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ORIGINAL RESEARCH

Odontogenic Myxoma: A Study based on Biopsy Material over a 40-Year Period

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ABSTRACT

Aim: Odontogenic tumors, including odontogenic myxomas (OMs) are regarded as rare neoplasms in the human body. Nevertheless, they may be problematic for diagnosis and treatment planning due to possible variations between different races and countries. The aim of the current study was to present the clinicopathologic features of OM in an Iranian population over a 40-year period and compare them with those reported elsewhere.

Materials and methods: Clinical/demographic data and histologic slides of OMs and all lesions that could be considered in their differential diagnosis, reported from 1967-2008 were analyzed. Statistical analysis was performed using χ^2 and t-test and $p < 0.05$ was regarded significant.

Results: Forty OMs were identified, of which 42.5% occurred in men (mean age, 27.4 years) and 57.5% in women (mean age, 28.2 years). Most tumors were observed in the posterior mandible. All cases possessed the classic World Health Organization histologic features; while 3, 15 and 6 cases showed epithelial rests, residual bone and conspicuous collagen bundles, respectively. Five patients were followed and none of their tumors recurred.

Conclusion: The clinicopathologic characteristics of the current Iranian population are similar to most other reports with a predilection for the posterior mandible, 3rd decade and female subjects; however, there were variations in microscopic features of the studied cases.

Clinical significance: Clinical and histologic information on OM in different populations may be useful in clinical settings and treatment planning. Reporting more detailed histologic data can help clarify the biology of this tumor and aid in its histopathologic diagnosis.

Keywords: Myxofibroma, Myxoma, Odontogenic tumors, Cross-sectional study.

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INTRODUCTION

Gnathic odontogenic myxoma (OM) was first introduced in 1947[1] and according to the World Health Organization (WHO) is an intraosseous benign but infiltrative neoplasm, classified under odontogenic tumors derived from 'mesenchyme and/or odontogenic echtomesenchyme with or without odontogenic epithelium'.[2] Controversy surrounds the pathogenesis of OM as to whether it originates from the dental apparatus or primitive nonodontogenic mesenchyme.[3] It has even been proposed that OM may result from myxomatous degeneration of other lesions, especially odontogenic fibromas.[3,4] This latter theory may be based on the fact that some OMs have the ability to produce a higher amount of collagen fibers (myxofibroma) and a number of odontogenic fibromas have been known to contain a significant quantity of ground substance, creating a fibromyxoid appearance.[2,5] Consequently, it has been suggested that odontogenic fibroma and OM may be the two endpoints of a spectrum and lesions with various amounts of collagen and myxomatous changes fall somewhere in between these tumors.[4,6]

Small OMs are treated by curettage, but considering the lack of encapsulation and its infiltrative nature, more aggressive approaches are used for larger tumors or those located in less-accessible regions.[3,6] Grossly, these neoplasms are characterized by a loose, gelatinous, sticky, grey-white mass with a clear mucinous appearance. Histopathologic typical features include angular, stellate, spindle-shaped and round cells in an abundant loose mucoid/myxoid stroma with sparse collagen fibrils; or larger quantities of fibrous material in the case of myxofibroma.[2,6] In addition varying amounts of capillaries and odontogenic epithelium, mast cells, plasmacytoid or signet-ring-appearing cells, laminated osteocement-like spherules and residual bony trabeculae have been demonstrated in this neoplasm.[7-10]

In general, odontogenic tumors are uncommon lesions[2,6] and OMs are considered to be rare neoplasms in the human body, even among the group of odontogenic tumors.[5,8,11-13]

Despite the infrequency of this group, they could be an obstacle to the clinician in terms of diagnosis and treatment planning. Access to demographic data, prevalence and location of tumors in different populations can be beneficial in establishing differential diagnosis and making a correct therapeutic decision.[2] There are only a few published reports in the Iranian population that may be able to provide this type of information, however, none of them have studied OMs separately. Therefore using the archives of two of the largest referral centers of odontogenic tumors, we investigated the relative frequency of OMs over a 40 years period and conducted a review of the literature to compare our findings with previously published series of OM.

MATERIALS AND METHODS

The records of the Department of Oral and Maxillofacial Pathology, Faculty of Dentistry; and Shariati Hospital; Tehran University of Medical Sciences between 1967 and 2008 were reviewed to identify patients with odontogenic myxoma/myxofibroma and odontogenic fibroma. Furthermore all other lesions that may be considered in the differential diagnosis of this tumor, including the dental papilla of a developing tooth, myxoid changes in a dental follicle, nasal polyp, myxoid nerve sheath tumor, myxoid neurofibroma, chondromyxoid fibroma and other myxoid gnathic neoplasms were retrieved. The microscopic hematoxylin/eosin-stained slides were collected from the pathology archives and re-examined by two oral and maxillofacial pathologists. Diagnosis was established according to the criteria described by the WHO.[2] In addition, odontogenic epithelial rests, collagen content, calcifications in the form of spherules, residual bone tabeculae and presence of mast cells were also assessed. Any disagreements between the observers were resolved by re-evaluation of the slides under a double-headed microscope.

Site of involvement (maxilla/mandible and anterior/posterior), age and sex of all patients that received a diagnosis of OM, along with a prior history of this lesion were recorded for each case. χ^2 and t-test were used for statistical analysis and p values of less than 0.05 were regarded as significant.

RESULTS

We reviewed a total of 13,173 patient records from the Faculty of Dentistry and 148,069 from Shariati Hospital during the 40-year study period. Approximately 400 odontogenic tumors (not counting keratocystic odontogenic tumors), were found of which 44 were odontogenic myxomas. Due to incomplete clinical information or diagnostic issues, 4 cases were excluded, leaving 40 neoplasms for analysis.

Altogether 17 (42.5%) men and 23 (57.5%) women with OM were identified (M/F ratio: 1/1.3), demonstrating a mean age of 27.4 years (age range: 10-48 years) and 28.2 years (age range: 6-55 years), respectively. OMs were most prevalent in the 3rd decade of life. Neither mean age ($p = 0.820$) nor the prevalence of myxoma ($p = 0.343$) showed a significant difference between males and females. We found 14 OMs in the upper jaw, with 1 and 10 situated anteriorly and posteriorly, respectively; while three of the neoplasms were found in the maxillary sinus. The remaining 26 tumors were located in the posterior regions of the lower jaw. The difference in occurrence of myxoma between the mandible and maxilla was marginally nonsignificant ($p = 0.058$). There were 15 mandibular and 8 maxillary tumors in the female patients. Correspondingly, 11 and 6 tumors occurred in male subjects (Table 1). We did not observe a significant difference in location between males ($p = 0.225$) and females ($p = 0.144$). Patient symptoms were available for 22 cases and the most common clinical presentation was jaw swelling or expansion followed by pain. Rapid growth, root resorption and tooth displacement was seen in one and perforation of the sinus floor was seen in another of the OM patients evaluated in the present series.

The prevalent microscopic picture was of a mucoid background stroma with few delicate collagen fibrils containing widely-spaced mostly spindle to stellate hyperchromatic cells that had long eosinophilic cytoplasmic processes, in accordance with the WHO description. The collagen content of 6 cases was conspicuous, mainly in the form of moderately-sized interweaving collagen bundles, without formation of hyalinized areas. Scattered mast cells were found in one tumor. We did not observe bizarre, multinucleated or giant cells in our sample and mitotic figures were rare. None of the tumors showed encapsulization, however 15 of them demonstrated residual bony material which were scattered randomly throughout the lesions in 13 (Fig. 1), and situated peripherally in two of the tumors. Odontogenic epithelial rests were found in 3 specimens (Fig. 2).

Follow-up for a median of 7 years (range: 3 to 18 years) was possible for 3 female and 2 male subjects who ranged in age from 26 to 30 years. During this period none of the cases showed recurrence.

Table 1: Characteristics of 40 myxoma cases in an Iranian population

Myxoma	*Number*	*Mean age ± SD*	*Mandible*	*Maxilla*
Male	17	27.4 ± 11.66	11	6
Female	23	28.2 ± 11.43	15	8
Total	40	27.9 ± 11.39	26	14

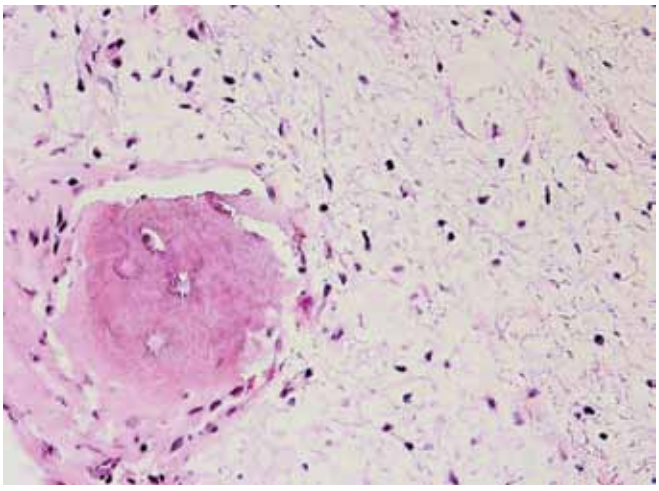

Fig. 1: A hematoxillin and eosin stained section depicting bony material within the myxomatous stroma of an odontogenic myxoma (original magnification, 200×)

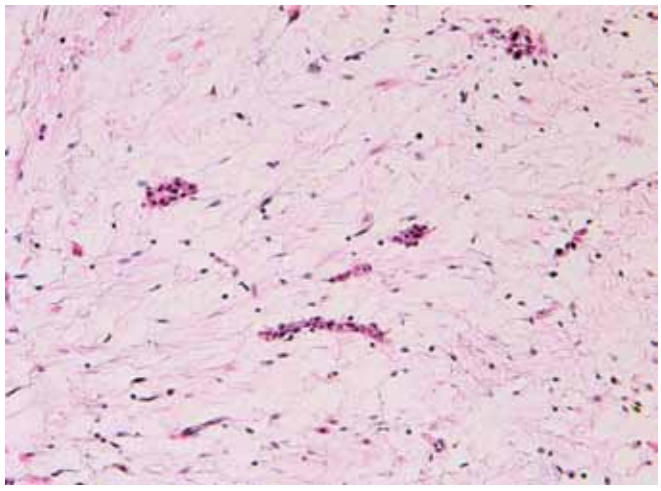

Fig. 2: A case of odontogenic myxoma with odontogenic epithelial rests scattered randomly in the tumor stroma (hematoxylin and eosin staining; original magnification, 200×)

DISCUSSION

'Myxoma' was initially used by Virchow over a century ago; later defined by Stout, it was believed to originate from primary mesenchymal progenitor cells.[14,15] This tumor occurs in various sites and organs,[14,16] including the head and neck, which most commonly affects the mandible, especially the posterior areas.[6] Our cases also showed a predilection for the posterior regions of the lower jaw, with a marginally nonsignificant difference between maxillary and mandibular tumors. Some investigators[8,10,12,13,17,18] similarly reported a predisposition of OM to occur in the mandible, but others have shown a more equal distribution.[9,19] Of the maxillary cases identified in the present study, 21.428% were located in the sinus which was considerably less than the 90% described elsewhere.[9] Kaffe et al[13] and Noffke et al[18] found 11.2 and 20% of the reviewed cases to cross the midline, respectively. None of the myxomas in the current investigation crossed the midline, which is in agreement with previous studies that consider bilateral tumors to be infrequent.[8,9,20]

The male to female ratio in the present study was 1:1.3, which shows a slight female predominance similar to the results reported by Kaffe et al[13] and Peltola et al.[17] Other investigations show a more pronounced female predilection,[10,12] especially in the African continent.[8,18] However, several reports have mentioned a more equal sex distribution.[9,21,22] Based on our findings, neither men nor women showed a significant difference between the occurrence of myxoma in the upper and lower jaws.

In the present study most patients were in their 3rd decade of life with a mean age of 27.9 years. A high frequency of OM in this decade has also been mentioned previously.[8,10] A total of 11 patients (27.5%) were between 6 and 20 years of age, which renders further support to the fact that this neoplasm should be included in the differential diagnosis of intrabony lesions occurring in the first and second decades of life, as indicated by Kaffe et al.[13] There was no significant difference in age between male and female subjects.

General microscopic characteristics of OM have been extensively described in pathology texts[6,23] and by the WHO;[2] however, there are various features that may not be essential for the diagnosis, but can be variably present in some tumors and therefore worth reporting.

Epithelial rests were observed in 3 (7.5%) of the present cases, corresponding with previous findings ranging between approximately 8%[9,10] and 20%.[12] There are conflicting views on the existence of epithelial strands in OM; some believe that they have a significant role in its pathogenesis by inducing the formation of myxoma cells,[24,25] while others merely consider them as 'residual rests' with no specific function in the neoplasm.[5] Entrapment of epithelium from neurovascular bundles or the eruption tract has been proposed as a possible explanation for the existence of these islands.[4] In addition, these rests have been used to confirm the odontogenic source of OM, as opposed to originating from myxoid and degenerative changes in a previous non-odontogenic mesenchymal lesion.[10]

The stroma of OM is typically loose and encompasses occasional fine collagen fibrils; however some cases may contain larger numbers of collagen bundles, hence the designation, 'myxofibroma'.[2,5,6] Collagen content of OM varies among different reported series, ranging from 'a few cases with moderate amounts of collagen'[8] to infrequent specimens with 'variable amounts of mature collagen'[10] to 30%[12] and 52%[9] of the studied samples. The 15% myxofibromas obtained in the current investigation, falls somewhere in between the reported values. It has been stated that myxomas and myxofibromas do not differ in their biologic behaviors.[5]

However, the number of investigations focusing on this subject seems to be limited. Schmidt-Westhausen et al[26] demonstrated that the extracellular matrix of OM contains collagen type I. On the other hand, according to Nonaka et al,[27] MMP types 1, 2 and 9 were involved in the degradation of type I collagen in OM. This is in agreement with the suggestion that in addition to the involvement of MMPs in the invasive characteristics of OM, this molecule may also be responsible for the morphologic structure and myxoid appearance of this neoplasm. Furthermore, if the theory that fibromyxoma exists in a spectrum is considered to be true, it would seem logical to presume that this intermediate tumor could have a limited capacity for invasion/recurrence like odontogenic fibroma or it may behave more aggressively similar to OM.[6] However, this theory needs to be confirmed and considering that classification of myxofibroma into odontogenic fibroma or myxoma, may have clinical implications, further investigation using extracellular matrix markers along with clinical data and patient follow-up is suggested in order to clarify this matter.

Residual bone was found in 37.5% of our cases which was close to the 25.8% reported by Martinez-Mata et al,[10] but much less than the 56% defined by Li et al.[9] According to previous studies, these structures may be responsible for the mixed radiographic appearance, seen in some cases of OM.[13,18] One of our cases demonstrated scattered mast cells; compatible with the findings reported by Takahashi et al,[25] but much less than the 72.6% described by Martinez-Mata et al.[10] We did not observe spheroid bodies, 'hyaline cells', atypical nuclei, binucleated cells, and lobulation that have been reported elsewhere.[7-9,18]

Follow-up was possible for only 5 of our cases and none of them recurred. According to previous studies, only 48% of investigations provide information on the recurrence of OMs and many do not mention patient follow-up in their reports.[28] MacDonald-Jankowski[28] in a systematic review of OMs in the Hong Kong Chinese, analyzed 45 systematic reviews of which information regarding recurrence was not given in 21 studies. In addition to their own investigation of 10 central OMs, they also presented 3 other reviews (with 4, 10 and 15 cases) that did not observe recurrences in any of their patients, which was similar to our findings. Other papers have also attested to the fact that evaluation of data pertaining to recurrences of this tumor is difficult due to the sparsity of information available on this subject. It should be noted that there are other studies reporting higher recurrence rates ranging from 10 to 43% (average, 25%), which has been associated with more conservative treatment methods like enucleation and curettage as opposed to radical surgery.[6,9,12] Additionally the duration of follow-up can also influence the number of reported recurrences, as there are cases that have been known to recur after 20 and 10 years.[28] Considering that only five patients were re-evaluated for a maximum of 18 years in our investigation and the existence of possible differences between the treatment modalities used in our series with other studies, discordance with the abovementioned higher recurrence rates can be justifiable.

CONCLUSIONS

According to the results obtained from the present Iranian sample of OMs, it seems that the clinicopathologic features of this tumor are similar to most studies that also found a slight female predilection and a higher frequency in the 3rd decade of life and the posterior parts of the lower jaw. On the other hand, a number of histologic characteristics that have been reported elsewhere were not observed in the current population.

CLINICAL SIGNIFICANCES

Considering that OMs are relatively uncommon lesions in the human body and the fact that probable variations in clinicopathologic and microscopic features may exist between geographic areas and races, it seems that access to these data in different populations may be useful in clinical settings and treatment planning. Also reporting more detailed histologic data can help clarify the biology of this tumor and aid in its histopathologic diagnosis.

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REFERENCES

1. Thoma KH, Goldman HM. Central myxoma of the jaw. Oral Surg Oral Med Oral Pathol 1947 Jul;33(7):B532-540.
2. Barnes L, Eveson JW, Reichart P, Sidransky D. WHO Pathology and Genetic of Head and Neck Tumours. Lyon: IACR 2005.p. 316-318.
3. Reichart PA, Philipsen HP. Odontogenic tumors and allied lesions. London: Quintessence Publishing 2005;p:179-199.
4. Adekeye EO, Avery BS, Edwards MB, Williams HK. Advanced central myxoma of the jaws in Nigeria. Clinical features, treatment and pathogenesis. Int J Oral Surg 1984 Jun;13(3): 177-186.
5. Brannon RB. Central odontogenic fibroma, myxoma (odontogenic myxoma, fibromyxoma), and central odontogenic granular cell tumor. Oral Maxillofac Surg Clin North Am 2004 Aug;16(3):359-374.
6. Neville BW, Damm DD, Allen CM, Bouquot JE. Oral and maxillofacial pathology. 3rd ed. Philadelphia: Saunders 2008.
7. Oygür T, Dolanmaz D, Tokman B, Bayraktar S. Odontogenic myxoma containing osteocement-like spheroid bodies: report of a case with an unusual histopathological feature. J Oral Pathol Med 2001 Sep;30(8):504-506.

8. Simon EN, Merkx MA, Vuhahula E, Ngassapa D, Stoelinga PJ. Odontogenic myxoma: a clinicopathological study of 33 cases. Int J Oral Maxillofac Surg 2004 Jun;33(4):333-337.
9. Li TJ, Sun LS, Luo HY. Odontogenic myxoma: a clinicopathologic study of 25 cases. Arch Pathol Lab Med 2006 Dec;130(12):1799-1806.
10. Martínez-Mata G, Mosqueda-Taylor A, Carlos-Bregni R, de Almeida OP, Contreras-Vidaurre E, Vargas PA, Cano-Valdéz AM, Domínguez-Malagón H. Odontogenic myxoma: clinicopathological, immunohistochemical and ultrastructural findings of a multicentric series. Oral Oncol 2008 Jun;44(6):601-607.
11. Harder F. Myoxomas of the jaws. Int J Oral Surg 1978 Jun;7(3):148-155.
12. Lo Muzio L, Nocini P, Favia G, Procaccini M, Mignogna MD. Odontogenic myxoma of the jaws: a clinical, radiologic, immunohistochemical and ultrastructural study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1996 Oct;82(4):426-433.
13. Kaffe I, Naor H, Buchner A. Clinical and radiological features of odontogenic myxoma of the jaws. Dentomaxillofac Radiol 1997 Sep;26(5):299-303.
14. Stout AP. Myxoma, the tumor of primitive mesenchyme. Ann Surg 1948 May;127(4):706-719.
15. Dutz W, Stout AP. The myxoma in childhood. Cancer 1961 May-Jun;14:629-635.
16. Amano J, Kono T, Wada Y, Zhang T, Koide N, Fujimori M, Ito K. Cardiac myxoma: its origin and tumor characteristics. Ann Thorac Cardiovasc Surg 2003 Aug;9(4):215-221.
17. Peltola J, Magnusson B, Happonen RP, Borrman H. Odontogenic myxoma--a radiographic study of 21 tumours. Br J Oral Maxillofac Surg 1994 Oct;32(5):298-302.
18. Noffke CE, Raubenheimer EJ, Chabikuli NJ, Bouckaert MM. Odontogenic myxoma: review of the literature and report of 30 cases from South Africa. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007 Jul;104(1):101-109.
19. Regezi JA, Kerr DA, Courtney RM. Odontogenic tumors: analysis of 706 cases. J Oral Surg 1978 Oct;36(10):771-778.
20. Harokopakis-Hajishengallis E, Tiwana P. Odontogenic myxoma in the pediatric patient: a literature review and case report. Pediatr Dent 2007 Sep-Oct;29(5):409-414.
21. White DK, Chen S, Mohnac AM, Miller AS. Odontogenic myxoma. A clinical and ultrastructural study. Oral Surg Oral Med Oral Pathol 1975 Jun;39(6):901-917.
22. Lu Y, Xuan M, Takata T, Wang C, He Z, Zhou Z, Mock D, Nikai H. Odontogenic tumors. A demographic study of 759 cases in a Chinese population. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998 Dec;86(6):707-714.
23. Regezi JA, Sciubba JJ, Jordan RCK. Oral pathology: clinical pathologic correlation. 5th ed. St Louis: Saunders 2008. p. 272-273.
24. Harrison JD. Odontogenic myxoma: ultrastructural and histochemical studies. J Clin Pathol 1973 Aug;26(8):570-582.
25. Takahashi H, Fujita S, Okabe H. Immunohistochemical investigation in odontogenic myxoma. J Oral Pathol Med 1991 Mar;20(3):114-119.
26. Schmidt-Westhausen A, Becker J, Schuppan D, Burkhardt A, Reichart PA. Odontogenic myxoma-characterisation of the extracellular matrix (ECM) of the tumour stroma. Eur J Cancer B Oral Oncol 1994 Nov;30B(6):377-380.
27. Nonaka CF, Augusto Vianna Goulart Filho J, Cristina da Costa Miguel M, Batista de Souza L, Pereira Pinto L. Immunohistochemical expression of matrix metalloproteinases 1, 2 and 9 in odontogenic myxoma and dental germ papilla. Pathol Res Pract 2009;205(7):458-465.
28. MacDonald-Jankowski DS, Yeung R, Lee KM, Li TK. Odontogenic myxomas in the Hong Kong Chinese: clinico-radiological presentation and systematic review. Dentomaxillofac Radiol 2002 Mar;31(2):71-83.