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Epithelium Rich Type Central Odontogenic Fibroma in Maxilla: A Case Report and Review of Literature

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Abstract Central Odontogenic Fibroma (COF) is a rare, benign neoplasm of mesenchymal origin that makes up less than 5% of odontogenic tumors commonly found in women in ratio 2.8:1. For many years there was considerable confusion concerning the criteria by which the lesion should be diagnosed and as a result, a verity of different conditions were being reported as odontogenic fibroma (OF). In this article reporting a case of COF (Epithelium Rich-type) in the maxilla radiographically presented as a well-defined radiolucent and radiopaque lesion retarding the first premolar from erupting plus reviewing the literature about COF including its variants.

Keywords: *Epithelium Rich Type, Central Odontogenic Fibroma, maxilla, WHO type, benign neoplasm*

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1. Introduction

Central Odontogenic Fibroma was used to name every enlarged dental follicle but actual cases been reported as the criteria proposed by Gardner in 1980 [3]. It is believed that it arises from true odontogenic mesenchyme influenced by the odontogenic apparatus [4]. As mentioned in literature about the types of COF, being the complex type favoring the mandible with aggressive behavior involving pain, facial asymmetry, teeth displacement and rhizolysis but here in our case showing the same type with the same features but in maxilla [2,5].

The presence of some elements like myofibroblasts, macrophage, giant cells, as well as the proliferative index can be related to the potential aggressiveness of the tumor; so suggested to do immunohistochemical and electron microscopic studies for better understanding of the biology and eventually the pathogenesis of this unusual odontogenic tumor [3]. Another immunohistochemistry feature supporting the nature of COF is the presence of Langerhans cells positive for CD1a but there pathological significant is still unclear [3].

In order to diagnose a lesion with COF, there must be epithelial remnant present according to the WHO classification of odontogenic tumor. The presence of epithelium can be evaluated either in hemotoxylin-eosin – stained sections or, recently by immunohistochemistry [3]. Among all the histological variants, granular cells can be detected in numerous tumors such as ameloblastoma, ameloblastic fibroma and COF. With a malignant form that was reported in 40 years old lady ended up with hemiresection of her maxilla with high recurrent rate and such researches concluded that for a lesion, the presence of granular cells increased the risk of the tumor being malignant [5].

Kaffe et al recommended considering a list of differential diagnosis for all abnormal radiolucency findings in the jaws including odontogenic fibroma due to difficulty to confirm COF diagnosis solely by radiograph [6]. Based on what mentioned above in order to differentiate COF from other lesions, its very difficult only by radiographs but collecting data gathered from a combination of history, clinical examination, other radiographic modalities like MRI, macroscopic and microscopic characteristically unique about that lesion [1]. COF may give a picture of an aggressively behaved tumor as it shows infiltrative pattern in the surrounding bone trabeculae in cone beam CT [6]. It responds well to surgical enucleation with rare tendency for recurrence. The reported cases for recurrence to date have shown a higher percentage affecting young females [1]. Hopefully this case will add valuable knowledge to the already existing literature.

2. Case Report

A 13-years-old, Saudi boy came to the clinic in oral and maxillofacial department in King Fahad General Hospital in Jeddah with his father complaining of facial swelling in the left side. Since four months, the patient started to notice hard nonpainful swelling in the left side of the upper jaw causing facial asymmetry but in the following two months, he started to feel non frequent tolerable pain related to the same area. The patient is a schoolboy, healthy and well developed. Extra oral examination revealed moderate facial swelling in the left side obliterating the nasolabial fold with normal skin covering and with no paresthesia and no lymphadenopathy

(Figure 1A). Intraoral examination, revealed 3x2 cm hard, painful expansion of both buccal and palatal region in the area of canine and premolar region with missing of the first premolar in that area.

The gingiva looked normal with localized area of ulcerations from pressure of the opposing teeth (Figure 1B). The adjacent teeth were not mobile but the canine was labially displaced & non-vital.

Radiographically, the lesion appeared as well defined mixed radiolucent and radiopaque occupying the region between the upper left canine and second premolar causing the neighboring roots to divert with no root resorption. Associated impacted first premolar also was appreciated. (Figure 2)

All lab investigation was within normal limit. Incisional biopsy in dental clinic under local anesthesia was done and fixed in 10% formalin and sent to the pathology department in the same hospital. Microscopic examination revealed cellular fascicles of plump spindle and stellate fibroblasts lying in a dense collagenous fibrous stroma with often-whorled pattern. Numerous strands and nests of odontogenic epithelium. Areas of sclerosis and foci of residual active bone seen focally. The result came to be central odontogenic fibroma (epithelium rich-type).

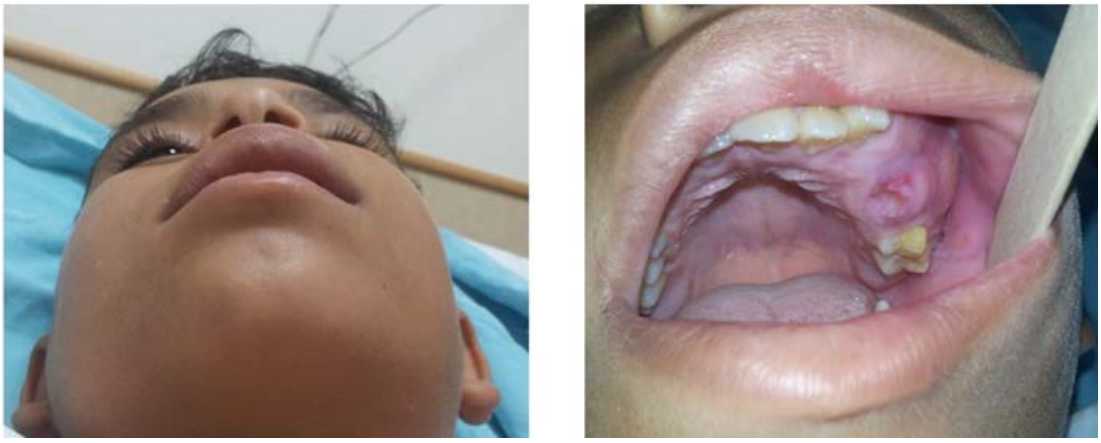

Figure 1. (A) Extraoral examination of (bird's view) showing the left zygomatic swelling and obliterated nasolabial fold and elevated left nostril. (B) Intraoral examination showing the swelling with buccal expansion

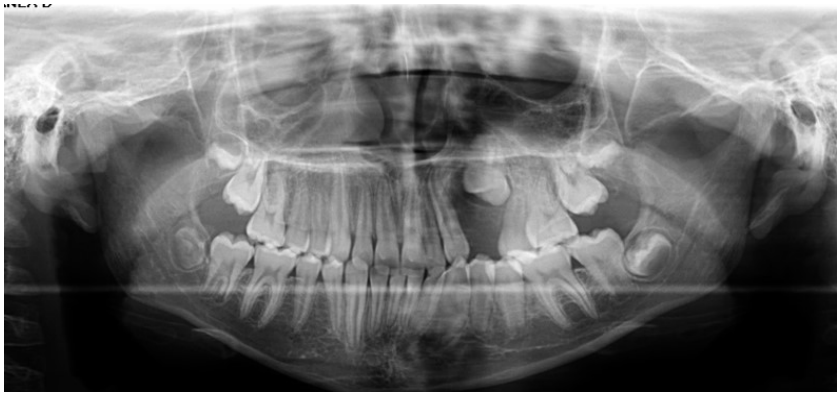

Figure 2. Ill defined mixed radio-opaque and radiolucent lesion in the upper left quadrant. Notice the impacted first premolar and divergent roots of the canine and second premolar

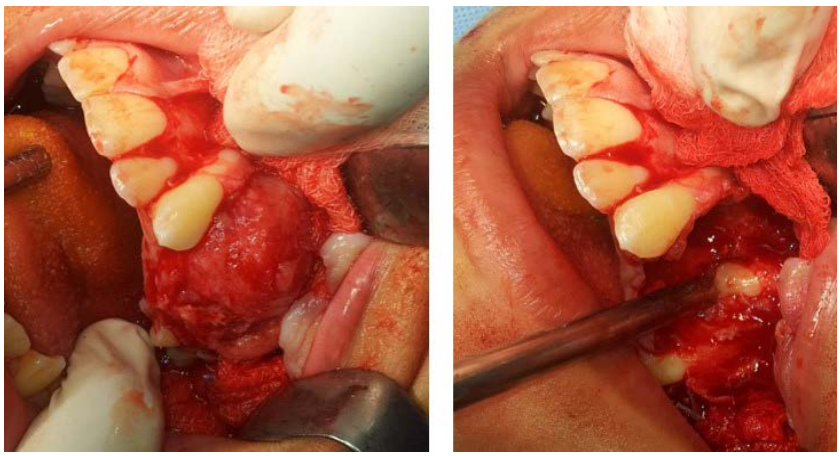

Figure 3. Intraoperative pictures (A), revealed 4x4 cm round, hard and well capsulated mass. (B), the impacted first premolar was exposed and removed following the removal of the mass

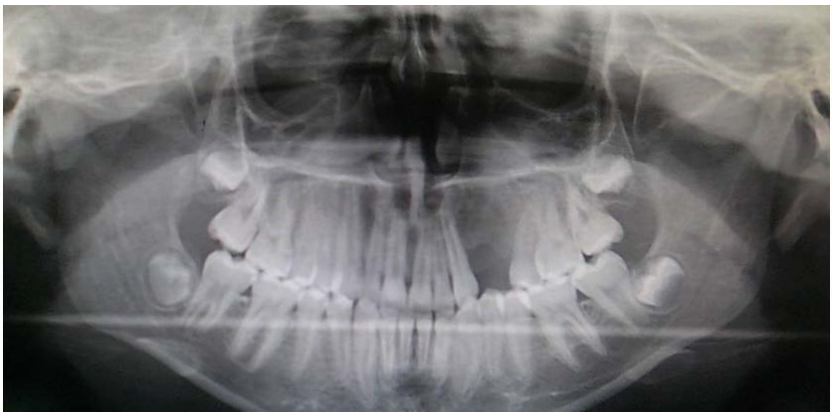

Figure 4. Five months post-op panoramic view. Notice the opacifications in the operated area indicates bone filling the area

Five months later the patient was taken to the operating room for surgical removal of this lesion under general anesthesia. Intraoperative, the lesion was well localized and capsulated round hard so enucleation of that mass and curettage plus extraction of the impacted tooth was made (Figure 3). Post-operatively, the patient was on sinus precaution for 2 weeks plus antibiotic and painkiller.

The histopathology of the postoperative tissue was consistent with the incisional biopsy microscopic examination. Five months later, the patient is fine with no complaints. The swelling is reduced and panoramic view revealed opacifications in the area indicating bone filling in the area. The patient was sent for endodontic treatment for the canine.

3. Discussion

Odontogenic fibroma (ODF) is defined by the World Health Organization (WHO) as, "a rare neoplasm characterized by varying amounts of inactive-looking odontogenic epithelium embedded in a mature, fibrous stroma" [7]. ODF can be further divided into central (intraosseous) odontogenic fibroma (CODF) and peripheral (extraosseous) odontogenic fibroma (PODF), according to the anatomical sites involved [8]. Bhaskar in 1977, used to give the OF name to every enlarged dental follicle and it was as common as 23% of all odontogenic tumors until Gardner separated between those different types although difficulties persisted in distinguishing between the enlarged or hyperplastic dental follicle and COF the simple type. To date, there are estimated 100-reported cases of COF in the English literature until 2012 [9].

Central odontogenic fibroma has been defined as a benign neoplasm containing varying amounts of inactive odontogenic epithelium occurring centrally in the jawbones, with a slow growth resulting in painless cortical expansion [10]. It is the tumor of mesenchymal component of the odontogenic apparatus- the periodontal ligament, dental papilla or dental follicle. Gardner in 1980 classified COF into 3 different, yet probably related, lesions into; Hyperplastic dental follicle, simple and WHO (World Health Organization) type. Since 1992, WHO publication doesn't use the term 'WHO type' instead odontogenic fibroma complex type" or "fibroblastic odontogenic fibroma has been widely accepted [10]. The recent (WHO 2005) classify COF histologically into only two subtypes; Epithelium poor and Epithelium – rich type [11]. Epithelium poor type – is usually an expansile fibrous neoplasm with varying collagenous fibrous connective tissue containing nests of odontogenic epithelium [10]. This type is the most collagenous variant of histological aspect of odontogenic myxoma, myxofibroma and odontogenic fibroma but differs in clinical behavior as it does not infiltrate to the surrounding bone [12]. Epithelium – rich type –containing fibrous tissue in myxoid area associated with odontogenic epithelium and features of dysplastic dentine or cementum-like tissue [13]. The different histologically was attributed to the tissue of origin [11]. In a study done on dogs in 1983, It has been suggested that epithelium – poor type is derived from the dental follicle and the epithelium – rich type arises from the periodontal ligament [14]. Handlers et al didn't believe in separating COF into different types because they behave similarly and have no effect on the mode of treatment [15].

In order to diagnose COF, Wesley et al in 1975 suggested a set of criteria for cases reported [10]. In the following we will classify the review of the literature into 3 aspects; clinically, Radiographically and histopathology.

Clinically, the lesion is endosseous and has a slow persistent growth involving the buccal or lingual cortical expansion [10]. Pain and paresthesia are rare clinical observations that can be observed in more aggressive form [16]. It can be confused with periapical lesion around a sound tooth so its important to include the pulp vitality test plus evaluation of periodontal health status as part of clinical examination [17]. Sometime COF can grow causing facial asymmetry [18]. COF have been linked to intracranial aneurysm and tuberous sclerosis [19]. The true incidence of COF is difficult to determine because of the different diagnostic criteria that have been applied to the lesion over the years. Shsfer, Hine and Levy believed that COF is distinct lesion from myxoma and parafollicular fibrosis found in dentigerous cyst and follicles [20]. Peters, Cohen and Altini, reported hyperplastic dental follicle with COF-like features, hypodontia and amelogenesis imperfecta (enamel dysplasia) [19]. All the reported cases of COF- like proliferation associated with enamel dysplasia in the literature were from South Africa [19]. Feller and Raubenheimer found a well-established association between the development of multiple WHO-type hamartomas and enamel dysplasia [21].

COF affect wide age ranged mainly between the 2nd and 4th decades of life. In 2005, Barnes et al found that COF

has a female predilection [11]. On the other hand, Tkeoka reviewed eighteen Japanese cases from 1980-2010 found that COF affect both gender equally [9]. Three cases their first decayed of life were reported by Brannon and the fourth one by Chrcanovic in 2011. Concluding the incidence in primary dentition is extremely rare. In earlier literature, the mandible was the common site of involvement (52%) mainly in the posterior region followed by the maxilla in the anterior area [14]. Then reports have changed to be equal between maxilla and mandible [22]. But updated records tell the opposite of that, being the maxilla is the common site of involvement [23]. Three cases reported in maxilla, two by Silverman and Knight and one case by Hamner and all were thought to be hyperplastic dental follicle [20]. COF can be bilateral or multicentric lesion but t could be part of a syndrome and mostly they maybe hamartomas rather than true neoplasm [21].

Radiologically, It appears as well defined unilocular radiolucent lesion if it's a small but it can be a multilocular with sometime a scalloped border when reach a larger size associated with root resorption of the adjacent teeth [14]. Rarely can be as a mixed radiolucent and radiopaque appearance. Half of the cases present posterior to the first molar and up to one-third accompany an unerupted third molar [10]. 12% of COF exhibit radiopaque flecks scattered within the lesion [23]. Radiographic features are not pathognomic. It can be confused with those lesions with similar appearance like hyperplastic dental follicle, dentigerous cyst, keratocystic odontogenic tumor and unicystic ameloblastoma, traumatic bone cyst and myxofibroma [13,24].

Keratocystic odontogenic tumors grow anterioposteriorly without causing considerable expansion. Ameloblastic fibroma differ histologically by having the characteristic ameloblastic follicles surrounded a highly cellular dental follicle like stroma. Myxofibromas appear as ill-defined radiolucency and histologically show abundant collagen fibers with spindle, round and stellate cells [23].

According to Marx, inciosaonal biopsy is required first due to the aggressive aggressive behavior. Once it turned back to be COF, a panoramic radiograph is enough for treatment planning. Cone beam CT is another useful tool in examining the internal structures and bony margins very well [6]. MRI also can be a useful tool to distinguish COF from other tumor. Hara et al in 2012, dragged the attention for the benefit of using MRI as a relevant diagnostic tool to distinguish the COF from other odontogenic tumors and cystic lesions. By evaluating:

1- Contrast – enhanced T1- weighted images T1WIs (CE-T1WIs) is another parameter was used with fat suppression. COF shows homogeneous isointensity on T1WI and heterogeneous iso- to hyperintensity on short T1 inversion recovery (STIR) or T2WI and CE- T1WI. In contrast to cystic lesion which displays homogeneous hypointensity on T1WI and homogeneous hyperintensity on STIR.

2-The time signal intensity curves (TIC) using dynamic contrast- enhanced MRI (DCE-MRI) that's used for diagnosis of multiple jaw lesions. DCE- MRI is constructed using 14 consecutive scans each scan takes 14 seconds. Contrast index (CI) curves of COF that is calculated from DCE-MRI shows rapid increased in enhancement until 200 seconds and then steadily increased up to 800 seconds due to the rich amount of fibrous tissue which reduce the washout of the contrast. All that considered unique characteristics for COF used as diagnostic tool in comparison to other odontogenic tumors. In ameloblastoma CI curve shows two patterns; either increasing in 100-300 seconds then continue platue from 600-900 seconds or increasing rapidly and then after 90-120 seconds decreasing rapidly to 300 seconds followed by gradual decreasing afterward. In odontogenic myxoma, in the first 500-600 seconds, CI shows gradual increasing of the contrast. Difficult mostly exist between ossifying fibroma and COF due to the similarity between them which is appreciated not only in plane radiograph but also on MRI and CT due to the close similarity of the histological features [25].

Histopathologically, the most consistent feature is a tumor composed predominantly of mature collagen fibers with numerous interspersed fibroblasts. The presence of small nests and/or strands of inactive odontogenic epithelium are a variable feature [10]. The quantity of odontogenic epithelium is not related to the risk of recurrence [15].

Hyperplastic dental follicle (HDF) was defined by Gardner in 1980, which is a narrow well circumscribed lesion around a crown of an unerupted tooth having fibrous connective tissue like that in dental follicle as microscopically appearance [26]. Usually it is symmetrical unlike COF plus it can't be more than 4 mm large [3]. Earlier, Bhaskar classified every enlarged dental follicle as odontogenic fibroma and here came the commonality of odontogenic fibroma but Gardner separated between the two lesions and yet the difficulty in the differentiation between COF the simple type and HDF [26]. Dental follicle may also have similar features to COF (Epithelium rich-type) like odontogenic rests and some calcifications but differ in absence of fibroblastic connective tissue arranged in interwoven strands that is a characteristic for COF [12]. Examination of collagen fibers of known thickness by this method can serve as one method to differentiate between the normal and abnormal collagen. In a study done by Hirshberg et al found different between COF & HDF in the polarized color of collagen fibers between the two lesions, by using picrosirius red staining followed by polarizing microscopy which can selectively demonstrate collagen. Polarization colors of the thick collagen fibers of COF show small percentage of orange and yellowish-orange while it's found in high percentage in HDF. [26]. In Contrast to dental follicle, COF is a destructive lesion with persistent growth. Only 1 out of 57 of COF examined by Ramer et al, has reported to have features of dentigerous cyst [24].

Reviewing the literature, COF can have the following subtypes:

- Central odontogenic desmoplastic fibroma.
- Simple odontogenic fibroma exhibit pleomorphic fibroblasts.
- Central granular cell odontogenic tumor of the jaw (CGCOT)
- Central odontogenic fibroma with giant cells (GCG-like variants).
- The collagenous lesion described by Wesley and colleagues [27].

- Coincidental co-occurrence of COF (epithelium rich- type) and traumatic bone cyst (TBC) in a young patient [2].

Based on the presence or absence of odontogenic epithelium, intra-osseous fibroma can be classified into odontogenic fibroma and non-odontogenic fibroma (desmoplastic fibroma) [28]. It is very difficult to distinguish microscopically between them especially in the absence of odontogenic epithelium. A study done by Ikeshima et al, in attempt to find the differences existent in clinical finding between the two lesions. COF involve mainly in older patients than desmoplastic form. COF affect mainly females rather than desmoplastic form that have an equal sex predilection. Desmoplastic fibroma is found to affect mainly the mandible with high tendency for bone expansion unlike COF that have equidistance in mandible and maxilla. Radiographically, COF appear to have varying characteristics divided between unilocular and multilocular appearance with incidence of root resorption compared to desmoplastic type which have three more time to be multilocular appearance [28]. In conclusion, differentiation between both lesions is still difficult but one can consider the diagnosis of COF if it doesn't clearly shows features of desmoplastic fibroma [24]. Desmoplastic fibroma has abundant of collagen fibers separated by spindle-shaped fibroblasts with elongated or ovoid nuclei [12]. Because of the collagen, the paraffin section doesn't stain blue with hemotoxylin and eosin, in addition to the absence of odontogenic epithelium that is in the COF [12]. It shares many features with soft tissue desmoids tumors and fibromatosis. It is an infiltrative to the surrounding while COF do not and requires wide resection margins rather than ostectomy for treating COF [28]. Ibarguren in 2006 reported a case of locally aggressive, large COF (desmoplastic) variant occupying the right half of the mandible pushing the third molar up to the coronoid, which was involved by an inflammatory cyst. Suggesting that the inflammatory cyst is the first in occurring, which then stimulated the COF development. It was assuring about less chance of recurrence [29].

Simple type of COF could have numerous pleomorphic fibroblasts and calcifications that ware reported by Gunhan et al and it is called giant cell fibroma of the oral cavity and skin [12]. Historically, central granular cell odontogenic tumor (CGCOT) thought to be a separate entity from COF not a variant as proposed by WHO [27]. The use of immunohistochemistry as one of the modalities to distinguish its histopathological nature. In 1987, Vincent et al used the name central granular cell odontogenic fibroma that doesn't exhibit S-100 protein activity that was eliminated from granular cell tumor of the soft tissues. [12]. Another findings of Chen and Brannon et al, suggest that the origin of the granular cells may histiocytic and the granular appearance of these cells represent lysosomes [27]. Simple central odontogenic fibroma share similar histological pattern. It shows scattered granular cells within the fibrous connective tissue as been published by Taylor et al in 1999 [3]. That is different from the epithelium rich- type that lacks this feature [12].

Another subtypes which is COF with central giant cell granuloma. Three hypothesis explaining that coexistance; first, it can be COF with reactive CGCG component to the inactive odontogenic epithelium. histologically shows full picture of COF with giants cells present in peripheral zone. CGCG is positive to CD68 and epithelium cords that are poisitive to marker CK19, which indicates that this is an odontogenic lesion [1]. Second, it considered to be a collision, hybrid lesion of the COF/CGC as a result of incidental occurrence of COF (Epithelium rich- type) in synchronizing with giant cell granuloma [11]. The third proposal, suggest that COF is induced as secondary lesion by the growth factor from primary CGCG lesion producing more proliferation of odontogenic epithelium [1]. Younis et al in 2008 found that Only 12 cases of COF with giant cell granuloma (GCG)-like lesion have been reported in the English literature in addition to their case report of COF epithelium rich type with a GCG-like component. [30]. Histologically, the lesion showed unique features of a densely collagenous to delicate fibromyxoid stroma, containing apparently inactive odontogenic epithelial strands and nests, and showing some duct-like spaces or hyaline basement membrane globules with a variably collagenous stroma of plump and narrow spindle-shaped mononuclear cells that contained multinucleated giant cells consistent with GCG lesions, with some lesions showing osteoid deposits [30]. The specimen obtained were usually a defined, non-encapsulated with soft, brown, irregularly shaped, and had a rough surface with small fragments of hard tissue [1]. This can be confused with other lesions give the same picture like cherubim, brown tumor of hyperparathyroidism and aneurismal bone cyst. Suggesting the presence of a GCG-like component makes this lesion more likely to recur [30]. Recurrences of these lesions are as common as 25% [1]. Since they share the same clinical, radiographic and histological features, further studies should be done to distinguish between the two lesions in order to reach a proper diagnosis and achieve the optimum treatment with better success rate [12]. The last subtype is COF can occur coincidental co-occurrence with other separate lesions as a case reported by Kumar et al in 2013, about non-syndromic coincidental co-occurrence of COF (WHO type) and traumatic bone cyst (TBC) in a young patient and each lesions are independent from the other and is treated separately [2].

Treatment and prognosis:

The lesion is benign and responds well to surgical enucleation and curettage has often proven to be successful with no tendency to undergo malignant transformation [13].

Iordanidis in 2013 used several immunohistochemical panel on a case of COF found that COF was negative for CAM 5.2 cytokeratins (CKs8, 18) which means that it doesn't belong to simple nor embryonic epithelia, positive for vimentin (V9, diluteion 1:100) indicate those cells are primordial and positive to alpha- smooth muscle actin (1A4,dilution 1:100) which indicate the presence of myofibroblasts. The amount of myofibroblasts reveals the biological behavior of a lesion, which was less in COF explaining the non-aggressiveness behavior [31].

Few clinical cases in literature reported incidence of recurrence [13]. There were 13% of recurrent cases in literature [32]. There were reported cases recurred 16 months after surgery [32]. Marx et al supporting the idea of the benign behavior of the lesion and rare recurrent and

if there was, it might be misdiagnosed and recommended to review the histopathology of that lesion because it possible to be myxoid fibroma rather than COF and follow up is needed [33]. The inadequate preoperative histological diagnosis and surgical management were the two common causes for recurrence. 5 years follow is adequate to evaluate the lesion recurrence [29].

After the curettage of the lesion, bone-filling material like beta-tricalcium phosphate material can be placed in the bony defect as bone graft with good prognosis [34].

4. Conclusion

Central odontogenic fibroma is a benign odontogenic neoplasm that has been infrequently reported in literature. It remains incompletely understood. It appears as endodontic lesions and /or the other odontogenic tumors. From all the reported incidents of recurrent yet further studies must be made to determine which variant has much more recurrent rate than the other.

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