

Review Article

The Aural Protuberance -External Auditory Canal Exostoses

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OPEN ACCESS**Preface**

External auditory canal exostosis is an irreversible, benign, bilateral, multinodular overgrowth of osseous tissue confined to the bony segment of external auditory canal. The condition frequently arises due to repetitive immersion of the ear in cold water or exposure to cold wind. Exostosis of the external auditory canal is additionally designated as Surfer's ear. Lesions are composed of reactive, localized overgrowth of bony exostoses with a broad base.

External auditory canal exostoses can be circumvented with awareness and prevention of repetitive, chronic exposure to cold water and wind. Consistent employment of physical protection to the ear as earplugs and wetsuit hood during exposure to cold water or wind is recommended in order to mitigate emergence and progression of auditory canal exostoses.

Disease Characteristics

Exostoses of external auditory canal is bilateral, irreversible and engendered by concomitant and chronic ear exposure to cold wind and water. The preventable condition is commonly associated with surfing although may arise in swimmers, divers, kayakers or participants of maritime activities [1,2].

External auditory canal exostoses emerges due to prolonged irritation of external auditory canal. Characteristic, repetitive exposure to cold seawater initiates configuration of new bone upon the tympanic ring within external auditory canal. Prevalence and disease severity is contingent to cumulative duration and frequency of exposure to cold water or wind. External auditory canal exostoses is prevalent within coastal areas with frequent exposure to cold water or wind. Disease prevalence varies from 26% to 73% within specific populations such as surfers or individuals engaged in maritime activities [1,2].

Repetitive, long-term exposure to cold water is a major contributory factor towards emergence of the condition. Annual increment of occurrence of external auditory canal exostoses contingent to exposure to cold water is around 12%. Duration of exposure and temperature of cold water is concordant to severity of obstruction of auditory canal initiated by exostoses [1,2].

A male predominance is observed. Significant exostoses with obstruction of ear canal exceeding > two thirds of the circumference is common in males, in contrast to the females [1,2].

The condition is commonly discerned within the third decade or fourth decade although no age of disease emergence is exempt [3,4].

Ear canal obstruction engendered by exostoses is generally proportional to severity of clinical symptoms [3,4]. Disease severity is categorized contingent to proportionate occlusion of external auditory canal as

- mild disease or grade I which is associated with below <33% occlusion of external auditory canal.
- moderate disease or grade II is accompanied by 33% to 66% occlusion of external auditory canal.
- severe disease or grade III demonstrates > 66% occlusion of external auditory canal [2,3].

Disease Pathogenesis

Frequent and extended exposure to cold water or wind gradually induces bone growth within external auditory canal. Of obscure pathogenesis, it is posited that cold water induces vasodilation within the bony auditory meatus thereby enhancing vascular tension. Accompanying inflammation engenders periostitis. Besides, inflammatory process augments osteoblastic activity with subsequent fibrosis and ossification inducing configuration of new bone within the external auditory canal [3,4]. The tympanic ring is layered by attenuated stratified squamous epithelium coating subjacent temporal bone. Aforesaid region is a pathological site of configuring bony exostoses. Also, superimposed stratified squamous epithelium and subjacent periosteum is devoid of intervening subcutaneous tissue which contributes to bone growth and extension into the external auditory canal [3,4].

Configuration of external auditory canal exostoses is contemplated to be a protective mechanism which buffers the tympanic membrane from cold water or wind [3,4]. Typically, bone growth within exostoses arises medially or anteriorly consequently engendering partial or complete occlusion of external auditory canal. Sub-epithelial layer within the lateral auditory canal is dense, in contrast to medial aspect. Consequently, vasodilation with subsequent articulation of bone may be minimal [3,4].

Also, external auditory canal exostoses may be generated due to altered pH of immersing water or water-borne chemical or physical irritants. Although benign, occlusion due to exostosis can entrap debris within the auditory canal and engender conductive deafness with emergence of recurrent otitis externa [3,4].

Clinical Elucidation

External auditory canal exostoses with multiple, bilateral lesions is usually asymptomatic. Nevertheless, benign external auditory canal exostoses can engender conductive deafness, recurrent otitis externa, otalgia, otorrhea, impaction of cerumen and water trapping [5,6].

Gradual progression of external auditory canal exostoses is associated with decimated hearing, ear fullness, chronic otitis externa or a sensation of water entrapped within the auditory canal [5,6].

Enlarged lesions can significantly obstruct external auditory canal. Although exceptional, pain arises as a consequence of otitis externa induced by exostoses [5,6].

Typically, incriminated subjects depict secondary manifestations as pain in the ear, deafness or sensation of fullness of external auditory canal. Afore-said symptoms arise due to otitis externa, ruptured tympanic membrane and cerumen or foreign body impacted within the auditory canal [5,6].

Histological Elucidation

Upon gross examination, a broad-based, heaped-up, non-pedunculated bony proliferation is observed which simulates normal bone cortex [5,6].

Exostoses of external auditory canal is composed of parallel, concentric layers of sub-periosteal bone admixed with abundance of osteocytes. Bone marrow spaces are absent. Bony exostoses is superimposed with periosteum and an attenuated superficial squamous epithelial layer [5,6].

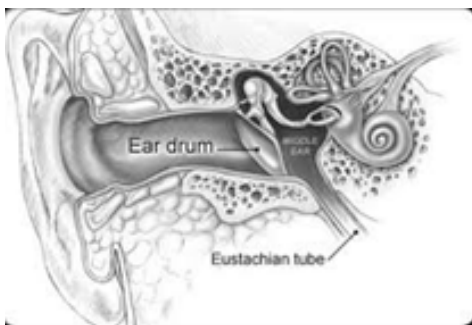


Figure 1: External auditory canal exostoses demonstrating broad-based bony thickening in the ear canal [9].

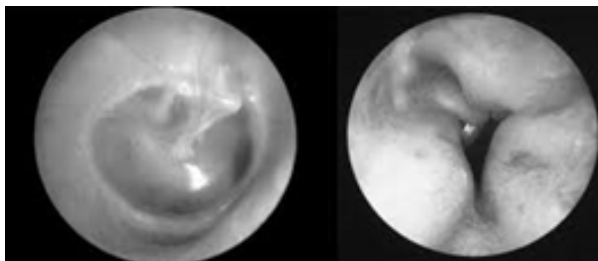


Figure 2: External auditory canal exostoses depicting, bulbous bony overgrowth within the ear canal [9].



Figure 3: External auditory canal exostoses delineating broad-based bony overgrowth composed of cortical tissue, superimposed periosteum and attenuated stratified squamous epithelium [10].

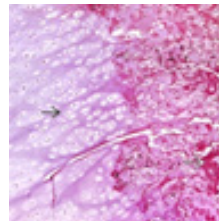


Figure 4: External auditory canal exostoses exhibiting bony overgrowth composed of cortical bone and an absence of bone marrow elements [10].

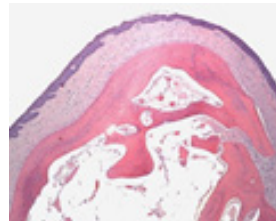


Figure 5: External auditory canal exostoses enunciating broad-based bony outgrowths of cortical bone with a periosteal layer and stratified squamous epithelium [11].

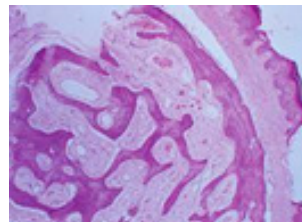


Figure 6: External auditory canal exostoses exhibiting cortical bone configuring broad-based exostoses with layering periosteum and a stratified squamous epithelial layer [12].

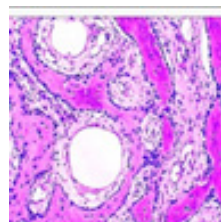


Figure 7: External auditory canal exostoses exemplifying cortical bony overgrowth with innumerable osteocytes and a periosteal covering [13].

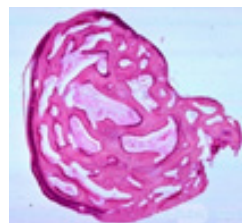


Figure 8: External auditory canal exostoses enunciating bony overgrowth composed of bone cortex with superimposed periosteal layer [14].

Differential Diagnosis

Upon otoscopy, external auditory canal exostoses requires segregation from conditions such as external auditory canal osteoma, cholesteatoma, keratosis obturans, aural polyp and benign or malignant neoplasms [7,8].

External auditory canal exostosis requires a segregation from

- external auditory canal osteoma which is an uncommon, unilateral condition composed of focal, pedunculated, bony tumefaction. Commonly, osteoma is singular and deposited within the lateral external

auditory canal. Additionally, osteoma can be discerned within cortex of mastoid, facial bones or mandible. Morphologically, osteoma is comprised of lamellar bone with few osteocytes circumscribing fibro-vascular articulations [7,8]

- external auditory canal cholesteatoma which is typically a unilateral lesion comprised of keratin-encrusted flakes of bony tissue in association with scalloping of adjacent bone. Cholesteatoma is a rapidly progressive, cystic tumefaction layered with keratinized, stratified squamous epithelium and imbued with impacted cellular, keratinous debris. Commonly arising due to chronic otitis media, the lesion can be congenital. Situated within the middle ear, cholesteatoma is configured due to aberrant negative pressure generated within the external auditory canal [7,8].
- keratosis obturans is a unilateral lesion occurring due to accumulated keratin within the external auditory canal. The condition is posited to arise due to excessive stimulation of cerumen-producing glands or epithelial cell dysregulation. Generally, younger adults are incriminated. •aural polyp is a benign, fleshy tumefaction occurring within the external auditory meatus or inner ear. Lesions are engendered due to irritation arising due to cholesteatoma, foreign bodies or inflammation associated with chronic otitis externa [7,8].
- malignant neoplasms arising within the external auditory canal such as squamous cell carcinoma, carcinoid tumour or embryonal rhabdomyosarcoma may mimic external auditory canal exostoses. Squamous cell carcinoma is frequently discerned within the elderly population. Carcinoid tumour emerging within the external auditory canal is exceedingly infrequent. Embryonal rhabdomyosarcoma is an immensely malignant neoplasm generally discerned in children [7,8].

Investigative Assay

A characteristic history and physical examination are sufficient to appropriately discern external auditory exostoses. Upon otoscopy, multiple, bilateral lesions of external auditory canal exostoses demonstrate a firm, bony, nodular appearance at the tympanic ring within external auditory meatus. Antecedent lesions of exostoses are usually located at medial and antero-superior segment of the external auditory canal [7,8] Competent history is beneficial in disease discernment. Extended duration and repetitive exposure to cold water or wind with activities such as surfing, kayaking, diving or swimming can be elicited [7,8]. Assessment of exact number of years of exposure to cold water is significant [7,8].

Upon physical examination, multi-nodular, broad-based, bony masses confined within the tympanic ring can be visualized with an otoscope. Magnitude of the mass is proportional to degree of clinical symptoms. Multitudinous, firm, tumour masses are discernible within bilateral external auditory canals. Enlarged exostoses can obscure the tympanic membrane. Cerumen can be accumulated upon the tympanic membrane due to entrapment beside or within the exostoses [7,8].

Upon plain radiography, localized or broad-based, circumferential expansion of osseous external auditory canal is observed. Nevertheless, imaging features can be non-specific, and it can be challenging to differentiate exostoses from infections or malignant neoplasms [7,8]. Computerized tomography (CT) of external auditory canal exhibits a pedunculated, bony outgrowth confined to the external auditory canal. CT is usually employed for selection of optimal surgical procedure to be adopted for treating exostoses [7,8]. Magnetic resonance imaging (MRI) can be occasionally utilized for evaluation of appropriate therapeutic surgical methodology [7,8].

Therapeutic Options

Preliminary detection and circumvention of emergence and progression of surfer's ear is imperative. Preventive manoeuvres such as awareness, silicon earplugs or neoprene hoods can be utilized in order to decimate

cold water/wind exposure to the auditory canal [7,8]. External auditory canal exostoses can be adequately treated with conservative measures. Surgical intervention is generally adopted to manage severe clinical symptoms [7,8]. Preventive measures are comprised of enhanced awareness of contributory factors and specific disease. Consistent employment of physical protection of the ear during exposure to cold water or wind is recommended [7,8]. Ear lavage can be suitably performed in order to appropriately visualize anatomical ear structures. With the eradication of debris and resolution of ear obstruction, possible emergence of conductive or sensi-neural deafness can be assessed [7,8]. Medical management is composed of consistent cleaning of external auditory canal along with extrication of entrapped debris thereby circumventing complications such as recurrent otitis externa, rupture of tympanic membrane and conductive deafness. Otitis externa can be treated with antibiotics and aspiration [7,8]. Configuration of external auditory canal exostoses is irreversible and mandates surgical intervention. Severe, persistent clinical symptoms and occlusion exceeding > 80% despite medical management can be suitably treated with canalplasty [7,8]. Surgical intervention is adopted in symptomatic individuals refractive to medical management. Transmeatal surgical excision can be employed in aforesaid instances. Bilateral surgical procedures can be performed as dual canalplasties with an interval of six weeks [7,8]. Severity of complications arising due to external auditory canal exostoses is contingent to magnitude of exostoses which is dependent upon duration and frequency of exposure to cold water or wind. Complications are progressive and concurrent to repetitive exposure [7,8]. Complications of surgical intervention such as ruptured tympanic membrane, delayed healing, stenosis of external auditory canal, decimated hearing of enhanced frequencies, temporomandibular joint dysfunction, mastoiditis, facial nerve palsy, conductive deafness, recurrent otitis externa, otalgia, otorrhea, impacted cerumen or water trapping may ensue [7,8]. Occlusion of external auditory canal associated with enlarged exostoses can propagate inflammation with acute otitis externa which may transform into a chronic, reoccurring infection. Otitis externa is optimally treated with antimicrobial ear drops [7,8].

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