

CASE REPORT

Dentinogenic ghost cell tumor

Shikha B Singhaniya, Suresh R Barpande, Jyoti D Bhavthankar*Department of Oral Pathology and Microbiology, Government Dental College and Hospital, Aurangabad - 431 001, Maharashtra, India***Address for correspondence:**

Dr. S. R. Barpande,
Department of Oral Pathology and Microbiology,
Government Dental College and Hospital,
Aurangabad - 431 001, Maharashtra, India.
E-mail: sureshbarpande@yahoo.co.in

DOI: 10.4103/0973-029X.57679

ABSTRACT

Dentinogenic ghost cell tumor (DGCT) is a rare tumorous form of calcifying odontogenic cyst and only a small number of cases have been described. It is a locally invasive neoplasm that is characterized by ameloblastoma-like epithelial islands, ghost cells and dentinoid. The present report describes a case of a 21-year-old male with a tumor in the posterior region of the mandible, showing features of DGCT.

Key words: Dentinoid, dentinogenic ghost cell tumor, ghost cell**INTRODUCTION**

The calcifying odontogenic cyst (COC) was first described by Gorlin and his colleagues (1962), as a separate entity of odontogenic origin.^[1] As all lesions are not cystic and the biological behavior is often not compatible with a cyst, there is a controversy as to whether COC is a cyst or a tumor.^[2] Based on the dualistic concept, some authors consider that COC contains two entities: a cyst and a neoplasm.^[3] However, others regard COC as a tumor with a tendency for cyst formation.^[3] Based on this monistic concept the World Health Organization (WHO) has classified all COCs as neoplasms.^[4] The cystic lesions are termed as “calcifying cystic odontogenic tumors” (CCOT) and the neoplastic entity as a “Dentinogenic ghost cell tumor” (DGCT).^[1]

Dentinogenic ghost cell tumor is a rare tumor constituting only 11.5% of all COCs.^[2] It usually occurs in elderly persons with a slight male predilection. It shows a tendency to occur in the anterior segment of the jaws.^[2] Microscopically, it consists of ameloblastomatous epithelial islands, with areas of ghost cell formation and varying amount of dentinoid material.^[1]

The purpose of this article is to report a case of dentinogenic ghost cell tumor in a 21-year-male, in the posterior region of the mandible, which is at a comparatively younger age and at an infrequent site.

CASE REPORT

A 21-year-old male patient reported to the Department of Oral Pathology and Microbiology, Government Dental College and Hospital, Aurangabad, with the complaint of swelling in the left posterior region of the lower jaw, of one-month duration. The patient also complained of pain and pus discharge from the same region. Extraorally a diffuse swelling was seen over the left mandibular angle region [Figure 1].

Intraoral examination revealed the presence of a bony hard swelling, extending from 37 to the retromolar region [Figure 2]. The color of the lesional area was the same as that of the adjacent mucosa. It showed a smooth surface all over, except a small growth distal to 37, which subsided after antibiotic treatment.

Radiographs revealed a well-defined lesion extending from 34 to the ramus of the mandible with scalloped borders. The lesion was radiolucent with focal calcifications and impacted 38. Root resorption with 36 and 37 was also evident [Figure 3]. An occlusal radiograph showed buccal cortical expansion in the retromolar region on the left side [Figure 4].

Histopathological examination revealed a tumor mass composed of islands of odontogenic epithelial cells with hyperchromatic nuclei in a mature connective tissue stroma. Ameloblastoma-like islands with peripheral columnar, polarized basal cells, and central stellate reticulum-like cells were also noted. Numerous ghost cells with faint eosinophilic cytoplasm and a shadow of nuclear outlines were noted within the epithelial islands as well as in the connective tissue [Figure 5]. Many foreign body-type multinucleated giant cells were observed surrounding the ghost cells in the connective tissue stroma [Figure 6]. Some ghost cells exhibited calcification. Masses of dentinoid-like material were present in close proximity to the epithelial islands; in which some showed calcification [Figure 7]. Tumor cells also infiltrated the peripheral bone [Figure 8].

DISCUSSION

Calcifying odontogenic cyst constitutes 1 to 2% of all odontogenic tumors in which 88.5% are cystic and the remaining 11.5% are solid tumors.^[2] Praetorius *et al.* (1981), termed these solid tumors as “Dentinogenic ghost cell tumors” as they are made up of an ameloblastomatous epithelium with areas of ghost cell formation and varying amounts of

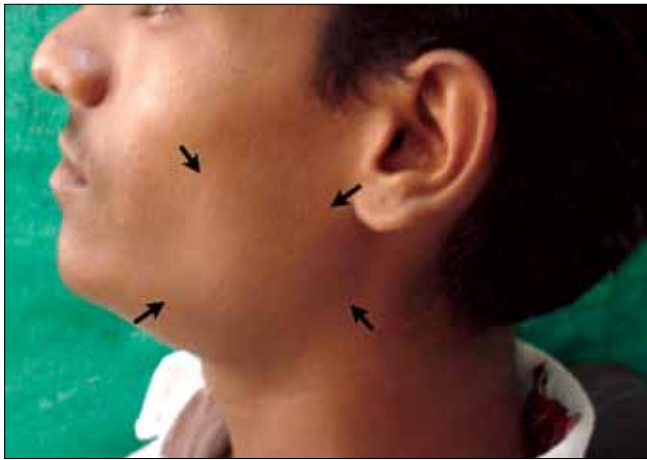


Figure 1: Diffuse swelling over mandibular angle region on left side



Figure 2: Bony hard swelling extending from 37 to retro-molar region with a small 1 x 1 cm reddish growth, distal to 37



Figure 3: Well-defined radio-lucency with focal radio-opacity and impacted 38. Root resorption of 36 and 37



Figure 4: Buccal cortical expansion in the left retro-molar region

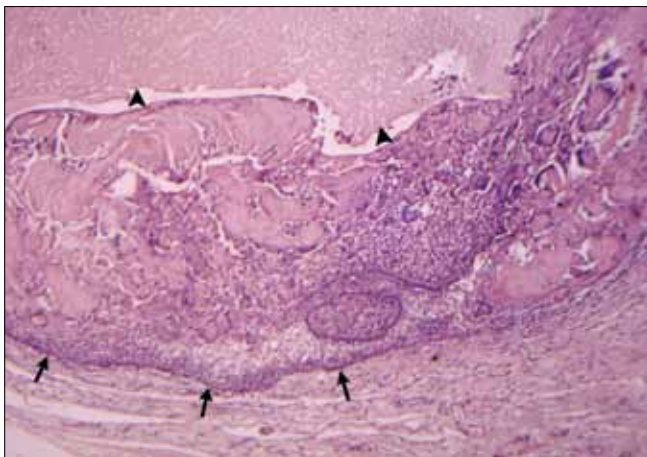


Figure 5: Ameloblastomatous epithelial island with ghost cells and dentinoid material (H and E, x 40)

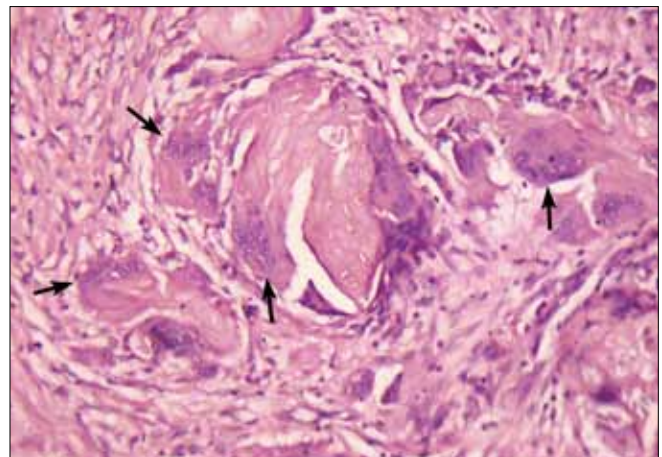


Figure 6: Giant cells surrounding ghost cells in the connective tissue stroma (H and E, x 100)

dentinoid.^[5] Fejerskov and Krogh (1972), interpreted it as a tumor or hamartoma with a marked tendency for cystic degeneration. They stated that there is no reason to assume that epithelial change can develop only in the pre-existing

cyst wall, but rather cystic degeneration can take place in the of the proliferating epithelial island. These authors also noted that the lesion is not invariably cystic and suggested the term “Calcifying ghost cell odontogenic tumor”.^[6] As it appeared

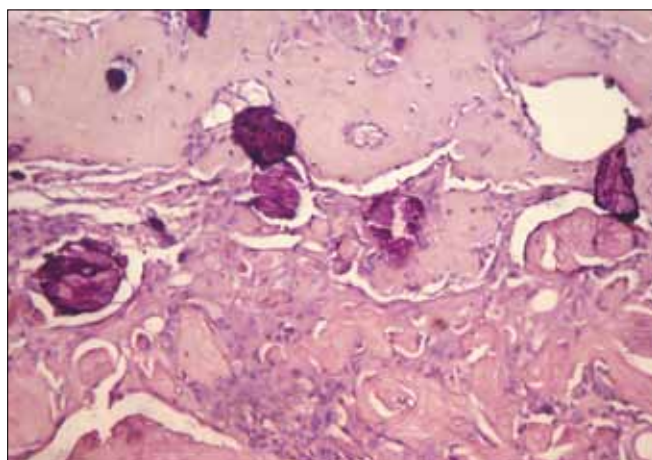


Figure 7: Calcifying ghost cells and dysplastic dentin (H and E, x 100)

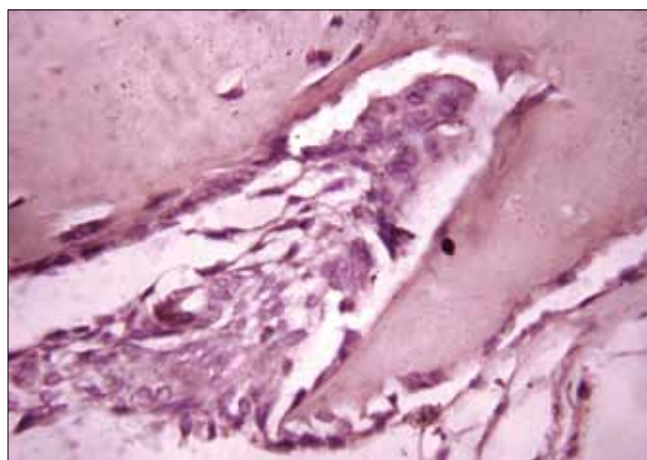


Figure 8: Tumor cells infiltrating adjacent bone (H and E, x 400)

to be one variety of ameloblastoma and could recur after conservative surgical treatment, Shear (1983), preferred the term “Dentinoameloblastoma”.^[5] Ellis and Shmookler (1986), preferred the term “Epithelial odontogenic ghost cell tumor” as epithelial cells appearing like ghost cells were the most distinctive feature of this neoplasm.^[5] Colmenero *et al.* (1990), suggested the term “Odontogenic ghost cell tumor” for the same neoplastic form of COC.^[7]

The average age for the presentation of this lesion is 50 years, (range 17 – 72 years) with slight male predilection.^[7] Tumor occurs in the maxilla and the mandible with equal frequency,^[7] with canine to first molar region the most often the affected site.^[8] Patients are usually without symptoms, although with a few complain of pain or discomfort.

The present lesion was seen in a 21-year-old male, in the posterior region of the mandible on the left side, at a comparatively younger age, and contrary to the common anterior region of the jaw.

Radiographically, radiolucency with scattered radio-opaque calcifications is a common feature. Root resorption or an impacted tooth in relation to the tumor mass is also noted in some cases.^[7] Radiographic features of the present case are in accordance with the previously reported cases.

Microscopic features show islands of odontogenic epithelial cells with hyperchromatic nuclei in a mature connective tissue. Loosely arranged stellate reticulum-like cells may be seen enclosed by the odontogenic epithelium. The epithelium may show ameloblastomatous proliferation with a well-defined basal layer of columnar or cuboidal cells and hyperchromatic nuclei, which are polarized away from the basement membrane.^[9] On account of the multipotentiality of odontogenic epithelium, the histological presence of areas similar to different odontogenic tumors, such as, ameloblastoma, odonto-ameloblastoma, ameloblastic fibro-

odontoma, odontoma, adenomatoid odontogenic tumor, and cementoma may be seen.^[2] Two characteristic features of DGCT distinguish it from ameloblastoma and other odontogenic tumors, numerous ghost cells, and masses of dentinoid material.^[8]

Ghost cells are characterized by the loss of nuclei, preservation of basic cellular outlines, and resistance to degradation.^[10] Although cellular outlines are usually well defined, they may be blurred, and as a result the groups of ghost cells appear fused. Dystrophic calcification may occur in some of the ghost cells, initially seen as fine basophilic granules and later as small spherical bodies. Sometimes ghost cells break through the basement membrane and come in contact with the connective tissue, where they evoke a foreign body reaction with the formation of multinucleated giant cells.^[11]

Most authors interpreted the changes in the ghost cells as aberrant or incomplete keratinizations or even as true keratinizations.^[6] Abram and Howell (1968), presented the concept that the keratin appeared to originate from the degeneration of squamous cells.^[6] Levy (1973), investigated the ghost cells in odontomas and suggested that they represented squamous metaplasia with subsequent calcification caused by ischemia.^[10] Sedano and Pindborg (1975), thought that ghost cells represented different stages of normal and aberrant keratin formation and that they were derived from the metaplastic transformation of odontogenic epithelium.^[10] Other investigators were of the opinion that ghost cells might be the product of abortive enamel matrix in the odontogenic epithelium, however, the morphology of ghost cells seems to be different from that of the enamel matrix.^[10]

Another characteristic feature is the formation of dentinoid or osteoid material, which represents an inflammatory response of the body to the presence of ghost cells.^[1] Abrams and Howell (1968), stated that masses of ghost cells induce granulation tissue to lay down the juxtaepithelial osteoid,

which may calcify.^[1] Sauk (1972), Sapp and Gardner (1977), and Nagao *et al.* (1982), stated that the juxtaepithelial osteoid or dentinoid are frequently found in areas free of either granulation tissue or ghost cells and postulated that it might be an inductive phenomenon rather than an inflammatory response.^[1,10] To date, it is not clear whether this material represents a true inductive effect or merely a metaplastic change in the connective tissue.

Similar histopathological features are seen in the present case, and hence it has been diagnosed as “Dentinogenic ghost cell tumor”.

In the immunohistochemical evaluation of a case of DGCT,' by Piatelli A *et al.* the epithelial cells were positive for cytokeratins, characterizing the presence of an odontogenic epithelium, while the calcified bodies and ghost cells were devoid of any immunoreactivity, representing that they were derived from the metaplastic transformation of the odontogenic epithelium or were a product of the coagulative necrosis of the odontogenic epithelium.^[12] There was also a strong positivity of the odontogenic epithelium for Bcl-2 and Mib-1, whereas, only a rare positivity for P-53. The ghost cells, giant cells, and dentinoid material were completely negative. It was concluded that the cells that expressed Bcl-2 and Mib-1 probably represented the portion of the tumor that proliferated and that could undergo malignant transformation.^[12]

Initially enucleation was the primary treatment for central DGCT, but local recurrence was noted. Hence, at present, a more radical approach is accepted.^[7] The present lesion was treated with segmental mandibulectomy followed by rib grafting. The healing was uneventful and no postoperative complaint was noted. The patient has been under observation since nine months and no recurrence has been noted till now.

CONCLUSION

COC has been seen to be of extensive diversity in its clinical and histopathological features as well as in its biological

behavior. The present case of 21-year-old male was diagnosed as DGCT, a tumorous form of COC, due to its characteristic histological features; numerous ghost cells and dentinoid material.

REFERENCES

1. Tajima Y, Ohno J, Ustumi N. The dentinogenic ghost cell tumor. *J Oral Pathol* 1986;15:359-62.
2. Gunhan O, Mocan A, Can C, Kisinisci R, Aksu AY, Finci R. Epithelial odontogenic ghost cell tumor: report of a peripheral solid variant and review of the literature. *Ann Dent* 1991;50:8-11.
3. Toida M. So-called calcifying odontogenic cyst: review and discussion on the terminology and classification. *J Oral Pathol Med* 1998;27:49-52.
4. Praetorius F, Ledesma-Montes C. Dentinogenic ghost cell tumour. In: Barnes L, Eveson JW, Reichart P, Sidransky D, editors. *Pathology and genetics of head and neck tumours. World Health Organization classification of tumours.* Lyon, France: IARC press; 2005. p. 314.
5. Gunhan O, Sengun O, and Celasun B. Epithelial odontogenic ghost cell tumor: report of a case. *J Oral Maxillofac Surg* 1989; 47:864-7.
6. Fejerskov O, Krogh J. The calcifying ghost cell odontogenic tumor or the calcifying odontogenic cyst. *J Oral Pathol* 1972;1:273-87.
7. Colmenero C, Patron M, Colmenero B. Odontogenic ghost cell tumours- The neoplastic form of calcifying odontogenic cyst. *J Cranio-Max Fac Surg* 1990;18:215-8.
8. Lezzi G, Rubini C, Fioroni M, Piattelli A. Peripheral dentinogenic ghost cell tumor of the gingiva. *J Periodontol* 2007;78:1635-8.
9. Hirshberg A, Dayan D, Horowitz I. Dentinogenic ghost cell tumor. *Int J Oral Maxillofac Surg* 1987;16:620-5.
10. Hong SP, Ellis GL, Hartman KS. Calcifying odontogenic cyst. A review of ninety two cases with reevaluation of their nature as cyst or neoplasm, the nature of the ghost cells, and subclassification. *Oral Surg Oral Med Oral Pathol* 1991;72:56-64.
11. Reichart PA, and Phillipsen HP. *Odontogenic tumors and allied lesions.* London: Quintessence Publishing Co. Ltd; 2004.
12. Piattelli A, Fioroni M, Alberti LD, Rubini C. Immunohistochemical analysis of a dentinogenic ghost cell tumour. *Oral Oncol* 1998;34:502-7.

Source of Support: Nil, Conflict of Interest: None declared.