ACTA SCIENTIFIC DENTAL SCIENCES (ISSN: 2581-4893)

Volume 2 Issue 10 October 2018

Case Report

Bony Exostoses: Case Series and Review of Literature

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Received: August 20, 2018; **Published:** September 20, 2018

Abstract

Bony overgrowths have the potential to arouse suspicion during clinical examination. Exostoses are cortical bone overgrowths, sometimes with a cancellous bone core, occurring in different anatomical locations in the oral cavity. While a seasoned diagnostician is able to easily differentiate benign bony overgrowths from pathologies, it may confound a relatively new clinician. This paper provides a brief overview of the various aetiologies, clinical appearance, difficulties posed while rendering treatment and potential uses of the same, in addition to reporting two cases that presented with bony exostosis.

Keywords: Exostoses; Torus Palatinus; Torus Mandibularis

Introduction

Exostoses are non-pathologic, localized, usually small regions of osseous hyperplasia of cortical bone and occasionally internal cancellous bone. In Dentistry, the term exostosis is often used interchangeably with hyperostosis, but it is considered as the equivalent term for osteochondroma (surface growths of bone with a cartilaginous cap) in the medical literature [1]. In the oral cavity exostoses may occur in different anatomic locations (Table 1). Occasionally, they grow on the crest under a pontic of a fixed bridge termed reactive subpontine exostosis or subpontine osseous hyperplasia (SOH). Glickman and Smulow divided buccal alveolar bone enlargement into two subtypes-exostosis and lipping [2].

Location	Descriptive term
Midline of the Palate	torus palatinus (TP)
Bilaterally in the lingual surface of the mandible, above the mylohyoid line in the region of canines or premolars	torus mandibularis (TM)
Buccal surface of the maxillary alveolar process in canine or molar area	Buccal exostosis
Palatal surface of the alveolus	Palatal exostosis

Table 1

Buccal exostoses are less frequently encountered than the palatine or mandibular tori, may present as a single or multiple growth and may attain large sizes. They may occur as a nodular, pedunculated, or flat prominence on the surface of the bone. Palpation elicits a bony hard feeling and the overlying mucosa is usually normal. A suggested male predominance and an increase in frequency with age is noted.1 As they are asymptomatic, exostoses are usually discovered incidentally during a routine dental examination. In the event of significant growth or edentulous patients where the fabrication of a prosthesis may be hampered due to their presence, they may come to notice. Despite numerous studies, their origin is unclear; numerous potential causes are presented in literature, but none are definitive. Certain prevalence with respect to ethnic groups, sex, and age has also been observed [3]. Though their etiology is unknown, some authors consider it as buttressing bone formation in response to trauma from occlusion and propose that it occurs in order to reinforce bony trabeculae for functional adaptation [2].

Exostosis is often overlooked by clinicians in terms of significance. There are however multiple aspects to its morphology, etiology and applied implications. This paper reports two cases showing multiple bony exostosis and highlights the uncommon of this commonly occurring entity.

Case Report

A 55-year-old male consulted the Department of Oral Medicine and Radiology for a routine dental check-up. Medical and family history revealed nothing significant. Patient gave history of extraction of 17, endodontic treatment of 46 and silver amalgam restoration with 26, 27. All the procedures were uneventful. Intra-oral examination revealed generalized spacing and gingival recession. Presence of multiple, nodular bony protuberances, along the facial surface of the mandibular anterior and along the entire buccal surface of the maxillary alveolar process were noted (Figure 1). The overlying mucosa showed no signs of ulceration.

Figure 1: Intraoral Clinical Picture of First patient showing maxillary buccal exostoses.

Another female patient aged 46 years reported with a chief complaint of occasional pain in the upper front tooth for 2 years. Past dental, medical and family histories were insignificant. There was a history of trauma due to fall leading to an incisal edge fracture of 11. The tooth appeared to be slightly discoloured indicating possible pulpal necrosis. Detailed intra-oral examination revealed the presence of generalized, small bony outgrowths along the buccal surface of the maxillary alveolar process (Figure 2). The mandible appeared unaffected and the oral mucosa showed no abnormality.

Both the patients were aware of the exostoses. Their presence caused minor inconvenience in employment of measures for effective oral hygiene maintenance as there was greater than normal food deposition. The patients were suggested an intra-oral

Figure 2: Intraoral Clinical Picture of Second patient showing maxillary buccal exostoses.

periapical radiograph (IOPA) of the bony buccal exostoses. IOPA of the first patient revealed localised homogenous radio-opacity in the alveolar region of missing 17, borders blending imperceptibly with the surrounding bone (Figure 3). These findings were consistent with the radiographic appearance of exostosis. The second patient refused to get a radiograph. The chief concerns of the patients were addressed, and they were instructed to consult in case if any symptom arose in the future.

Figure 3: Intraoral Periapical Radiograph showing diffuse radio-opacity cast by the exostosis.

Discussion

Alveolar bone exostoses (ABE) are defined as benign localised convex outgrowths of buccal (or lingual) bone, which could be delineated from the surrounding cortical plate [4].

The prevalence is varied with frequency depending upon the race, ethnic group, population and sample: from 0.9% to 61.7% for TP and from 0.54% to 64.4% for TM[6].

Despite the etiology being investigated largely, so far, no consensus has been reached. The proposed causes include genetic and environmental factors, masticatory hyperfunction, and continued growth [5]. Eggen., *et al*. [7] reviewed the role of nutrients in the etiology of tori and suggested that saltwater fish consumption in Norway possibly supplies elevated levels of polyunsaturated fatty acids and Vitamin D that is involved in bone growth that increases the chances of tori. In agreement, a case report by Kannan., *et al*. [8] described two cases with the presence of tori with history of seafood consumption in every meal. The threshold or quasi-continuous genetic theory states that the genetic factors can express themselves in the individual only when responsible environmental factors first reach a threshold level. Thus, both genetic and environmental factors determine expressivity, making the etiology multifactorial [5]. Antoniades., *et al*. hypothesized that the threshold or quasi-continuous model theory may also apply to buccal bony exostoses and palatal exostoses [9].

Glickman and Smulow [2] in 1965 floated the concept of Buttressing bone formation. The external surface of alveolar ridge of three specimens (two rhesus monkeys and one human) demonstrated new bone formation on both the tension and compression sides of teeth that were occlusally traumatised, and suggested that reinforcement of bone trabeculae led to such bone formation This theory is supported by others also who have noted the clinical association between powerful chewing forces, thick masseter muscles, occlusal wear facets and buccal alveolar exostoses as well as tori [4].

The proposed mechanism for buttressing bone formation is still uncertain, but bone flexion resulting in the release of bone morphogenic proteins that could stimulate bone growth, express as exostosis thickening or lipping at a point of stress [10].

Soft tissue graft procedures followed by development of bony exostosis development has been reported in a few cases. These procedures were performed to correct shallow vestibules with the use of skin grafts, connective tissue graft and free gingival grafts (FGG). Echeverria., *et al*. noted that exostoses commonly occurred in the cuspid-premolar area after an autogenous FGG [5]. They suggested that factors acting at this level, e.g. and genetic factors, excessive forces or surgical trauma may be influencing grafted areas. All the authors among the related reports agree that periosteal trauma seemed to be the chief etiological agent associated with the development of exostosis [5].

The clinical and radiographic findings of nine cases with bone growth in posterior mandible edentulous region, covered with a pontic were reported by Burkes., *et al*. [11], and proposed that genetic predetermination, functional stresses, and chronic irritation could be reasons for such bone growth. Three cases of Subpontine Osseous Hyperplasia (SOH) in an edentulous ridge under a fixed partial denture were presented by Aydin., *et al*. [12] One of the cases presented by them had the hyperplasia in the maxillary arch, the second such case reported ever in the dental literature. SOH commonly occurs on the mandible, usually under the molar pontic.

Nikitakis., *et al*. [13] reported three cases in which exostoses developed subsequent to dental implant placement and discussed the possible pathogenetic role of periosteal activation. Agrawal., *et al* reported a case of formation of buccal exostoses during an active orthodontic treatment with mini implants. They postulated trauma to the periosteal bone or mechanical factor of ministrain as the possible etiologies [4].

Despite multifactorial etiology, to explain the underlying mechanism, Dou., *et al*. investigated the potential role of mesenchymal stem cells (MSCs) derived from human TM in the pathogenesis of bone outgrowth. They found that TM harbored a distinct subpopulation of MSCs, with enhanced osteogenic and decreased adipogenic differentiation capacities, as compared with their counterparts from normal jaw bone. Their data suggest that the loss of Notch3 signaling may contribute partly to bone outgrowth in TM, as mediated by enhanced MSC-driven osteogenic differentiation in the jaw bone.

The diagnosis of exostoses is based on clinical and radiographic findings. Radiographically, the periphery of an exostosis is usually well defined and smoothly contoured with a curved border. However, some may have poorly defined borders that blend into the surrounding normal bone. The internal aspect usually is homogeneous and radiopaque. Although large hyperostosis can have an internal cancellous bone pattern, they most often consist only of cortical bone. Histologically, they consist of compact bone. Trabecular bone with a small amount of fibro-fatty marrow is sometimes visible.

Differentiation from gingival pathologies such as gingival enlargement or from bone pathologies such as osteomyelitis, osteoma and osteosarcoma is important when dealing with exostosis. A probability of Gardner syndrome should be ruled out if multiple bony growths or lesions present. Multiple supernumerary teeth, intestinal polyposis and cutaneous cysts or fibromas are other common features of this autosomal dominant syndrome.

Patients with tori or exostoses rarely complain of unaesthetic appearance, speech difficulties due to limited tongue movement and food lodgement resulting in malodour. Certain patients may fear that the lesion is cancerous. Patients may experience trauma or ulceration when masticating hard and sharp food since the soft tissue covering the bony protuberances is reported to be thinner than the surrounding mucosa. In addition, recording oral impressions and seating of dentures are difficult in these patients.

Owing to their innocuous nature, surgical intervention in majority of the cases is unnecessary except at the presentation of tissue trauma, periodontal or prosthodontic complications. There have been some case reports pertaining to exostoses removal due to intubation difficulties, prosthetic concerns limited tongue movement, or obstructive sleep apnea [6].

In patients requiring a bone grafting procedure for dental implant placement, alveolar ridge augmentation and the maxillary sinus lifting, periodontal osseous defect correction and other multiple facial reconstructions such as the nasal reconstruction, use of exostosis as a source of autogenous bone graft should be considered [15].

Conclusion

Exostosis in the oral cavity is a peripheral outgrowth of the bone which is benign in nature and rarely warrants any treatment. This manuscript provides a comprehensive review of oral exostosis and outlines its morphological appearance, radiological features, possible differentials and clinical implications. Its importance lies in its potential as an autogenous bone graft donor site. An informed clinician will be able to analyses the likely etiology or ascertain the impending complications, and correspondingly recommend treatment, if any.

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