Central granular cell odontogenic tumor of mandible in a child

Saravanan Lakshmanan*/ Babu Lal**/ Rudra Deo Kumar***/ Deepika Mishra****
/ Ongkila Bhutia*****

Central granular cell odontogenic tumor (CGCOT) is sporadic benign odontogenic tumor and it especially occurs in women older than 50 years of age. Radiologically it manifests as unilocular to the multilocular radiolucency with sometimes mixed densities. Histopathology displays sheets and islands of large eosinophilic cells with abundant granular cytoplasm, however few cases exhibit inadequate epithelium, thus creating a diagnostic confusion. Though, resection is advocated by some surgeons, however because of the non-aggressive biological behaviour, enucleation or curettage is the treatment of choice for this lesion. Till now only 39 cases have been reported in the past six decades. We are reporting the first case of CGCOT occurring in the youngest age of eleven-year-old patient with massive size of 11 × 7 × 6 cm. This would add CGCOT as a differential diagnosis in the bony lesions of younger individuals. In addition, the importance of immunohistochemistry studies in cases with scarce odontogenic epithelium and the potential role of Carnoy's solution in the management of this rare tumor in this age group was emphasized.

Keywords: *Odontogenic tumor, Children, Granular cell tumor, Pediatric tumor, Vimentin*

INTRODUCTION

Central granular cell odontogenic tumor (CGCOT) is one of the sporadic odontogenic tumors of the jaw. The first case was reported in 1950 by Werthemann in the name of "spongiocytic adamantinoma"[1]. Most of the literature suggests that tumor is composed of granular cells (GC) and odontogenic epithelium (OE). It has female predilection and mostly reporting between fifth to seventh decade of life[2]. Usually, it presents as a painless, slow-growing asymptomatic lesion but, aggressive cases may cause pain, root resorption and cortical expansion with perforation. Due to the low recurrence rate, conservative treatment like curettage or surgical excision is considered as a suitable option in this condition. However, some of these lesions may attain a massive size, and the absence of a capsule can make resection an inevitable treatment despite being a benign tumor.

To the best of our knowledge, only 39 cases of CGCOT have been reported in the literature with sufficient documentation (**Supplementary Table 1**). We are reporting a unique case of CGCOT with a massive lesion in a paediatric patient. The present case is the first case of CGCOT reported in the youngest age (<12 years) with large size which was managed via unconventional approach.

From All India Institute of Medical Sciences, New Delhi, India.
*Saravanan Lakshmanan, MDS, Senior Resident, Department of Oral and Maxillofacial Surgery.
**Babu Lal, MDS, Former Senior Resident, Department of Oral and Maxillofacial Surgery.
***Rudra Deo Kumar, MDS, Former Senior Resident, Department of Oral & Maxillofacial Surgery.
****Deepika Mishra, MDS, Additional Professor, Department of Oral Pathology and Microbiology.
*****Ongkila Bhutia, MDS, Professor, Department of Oral and Maxillofacial Surgery.

Corresponding Author:
Ongkila Bhutia,
Room 106,
Department of Oral & Maxillofacial surgery,
Centre for Dental Education and Research,
All India Institute of Medical Sciences,
New Delhi, India.
Pin code: 110049
Phone: +011-26542310
E-mail: dr_ongkila@rediffmail.com

doi: 10.22514/jocpd.2022.027

CASE REPORT

An eleven-year-old female was reported to department of oral and maxillofacial surgery with the chief complaint of painless, slow-growing swelling on the right side of the lower face for the past seven months. The patient had no history of infection, trauma, or tooth extraction. On the extraoral examination, the face was asymmetrical due to diffuse swelling and skin was normal in color, and no extraoral sinus or discharge was noticed (Fig. 1a). On intraoral examination, swelling extended from the ipsilateral lower canine tooth to the anterior border of the mandibular ramus with the expansion of the buccal and lingual cortex (Fig. 1b). We also noticed the lingual drifting of the right lower posterior teeth and the missing of the second molar tooth. The swelling was approximately 11 × 7 × 6 cm in dimension, non-tender, hard in consistency, non-fluctuant, non-compressible, non-reducible, and no fixity to the underlying structures. Sensory nerve examination revealed no signs of mental nerve paresthesia. Aspiration was negative at two different sites intraorally within the lesion.

Orthopantomogram (OPG) showed a single, well-defined, multi-locular radiolucency involving the entire right-side of the mandible crossing the midline reaching up to the contralateral canine tooth region. Superior-inferior expansion with thin corticated margin and thin random septae seen within the lesion. Teeth root resorption was not present. Missing second molar tooth and radio-opaque irregular sub centric mass in relation to second and third molar teeth region suggestive of remnant tooth structure noticed in the radiograph (Fig. 1c). Contrast-enhanced computed tomogram (CT) axial sections further revealed a thin corticated border with complete loss of bony trabeculae within the lesion. Both buccal and lingual cortical expansion along with multiple tiny breaches, and the internal content of the lesion was mixed cystic-solid in nature (Fig. 1d).

Routine laboratory investigations like complete blood count, liver function test, kidney function test and coagulation profile were within normal limits. Incisional biopsy on histopathology revealed loose hypercellular stroma consisting of lobules and sheets of cells with round to polygonal shape with eosinophilic, granular cytoplasm eccentrically placed round to ovoid nuclei. Fibrous connective tissue stroma separated these lobules. Stroma also showed collagen fiber bundles, numerous stellate fibroblasts, few cholesterol clefts, and chronic inflammatory infiltrate consisting of lymphocytes, plasma cells, and histocytes (Fig. 2). Tumor cells were diffusely immunopositive for vimentin, B-cell lymphoma -2 (BCL-2), neuron-specific enolase, focally positive for cluster of differentiation (CD) 68 and immunonegative for CD1a, langerin, pan cytokeratin (CK), S100, α-smooth muscle actin (SMA), desmin, and myogenin (Fig. 3). Ki67 proliferative index was less than 1%. No evidence of odontogenic epithelium or odontogenic islands was seen in the specimen. Histomorphology and immunohistochemical findings were suggestive of central granular cell odontogenic tumor. Due to the young age and benign nature of this lesion, curettage is preferred over resection.

Complete curettage along with the extraction of all involved teeth was performed through intraoral crevicular approach to avoid the facial nerve injury and extraoral scar (Fig. 4a). After curettage, ribbon gauze soaked with freshly prepared Carnoy's solution was kept the in the bony cavity for five minutes. Fixed residual tissue in the bony cavity was removed by peripheral ostectomy. Submandibular drain fixation was done, and double-layered watertight primary closure was performed to minimize the dehiscence. Intraoperatively tumor mass had a characteristic homogeneous fatty appearance without active bleeding (Fig. 4b). Excised specimen showed similar histological findings as incisional specimen, thus confirming the diagnosis of CGCOT. In the postoperative period, the patient was kept in maxillomandibular fixation for four weeks to prevent the pathologic fracture. The postoperative course was uneventful. No signs of recurrence were noticed after one year of follow up (Fig. 5). Patient will be planned for prosthetic rehabilitation of teeth in coordination with institute prosthodontist in the near future.

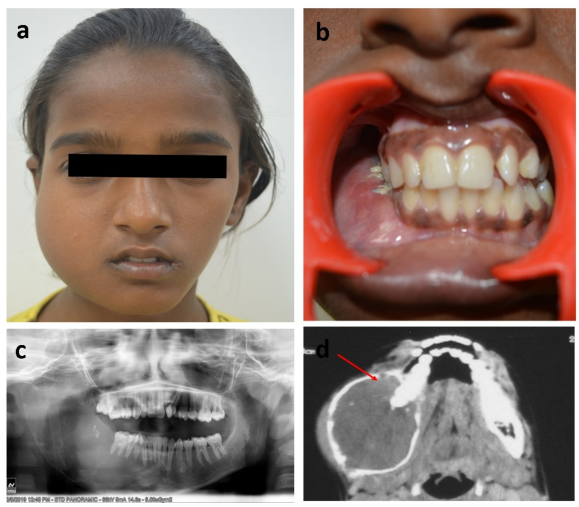

Figure 1: Preoperative clinical and radiographic presentation. a. Swelling in the right-side of face; b. Expansion and obliteration of lower buccal vestibule; c. OPG showing multi-locular radiolucent lesion involving entire right-side of mandible; d. CT axial section showing expansive lesion with cystic-solid component (arrow indicates solid component

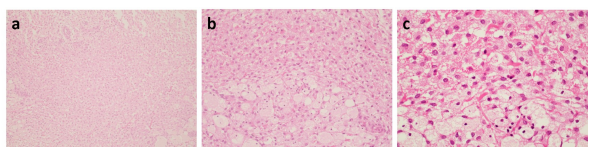

Figure 2: Hematoxylin and Eosin section of CGCOT showing sheets and lobules of large round to polygonal cells with abundant eosinophilic, granular cytoplasm, and eccentric, round-to-ovoid nuclei. (a. original magnification 4 ×; b. original magnification 20 ×; c. original magnification 40 ×).

doi: 10.22514/jocpd.2022.027

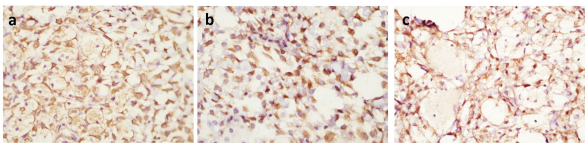

Figure 3: Immunohistochemistry of central granular cell odontogenic tumor (CGCOT) showing granular cells positive for the following markers in original magnification 40 ×. (a. Vimentin; b. BCL-2; c. Neuron specific enolase).

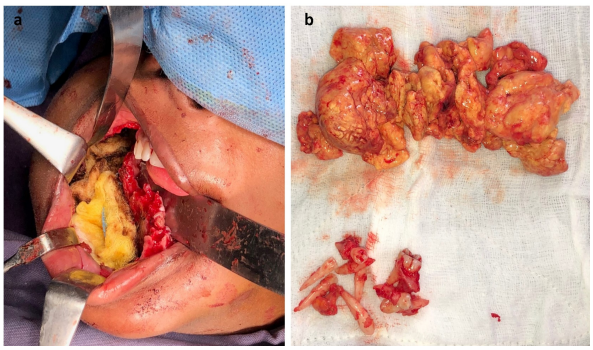

Figure 4: Surgical management. a. Intraoperative view of the bony cavity with Carnoy's solution socked multiple gauze pieces; b. Excised tumor specimen (homogenous fatty appearance) and multiple extracted teeth.

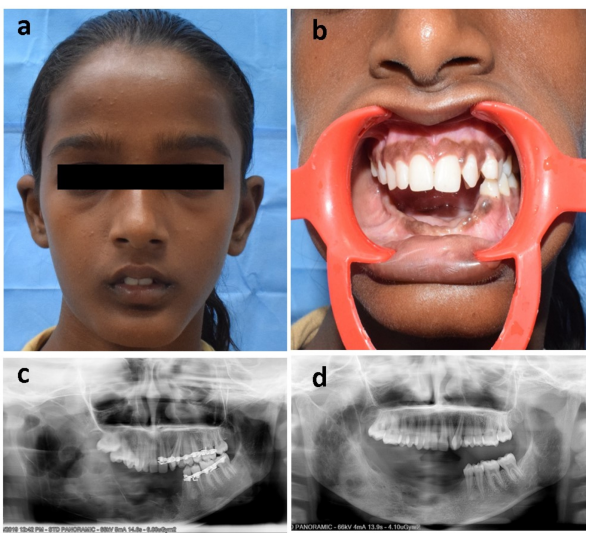

Figure 5: One year follow up. a. Grossly symmetrical face; b. satisfactory surgical site healing; c. Immediate postoperative orthopantomogram; d. One-year postoperative orthopantomogram reveals significant increase in radiopacity suggestive of adequate bone formation in the surgical site.

DISCUSSION

CGCOT nomenclature has undergone various changes from 1950 to date by different authors (**Supplementary Table 1**). Even though in World Health Organization (WHO) 4th update[3], the tumor was classified under the central odontogenic fibroma category, most of the authors like to describe this lesion as a central granular cell odontogenic tumor[2–4]. The clinicopathological features of CGCOT are similar to central odontogenic fibroma, such as the age of presentation, location, and female preference. The characteristic difference between these two lesions is the presence of cell-rich fibroblastic stroma in central odontogenic fibroma, which is absent in CGCOT. The present case is similar to literature findings in view of gender and location, however the age of presentation and size varied. In the literature size of the lesion range from 0.5 cm to 8 cm[1–7], however, this case was massive in presentation (11 × 7 × 6 cm). Apart from the dimension, our case seemed less aggressive as the swelling was painless and slow-growing in nature.

Radiographic findings of CGCOT are mostly non-pathognomic. Ardekian *et al.*[8] reported 90% lesions presenting as unilocular radiolucency and 10% lesions as mixed radiopacities with sclerotic borders. Further they noted calcifications microscopically in 50% of cases, but due to insufficient quantity, it could not be visualized in panoramic radiographs. Additionally CGCOT can lead to cortical perforation, tooth mobility, and root resorption. However, present case showed cortical expansion with a limited breach but no root resorption. Interestingly, ipsilateral missing second molar tooth and small sub centric radiopaque structure was also observed in the present case, which might be follicular remnants of the missing second molar.

Histologically granular cells can be seen in odontogenic lesions, namely granular cell ameloblastoma, central granular cell odontogenic tumor (variant of ameloblastic fibroma), calcifying epithelial odontogenic tumor, granular cell odontogenic cyst (variant of lateral periodontal cyst), granular cell tumor, granular cell myoblastoma, congenital epulis of the newborn, histiocytic lesions (Langerhans cell histiocytosis), salivary gland diseases (Warthin's tumor, oncocytoma) and sometimes in malignancies (like alveolar soft part sarcoma, malignant granular cell tumor, rhabdomyosarcoma, Hodgkin's lymphoma, basal cell carcinoma, angiosarcoma)[9]. Among all the central granular lesions, granular cell ameloblastoma is the most common jaw lesion, which displays granular cell changes within the centrally located stellate reticulum of the odontogenic islands. None of areas in the present case displayed odontogenic islands thus ruling out this entity.

Immunohistochemistry studies were the useful tool for the definitive diagnosis of CGCOT in the present case. Generally, granular cell component of CGCOT is immunopositive for vimentin and is almost always immunonegative for cytokeratin. However, OE component of CGCOT is positive for markers for cytokeratin[4]. In the present case, diffuse immuno positivity for vimentin and immunonegativity for pan CK was noticed, which excluded the presence of any odontogenic epithelium. In addition, immunonegativity for S100 and intraosseous location in the present case ruled out granular cell tumor (GCT). GCT is almost always immunopositive for S100 and tongue is the common site for this tumor[10]. Radiology features and immunonegativity for CD1a and, langerin ruled

out Langerhans cell histiocytosis. Only one study[11] supports CD1a positive for CGCOT, but later all studies[4,12] showed immunonegativity including our present case which was also negative for CD1a and langerin. Moreover, CD 68 positivity in the present case supports the histiocytic origin of GCs. Lack of any cytological atypia, nuclear pleomorphism and hyperchromatism, immunonegativity for Pan CK, SMA, desmin and myogenin and low Ki67 proliferative index completely excluded the vague possibility of salivary gland entities and malignancies that might present with granular cells.

Regarding management of CGCOT, both curettage and surgical excision with reconstruction are a treatment choice[2]. Even though a massive lesion in the present case warrants resection, however considering the young age and benign nature of the tumor, a conservative approach was preferred. Complete removal of this massive lesion through an intraoral approach was very challenging to the surgeons. Thus, curettage alone would be inadequate; hence Carnoy's solution and peripheral ostectomy were added in the management. Apart from odontogenic keratocyst, usage of Carnoy's solution in other aggressive maxillofacial lesions has been reported in the literature[13]. Thus, this treatment modality was undertaken for the first time in CGCOT to fix the remnant tissue in the curettage site to minimize the recurrence in the future. Brannon *et al.*[4] reported one recurrence case after 13 years in which involved teeth were not extracted during first surgery. Piattelli *et al.*[14] reported the first malignant CGCOT in the maxilla, in which maxillectomy with functional ipsilateral neck dissection was performed. Due to paucity of CGCOT in literature, these cases need to be documented with a regular long-term follow-up.

CONCLUSION

The CGCOT is a very rare benign tumor of odontogenic origin. Clinically and radiographically, it is similar to the other odontogenic tumors. Histopathology and sometimes immunohistochemistry is mandatory to get the definitive diagnosis, hence incisional biopsy is the reliable diagnostic modality for this rare tumor. This report adds the first case of pediatric CGCOT presenting with a large size and treated with chemical cauterization using Carnoy's solution. Because of its benign nature and homogeneous fatty consistency, we can manage even massive tumors with a conservative approach. It is essential to include CGCOT in the differential diagnosis of bone lesions in young subjects as it can attain massive size if untreated with bony destruction and disfigurement.

SOURCE(S) OF SUPPORT

No funding source or financial support for this article.

CONFLICTING INTEREST

Authors hereby declare that we have no conflict of interest to share or notify about this article.

ETHICAL APPROVAL

The included patient gave assent and their parents gave consent to use the photos for publication.

PATIENT DECLARATION OF CONSENT STATEMENT

Written assent from the patient and informed written consent from the parents were obtained.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.jocpd.com/files/article/1592749164954828800/attachment/Supplementary%20material%20.docx.

REFERENCES

1. Werthemann A. Uber spongiocytares adamantinoma. Oncologie. 1950; 3: 193–207.
2. Sarode SC, Sarode GS, Vaidya K. Central granular cell odontogenic tumor: a systematic review. Journal of Oral Pathology & Medicine. 2014; 43: 167–176.
3. El-Naggar AK, Chan JKC, Grandis JR Takata T, Slootweg PJ. World Health Organization classification of head and neck tumors. 4th ed. Lyon: IARC. 2017.
4. Brannon RB, Goode RK, Eversole LR, Carr RF. The central granular cell odontogenic tumor: report of 5 new cases. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2002; 94: 614–621.
5. Atarbashi-Moghadam S, Saebnoori H, Shamloo N, Dehghanpour Barouj M, Saedi S. Granular cell odontogenic tumor, an extremely rare case report. Journal of Dentistry. 2019; 20: 220–223.
6. Lee J, Wei L, Wu Y, Chiang C. An early central granular cell odontogenic tumor arising from the dental follicle of an impacted mandibular third molar. Journal of the Formosan Medical Association. 2014; 113: 766–768.
7. Rinaggio J, Cleveland D, Koshy R, Gallante A, Mirani N. Peripheral granular cell odontogenic fibroma. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2007; 104: 676–679.
8. Ardekian L, Manor R, Gaspar R, Laufer D. Central granular cell odontogenic tumor: case report and review of literature. Journal of Oral and Maxillofacial Surgery. 1998; 56: 1343–1345.
9. Gesek DJ, Adrian JC, Reid EN. Central granular cell odontogenic tumor. Journal of Oral and Maxillofacial Surgery. 1995; 53: 945–949.
10. Chiang C, Hu K, Tsai C. Central granular cell odontogenic tumor: the first reported case in oriental people and literature review. Journal of the Formosan Medical Association. 2014; 113: 321–325.
11. Chen S. Central granular cell tumor of the jaw. Oral Surgery, Oral Medicine, Oral Pathology. 1991; 72: 75–81.
12. Meer S, Altini M, Coleman H, Daya N. Central granular cell odontogenic tumor: immunohistochemistry and ultrastructure. American Journal of Otolaryngology. 2004; 25: 73–78.
13. RajeshKumar BP, Rai KK, Geetha NT, ShivaKumar HR, Upasi AP. Carnoy's in aggressive lesions: our experience. Journal of Maxillofacial and Oral Surgery. 2013; 12: 42–47.
14. Piattelli A, Rubini C, Goteri G, Fioroni M, Maiorano E. Central granular cell odontogenic tumor: report of the first malignant case and review of the literature. Oral oncology. 2003; 39: 78–82.