Recurrent Dentinogenic Ghost Cell Tumor: A Case Report

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Patient: Male, 42-year-old
Final Diagnosis: Dentinogenic ghost cell tumor
Symptoms: Swelling • recurrent pain
Medication: —
Clinical Procedure: Segmental maxillectomy
Specialty: Dentistry • Pathology • Surgery

Objective: Rare disease
Background: Dentinogenic ghost cell tumor (DGCT) is a rare, locally invasive odontogenic neoplasm, considered as a solid variant of the calcifying odontogenic cyst (COC). DGCT accounts for only 2% to 14% of all COCs and less than 0.5% of all odontogenic tumors. It is characterized by an ameloblastomatous odontogenic epithelium and the presence of ghost cells and dentinoid material.

Case Report: A 42-year-old male patient presented to the clinic with recurrent pain and swelling in the left maxilla. The patient had a similar presentation 3 years before, which had been managed by excisional biopsy and was misdiagnosed as unicystic ameloblastoma. Examination revealed a mild swelling in the left cheek with bony expansion on the posterior area of the left maxilla, with mobility in adjacent teeth. Radiographic evaluation revealed a large, well-demarcated radiolucent lesion with a sclerotic border involving the left maxilla and associated with root resorption in the adjacent teeth. An incisional biopsy was performed, and a diagnosis of DGCT was made. Segmental maxillectomy with safe margins was conducted, considering the aggressiveness of this pathological entity. The defect was reconstructed using the buccal fat pad. Histopathology examination confirmed the diagnosis of DGCT, which was characterized by ameloblastomatous odontogenic epithelium, dentinoid material, and ghost cells. One month follow-up revealed good healing of the surgical site. The patient was scheduled for regular follow-up.

Conclusions: This case reports the aggressiveness and high recurrence rates of DGCT. It is recommended to treat DGCT aggressively with safe margins and a long-term follow-up.

Keywords: Odontogenic Cyst, Calcifying • Odontogenic Tumors

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Background

Dentinogenic ghost cell tumor (DGCT) is a rare, locally invasive odontogenic neoplasm, considered as a solid variant of a calcifying odontogenic cyst (COC) [1,2]. DGCT was first introduced by Thoma and Goldman in 1946 [3]. Singhania et al classified the variations of COCs into 2 groups; cystic type “calcifying cystic odontogenic tumor” (CCOT), or type I, and the solid/neoplastic type, known as “dentinogenic ghost cell tumor” (DGCT), or type II [1,4]. However, in the latest edition of the World Health Organization (WHO) classification of head and neck tumors (2017), DGCT has been classified under tumors of mixed epithelial mesenchymal origin [1,5,6]. DGCT accounts for only 2% to 14% of all COCs [1,2] and less than 0.5% of all odontogenic tumors [1]. DGCT is characterized by an ameloblastomatous odontogenic epithelium and the presence of ghost cells and dentinoid material. The present report illustrates a recurrence case of central DGCT in the posterior maxilla in a middle-aged man.

Case Report

History of Present Illness

A 42-year-old male patient presented to the clinic with recurrent pain and swelling in the left maxilla. The patient’s medical history was noncontributory.

History of Past Illness

The patient was referred from another hospital to King Fahad Military Medical Center (KFMMC), Dahran, Saudi Arabia, in Aug 2018 for a swelling in the left maxilla that was incidentally noted. On examination, an expansile swelling was noted extending from the left canine to the left zygomatic buttress, which was non-tender with eggshell cracking. Computed tomography (CT) and cone beam CT scans showed unilocular radiolucency extending to the maxillary sinus, along with displacement of the wall of the maxillary sinus. The patient’s medical history was noncontributory.

An excisional biopsy was done under general anesthesia, through the aspiration of the cystic fluid, followed by total enucleation of the cystic lining, without rupture. A histological evaluation done by a general pathologist at KFMMC was reported as “unicystic ameloblastoma of the left maxilla”. The patient had uneventful postoperative healing and had regular quarterly follow-ups. An expansion of the buccal cortical plate was noted after 3 years, which led to further investigations.

Physical Examination

An extraoral examination revealed mild facial asymmetry with mild swelling in the left cheek. No TMI disorder and a normal mouth opening was noted. Intraoral examination revealed mild boney expansion on the left maxilla extending from the maxillary second premolar to the left wisdom tooth region; it was non-tender to palpation, with mobility grade I at teeth no. 14 and 15.

Imaging Examinations

A panoramic radiograph revealed a large, well-demarcated radiolucent lesion with a sclerotic border, involving the left maxilla, extending from the second premolar anteriorly to the maxillary sinus posteriorly and the maxillary sinus superiorly.

A CT scan showed soft tissue density, measuring approximately 3.3×3×3 cm. There was disruption of the inferior maxillary sinus wall with an extension of the lesion into the inferior aspect. Areas of cortical rarefaction and remodeling were noted with no periosteal reaction. After contrast administration, there was enhancing thin septa with no abnormal soft tissue thickening or enhancing, indicating a cystic lesion with separation, with associated resorption/erosion of the molar teeth roots and nasal septal deviation toward the left (Figure 1).

Management

Incisional biopsy was done under local anesthesia and sent for histopathological evaluation. A diagnosis of calcifying epithelial odontogenic tumor was made by a general pathologist in KFMMC, after which the case was presented to an oral and maxillofacial pathologist in Imam Abdurrahman University, Saudi Arabia, and was diagnosed as DGCT. Moreover, the first excisional biopsy was retrieved and reviewed to confirm the diagnosis of DGCT. Under general anesthesia, the patient underwent segmental maxillectomy with safe margins, considering the aggressiveness of this pathological entity. A surgical marker was used to delineate the osteotomy sites, considering the 2- to 3-mm safe margin. A vertical osteotomy was done 1 cm anterior to tooth no. 25 from the alveolar crest to the zygomatic buttress above the superior extent of the lesion. Then, a horizontal osteotomy connected to the vertical one from its superior extent until tuberosity posteriorly. A palatal osteotomy was done using a chisel to complete fracturing the segment with the involved teeth no. 23, 24, 25, and 26 within it. Five specimens were taken from the margins, along with main specimen, fixed in 4% neutral formalin solution, and submitted for histopathologic examination. Hemostasis was achieved and the left greater palatine artery was ligated. Reconstruction was done using the buccal fat pad and primary closure was achieved by mobilizing the palatal full-thickness flap, based on the contra lateral greater palatine artery, sacrificing the nasopalatine bundle. Layered closure was attained using 4-0 Vicryl. The patient was extubated smoothly and sent to recovery in stable condition.
Gross Examination

The gross examination showed a brownish/reddish well-demarcated bony lesion of the left maxilla with the involved teeth, the second premolar and first, second, and third molars attached to it, exposing only the crowns. The specimen measured 5×3×2.5 cm (Figure 2).

Microscopic Examination

A histopathological examination revealed a well-circumscribed partially capsulated lesion that has a cystic and solid part. The solid part showed islands and sheets of odontogenic epithelium with ameloblastoma-like features in a fibrous connective tissue stroma. The ameloblastoma-like features included palisading of the basal cell layer with reverse polarization and vacuolization, as well as stellate-reticulum. The epithelium also showed duct-like structures. Another major finding was the presence of sheets of ghost cells (keratinized epithelial cells characterized by the loss of nuclei with preservation of basic cellular outlines) within the epithelium. Clear cells and very few mitoses were observed in some parts of the epithelium. The cystic part was lined by the same type of cells seen in the solid part. In addition, dentinoid material, calcification, and forming body granuloma could be seen throughout the specimen (Figures 3, 4). This histological presentation was consistent...
Figure 2. Left maxilla tumor consisted of teeth with underlying irregular grayish hemorrhagic firm tissue measuring (5×3×2.5 cm).

Figure 3. Photomicrograph of hematoxylin and eosin stained sections: (A) 20×, showing the solid part of the tumor with a fibrous capsule; (B) 40×, the solid part shows islands and sheets of odontogenic epithelium with ameloblastoma-like features of palisading of the basal cell layer with reverse polarization and vacuolization as well as stellate-reticulum; and (C) 20×, cystic part lined by the same type of cells seen in the solid part.

Figure 4. Photomicrograph of hematoxylin and eosin-stained sections: 40×, (A) showing ghost cells (arrow) and dentinoid material (arrow head) and (B) showing clear cells.
with the first excisional biopsy that was misdiagnosed as a unicystic ameloblastoma. Figure 5 shows the histological features of the first biopsy, where it shows cystic growth with ameloblastoma-like features and ghost cells, also the presence of follicular ameloblastoma-like islands, and ghost cells with an amount much less than what was seen in the second biopsy.

**Outcome and Follow-Up**

The healing was uneventful after surgery. The 1-month follow-up revealed good healing of the surgical site. The patient was instructed to visit the clinic for regular follow-ups to monitor the healing and prognosis.

**Discussion**

COCs have various terminologies and classifications in the literature. In 1972, Fejerskov and Krogh [7] proposed the term “calcifying ghost cell odontogenic tumor”, as the term COC is not entirely appropriate. In 1981, Praetorius et al [8] proposed the term “DGCT” owing to the presence of ghost cells and the rich amount of dentinoid material. In 1991, Buchner et al [9] classified COCs clinically into central and peripheral lesions. Moreover, they subclassified each of them into cystic or neoplastic variations and added a rare malignant variant of COC in their classification. In 1991, Hong used the term “epithelial odontogenic ghost cell tumor” for the solid variant [10].

This dilemma of naming was solved in 2005 by the WHO [1]. According to the WHO, the spectrum of odontogenic ghost cell tumors involves DGCT, CCOT, and ghost cell odontogenic carcinoma (GCOC). In 2005, the WHO described DGCT as “a locally invasive neoplasm characterized by ameloblastoma-like islands of epithelial cells in a mature connective tissue stroma. Aberrant keratinization may be found in the form of ghost cells in association with varying amounts of dysplastic dentin” [1,2]. Buchner stated that COCs account for 1% to 2% of all odontogenic tumors and, out of this, only 2% to 14% were DGCTs [1,2].

DGCT is the solid variant of CCOT with a patient age range from the second to the eighth decade of life [1,2,6]. It has a slight male predilection [1,2,3,6], as in the present case, in which the patient was a man aged 42 years. It can be found as an intraosseous lesion (type 1, 83%) and less frequently as an extraosseous peripheral lesion occurring in the gingiva or alveolar mucosa (type 2, 17%) [2].

Most lesions were centrally located (intraosseous) [3]. Agrawal et al [11], reported that intraosseous DGCTs occur mainly in the canine to first molar region. The present case was noted in the posterior maxilla in the molar region. DGCT cases were found to have a well-defined (66.7%) unilocular border (51.8%) with a mixed appearance (60.6%) [3]. In a report by de Arruda et al [3], root resorption of teeth associated with the lesion was reported in 9 cases and tooth displacement/resorption was observed in 11 cases.

The size of intraosseous DGCTs range from 1 cm to 10 cm, or larger. The clinical characteristics of intraosseous DGCTs include noticeable swelling, facial asymmetry, expansion of the jaw, obliteration of the maxillary sinus, infiltration of the soft tissues, associated pain, pus discharge, tooth displacement or mobility, and root resorption [1,2,6,12]. The patient in the present case presented with swelling, dull pain, and root resorption with a size of 3.3×3×3 cm.

Radiographically, DGCT is seen as a radiolucent, radiopaque or mixed lesion, according to the amount of calcification. It could
be unilocular or multilocular with a well-defined or ill-demarcated margins. Root resorption, displacement of adjacent teeth, and the presence of impacted teeth have been noted [12-14]. In the present case, the recurrence was presented as well-demarcated radiolucency causing disruption of the inferior maxillary sinus wall and resorption of the molar teeth roots, suggesting the aggressive nature of the tumor.

Early diagnosis is important for a better prognosis of DGCT. Management differs for both variants of DGCT due to the difference in recurrence rate and malignant potential [11]. Simple excision (29.6%), followed by a radical approach (22.2%) and wide excision (18.5%) are the main therapies for DGCT cases. Intraosseous DGCT can have an infiltrative growth pattern and can recur after treatment [3]. Intraosseous variants of DGCT are more aggressive than extraosseous variants [14]. Aggressive local resection with adequate safety margins is advised for the intraosseous variants [14,15], especially in cases of ill-defined margins radiologically [1]. Complete removal of the tumor could necessitate a block excision, segmental mandibular resection, or partial maxillectomy [15]. Extraosseous lesions are mostly treated by conservative local excision [14].

The malignant transformation of a DGCT to odontogenic ghost cell carcinoma has been reported in the literature [9]. Recurrence rates have been found to be up to 71% [2]. Cases of recurrence frequently occur 5 to 8 years following initial treatment, whereas no recurrences have been reported for extraosseous cases [16]. As this entity has a high recurrence rate and clinical features of benign aggressive tumors, the recommended follow-up period is similar to that of an ameloblastoma, for which a radiological follow-up beyond 10 years has been suggested. Panoramic radiograph is indicated every 6 months in the first 5 years and annually afterward, and after the completion of 10 years of follow-up, the patient is recommended to follow up every 2 to 3 years, for as long as possible. A CT scan can be appropriate when a recurrence is suspected [17]. The present case was a case of recurrence after 3 years of treatment with enucleation. Hence, it is recommended to treat DGCT aggressively with safety margins and to keep patients under long-term follow-up.

**Conclusions**

DGCT has the utmost clinical importance because of its high recurrence and possible malignant transformation. A radiologic diagnosis of the unicystic form of intraosseous DGCT is often mislead by other differential diagnoses. Hence, a histopathological differential diagnosis by a specialized maxillofacial pathologist is often mandatory in cases suspected of ameloblastoma to delineate the presence of ghost cells and dysplastic dentin. More appropriate treatment was carried out for this patient after a diagnosis of DGCT was made. We recommend treating DGCT aggressively with safety margins, along with long-term follow-up.

**Department and Institution Where Work Was Done**

King Fahad Medical Complex Hospital, Dhahran, Saudi Arabia.

**Declaration of Figures’ Authenticity**

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