for diagnosis of EAE is CT Scan images especially in preparation for surgery. CT Scan reveal hard density protuberance in the pars osseous of the external auditory canal, usually located medial to the isthmus.[11]

Treatment of EAE may be conservative or surgical therapy. Conservative therapy includes avoiding exposure, using earplugs, and keeping ears clean. Medical treatment is symptomatic given to the patient. Indications for surgery are recurrent otitis externa, hearing loss, and occlusion of the ear canal more than 80%.[5-8] Most authors recommend complete total removal rather than subtotal removal due to prevent early recurrence. The most frequent uses in surgical techniques involve endaural, postauricular, and transcanal approach. Some of the tools to remove EAE are drills, chisels, and osteotome. Each of the surgical techniques is mostly chosen based on the operator's experience and the complication of the technique.[3-7] Therefore, this study aims to present a case report of a woman with unilateral EAE without cold water exposure with transcanal osteotome surgical approach.

CASE PRESENTATION

A 29-year-old woman was referred to the Ear, Nose and Throat department with left ear fullness one week ago. She also felt a slight decrease of hearing on the left side. The patient was told that she had a lump within the ear canal since 2013 but she had no symptoms. The patient had this condition before and underwent surgery in 2010. There was no history of recurrent ear infection or participating in water activities. Systemic physical examination did not reveal any abnormalities. Otoscopy of the left ear revealed a lump rising from EAC that covers 90% of EAC. The skin of the external auditory canal of the left ear was reddish compared to surrounding skin. We could not visualize the left tympanic membrane because of the occlusion. On palpation, the inner part of the thin skin is considered hard tissue such as bone. Otoscopy examination of the right ear was normal. The CT scan of her temporal bone demonstrated a hard density mass in the left EAC.

The patient underwent surgery using a transcanal approach with a microscope. Lidocaine with epinephrine 1:100.000 was injected into the bony cartilaginous junction. A skin incision around the exostosis is made to see the extent of the bone lesion. The lesion is broken up by gently tapping the base of the lesion with a straight osteotome. The bone mass that has been removed from the base is completely taken using forceps. The section is then saved for histopathological examination. The ear canal is irrigated with saline

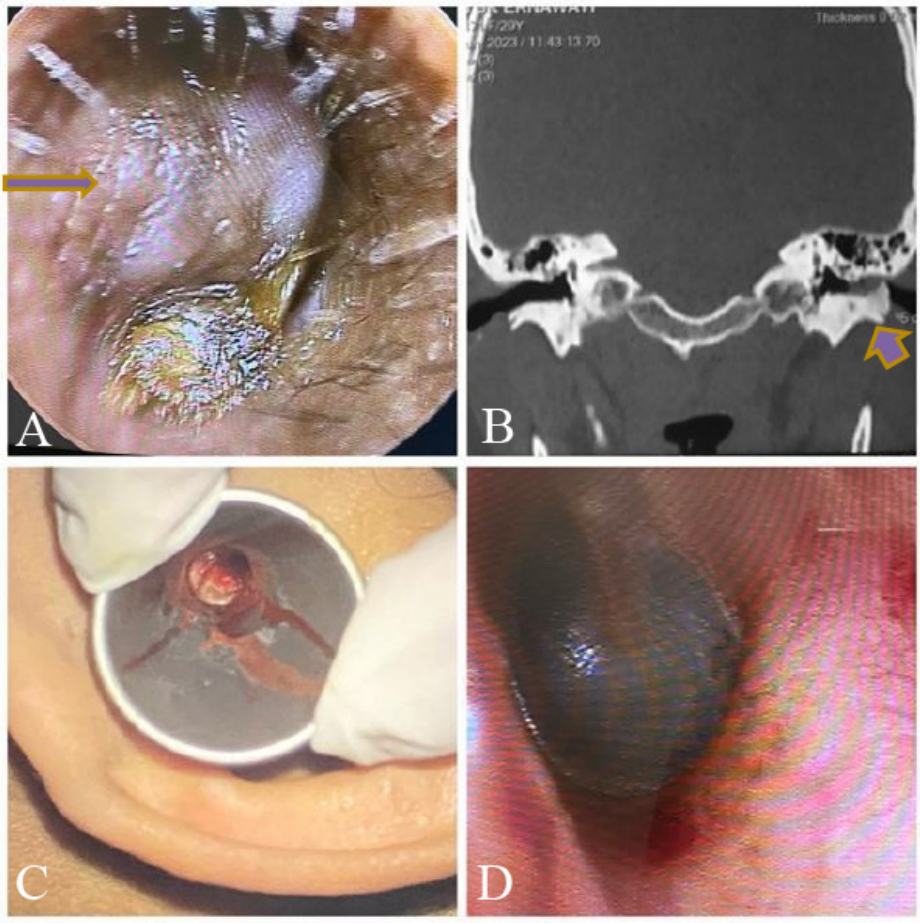

Figure 1. Image of a 29-year-old woman with external auditory exostosis. (A) Endoscopic image showing the left external auditory canal, the lesion almost covers 90% of the external auditory canal. (B) Temporal bone CT scan shows a dense mass on the left auditory canal. (C) image of the lesion during the surgical procedure. (D) Follow-up of endoscopic view 4 weeks after surgery. The patient was asymptomatic and free of complications or relapse.

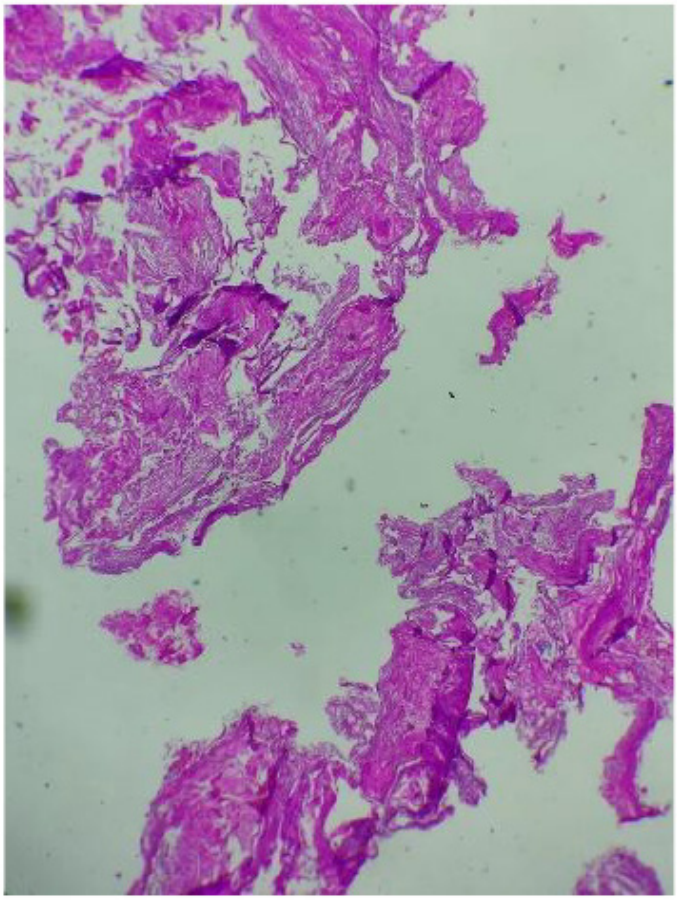

Figure 2. Histopathology shows keratin flakes and a little fibrous connective tissue.

then suctioned, then re-inspected. The tympanic annulus is intact because the medial skin of the exostosis is not disturbed. The skin edge is then returned to the base of the exostosis. Spongostan (gel foam) is given from the tympanic membrane to the lateral canal. The patient is then awakened from general anesthesia for post-operative care.

The histopathological results of the mass were the presence of keratin flakes and a little fibrous connective tissue. The patient was routinely monitored for 1 month, and there were no postoperative complications such as auditory canal infection, facial paralysis, tympanic membrane perforation, temporomandibular joint (TMJ) disorders, and no recurrence.

DISCUSSION

Ear auditory exostosis (EAE) is a bony protrusion near the tympanic annulus medial to the isthmus of the external auditory canal. The exact cause of EAE is not yet known but it is usually related to chronic exposure to cold water or cold air, usually known as surfer's ear. The length of the period of exposure to water and also the temperature of the water influence the severity of the exostosis.[1-3] Previously it was stated that genetic factors and inflammation were the causes of EAE, but currently it is more likely due to mechanical and chemical factors.[6] In this case, the patient did not have history of exposure to cold water and these mass have been felt known since 2013. This patient is a case where there is no history of exposure, genetic factors, or inflammation. To the authors' knowledge, only 1 adult and 1 child was reported with exostosis with no exposure to cold water. There are several cases of osteoma and exostosis occurring in the internal auditory canal. Therefore, exostosis can occur without direct stimulation such as exposure to cold water or cold air.[13]

Exostoses usually occur asymptomatically and are discovered accidentally during otoscopic examination. Patients will only experience symptoms if the occlusion is >80%. Symptoms that may be developed are conductive hearing loss due to occlusion, repeated wax retention, ear fullness, recurrent otitis externa with otalgia or tinnitus.[1-3] This patient was initially found accidentally in 2013 and had no symptoms, but complained of a feeling of fullness in the ears and a slight decrease in hearing about 1 week before going to the ENT clinic. An otoscopic examination found that there was a mass covering 90% of the external auditory canal. In this patient, grade III (severe) exostosis was found due to obstruction of >67%. Exostosis generally found on the medial side to the isthmus although they can be found on the anterior or superior of the canal wall whereas osteoma usually arise in the lateral part of the isthmus and have a pedunculated or lobular appearance. That composed of dense ivory bone and considered to be true pathological benign tumours of the bone.[10]

This patient had previously undergone conservative therapy since 2013 because the patient had no significant symptoms. Currently the patient complains of fullness in the left ear and a slight decrease in hearing as well as >80% occlusion so it is decided to undergo surgery. There are 3 types of approaches, namely transcanal, endaural, and retroauricular. Surgeons prefer transcanal because it is more minimally invasive than retroauricular which requires a wider incision. Transcanal can also minimize healing time, pain and scarring.[3,14] Almost all postauricular or endaural approaches use drills and drill bits, whereas transcanal approaches usually use osteotome, chisel, curettes and gouges. The patient underwent total removal to prevent early recurrence.[3] Osteotome was chosen to reduce complications such as smaller external auditory canal skin damage, reduce the incidence of sensorineural hearing loss (SNHL), and a faster healing time compared to using a drill. The use of drills is said to increase the incidence of prolonged inner ear symptoms such as SNHL because the vibrations produced by the drill can be transmitted into the cochlea. The use of an osteotome can also cause TMJ disorders or benign paroxysmal positional vertigo (BPPV) due to the

pressure generated during surgery.[11-15]

Osteotome-drill, and osteotome-piezoelectric, it was found that the use of osteotome alone gave the best results with the lowest complications compared to a combination of other tools.[15] In a study of 140 patients with 221 ears who underwent surgery. with an osteotome. Healing was achieved in 2 to 8 weeks with an average of 3.5 weeks and 90% recovered within 4 weeks.[16] In a study 138 ears in 106 patients who underwent surgery with an osteotome measuring 1 or 2 mm, it was found that 80% of patients recovered within 3 weeks without any postoperative complications.[7-11] There were 9 patients with tympanic membrane perforation but were given gelfoam or intraoperative fascia myringoplasty. These were shown that using only an osteotome via transcanal without the use of a drill is also safe, effective, and provides several benefits. In addition, the osteotome has a flat tip compared to a drill which has a round tip so it can lift along the lesion and is quicker to visualize the tympanic membrane. If the tympanic membrane is visible early, you can remove other lesions, especially the medial part, and remain careful with the position of the tympanic membrane that is already visible.[14-15]

Another frequent complication is facial nerve paralysis, especially if it is in the posterior inferior aspect of the external auditory canal where the facial nerve is approximately 2-4 mm lateral or at the level of the tympanic annulus. So far, the patient has not experienced complaints of facial nerve paralysis, but it is still a concern because of its possibility. There are several points to avoid complications, namely (1) doing a CT scan of the temporal bones without contrast on axial, coronal and sagittal cuts to describe EAE anatomy in 3 dimensions and the distance to the tympanic membrane; (2) It is recommended to remove the anterior exostosis first to obtain early visualization of the tympanic membrane unless there are obstacles to removing the anterior portion; (3) if the tympanic membrane is visible, it should be covered with gelfoam to avoid debris or bone fragments that can tear the tympanic membrane; (4) if the size is large, it is better not to remove the exostosis completely; (5) do not use a curette near the tympanic membrane because it can put pressure on the tympanic membrane and malleus resulting in perforation of the tympanic membrane and dislocation of the malleus.[14-17]

CONCLUSION

It is unusual that a patient will develop into EAE without the usual precipitating factor like cold water exposure. The surgery was done with a transcanal approach for minimal invasive surgery. The use of osteotome is to prevent complications postoperative. Future experimental studies should be performed.

CONFLICT OF INTEREST

The author reports no conflicts of interest in this study.

FUNDING

The authors are responsible for the study funding without the grant, scholarship, or other funding resources.

ETHICAL STATEMENT

The authors have secured informed consent from the patient regarding this study.

AUTHOR CONTRIBUTION

All of the authors equally contributed to the study.

REFERENCES

1. Simas V, Hing W, Furness J, Walsh J, Climstein M. The Prevalence and Severity of External Auditory Exostosis in Young to Quadragenarian-Aged Warm-Water Surfers: A Preliminary Study. *Sports (Basel)*. 2020;8(2):17.
2. Sintya E, Wedari NLPH, Budayanti NNS, Rahayu NLMM. Modifications in Adenoviral vectors to enhance its tropism: a literature review. *Journal of Clinical Microbiology and Infectious Diseases*. 2022; 2(2):22-26.
3. Barbon DA, Hegde R, Li S, Abdelbaki A, Bajaj D. Bilateral External Auditory Exostoses Causing Conductive Hearing Loss: A Case Report and Literature Review of the Surfer's Ear. *Cureus*. 2017;9(10):e1810.
4. Wegener F, Wegner M, Weiss NM. External auditory exostoses in wind-dependent water sports participants: German wind- and kitesurfers. *Eur Arch Otorhinolaryngol*. 2022;279(5):2353-2361.
5. Chen CK, Chang KP, Chien CY, Hsieh LC. Endoscopic transcanal removal of external auditory canal osteomas. *Biomed J*. 2021;44(4):489-494.
6. Ridwan A, Husni TRT, Machilah N, Aria Z. Comparison of angle, length, and diameter of the eustachian tube of safe and unsafe CSOM based on CT scan in Dr. Zainoel Abidin General Hospital, Banda Aceh, Indonesia. *Bali Medical* Journal. 2021;10(2):510-514.
7. Yuliyani EA, Sutanegara SWD, Muliartha IM. Effectiveness of nasal irrigation with isotonic saline against interleukin-8 levels and quality of life in chronic rhinosinusitis patients. *Bali Medical Journal*. 2019;8(3):750-754.
8. Dongol K, Shadiyah H, Gyawali BR, Rayamajhi P, Pradhananga RB. External Auditory Canal Cholesteatoma: Clinical and Radiological Features. *Int Arch Otorhinolaryngol*. 2021;26(2):e213-e218.
9. Rahayu ML, Pinatih GNI, Setiawan EP, Lesmana IWL, Pinatih KTMN, Arthana IMN, Widiantari IGAPW. Development of a tinnitus sound generator that matches the sound of tinnitus patient. *Bali Medical Journal*. 2022;11(2):1018-1022.
10. Rhys Evans PH, Cameron M. Aural exostoses (surfer's ear) provide vital fossil evidence of an aquatic phase in Man's early evolution. *Ann R Coll Surg Engl*. 2017;99(8):594-601.
11. Montebello B, Vella S, Grech R. The Chronically Blocked Ear - A dive into external auditory exostosis. *BJR Case Rep*. 2022;8(4):20220010.
12. Simas V, Hing W, Pope R, Climstein M. Australian surfers' awareness of 'surfer's ear'. *BMJ Open Sport Exerc Med*. 2020;6(1):e000641.
13. Yilmaz BM, Egemen E, Tekiner A, Öcal Ö. Bilateral Cerebellopontine Angle Osteomas: Case Report and Review of the Literature. *Asian J Neurosurg*. 2019;14(1):280-282.
14. Shohet J, Justeson D, Wilkins A. Transcanal Excision of Exostoses: Large Series Comparing Bone Removal Methods. *Otolaryngol Head Neck Surg*. 2023;169(4):999-1004.
15. Hsieh CY, Sun CH, Lin WL, Gotamco GL, Hsu CJ, Wu HP. Modified transcanal cochlear implantation in CHARGE syndrome: A case report. *Medicine (Baltimore)*. 2019;98(50):e18283.
16. Voss SE, Horton NJ, Fairbank KE, Xia L, Tinglin LRK, Girardin KD. Measurements of ear-canal cross-sectional areas from live human ears with implications for wideband acoustic immittance measurements. *J Acoust Soc Am*. 2020;148(5):3042.
17. Kurosawa M, Taniguchi K, Momose H, Sakaguchi M, Kamijo M, Nishikawa A. Simultaneous Measurement of Ear Canal Movement, Electromyography of the Masseter Muscle and Occlusal Force for Earphone-Type Occlusal Force Estimation Device Development. *Sensors (Basel)*. 2019;19(15):3441.