CASE REPORT

Unusual Granular Cell Odontogenic Tumor. Report of Two Undescribed Cases with Features of Granular Cell Ameloblastoma and Plexiform Granular Cell Odontogenic Tumor

Chong Huat SIAR and Kok Han NG

(Received 6 July 1992 and accepted 13 January 1993)

Key words: granular cell, granular cell ameloblastoma, immunohistochemistry, keratin, S-100 protein

Abstract

Granular cell ameloblastoma (GCA) is a well recognized variant of follicular ameloblastoma with extensive granular cell change. In contrast, plexiform granular cell odontogenic tumor (PGCOT) is a rare and recently described lesion characterized histologically by a monophasic plexiform pattern of granular cells. In this paper, two cases of an unusual granular cell odontogenic tumor exhibiting combined features of these two entities are described along with their immunohistochemical characteristics. The granular cells of both the GCA and PGCOT areas showed similar patterns of expression for keratin and S-100, which differed from those of typical ameloblastoma. No reactivity for desmin or vimentin was noted. The histomorphologic and immunohistochemical features of these hybrid tumors suggest that the granular cells present have a common origin, most probably the odontogenic epithelium.

Introduction

Granular cells are found in a variety of odontogenic lesions, notably granular cell ameloblastoma (GCA) and more recently in so-called plexiform granular cell odontogenic tumor (PGCOT). The latter was first described by ALTINI et al., who reported two cases which occurred in the posterior mandible of elderly male patients. Subsequently, a unicystic variant affecting the mandibular molar region of a Chinese female was also documented. Of probable odontogenic epithelial origin, this tumor, as its name suggests, is characterized histologically by a monophasic plexiform pattern of granular cells. Morphologically, histochemically and ultrastructurally, these cells resemble those of granular cell ameloblastoma.

In association with their initial report, ALTINI et al. also mentioned briefly three other cases of typical ameloblastoma exhibiting simultaneous areas of PGCOT. A review of the pertinent literature disclosed that PGCOT occurring in association with GCA has not been documented. In this report, two unusual cases showing combined features of these two entities are presented. The primary aim of this study was to elucidate the clinical and histopathologic features of these hybrid tumors along with their immunohistochemical characteristics in order to clarify their histogenesis.

1 Department of Oral Pathology, Oral Medicine and Periodontology, Faculty of Dentistry, University of Malaya, 59100 Kuala Lumpur, Malaysia
2 Division of Stomatology, Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur, Malaysia
To whom all correspondence should be addressed: Dr. Kok Han NG, Division of Stomatology, Institute for Medical Research, Jalan Pahang, 50588 Kuala Lumpur, MALAYSIA
Materials and Methods

Case reports

Case 1
A 21-year-old Chinese woman complained of a painless swelling, which had slowly enlarged over the previous two years, in the angle of the left mandible. Radiographs revealed a radiolucent lesion with a soap bubble appearance. The clinical impression was ameloblastoma. Enucleation of the lesion was done under general anesthesia.

Case 2
A 62-year-old Malay woman had a one-year history of a tender swelling on the edentulous incisal-premolar region of the right side of the lower jaw. Enucleation of the tumor was performed under general anesthesia.

Histopathology and immunohistochemistry

The tissue specimens obtained by surgical excision were fixed in 10% formol saline for at least 24 h and embedded in paraffin wax. Four micrometer-thick paraffin sections were cut and stained with hematoxylin-eosin (H&E), periodic acid-Schiff (PAS) with and without diastase, and mucicarmine.

Deparaffinized sections were also prepared for immunohistochemistry. The peroxidase-antiperoxidase (PAP) method with polyclonal antibodies was used to identify and localize keratin and S-100 protein. The indirect method with monoclonal antibodies was used to detect desmin and vimentin. The staining protocols for both techniques are detailed in Table 1. Appropriate positive and negative controls were included. Reagents, antibodies and PAP complexes were obtained from Dakopatts, Denmark.

<table>
<thead>
<tr>
<th>Table 1 Immunohistochemical staining methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAP technique</strong></td>
</tr>
<tr>
<td>1. Deparaffinization</td>
</tr>
<tr>
<td>2. Trypsin pretreatment (except vimentin): 0.01% trypsin/PBS (pH 7.6) 30 min</td>
</tr>
<tr>
<td>3. Inactivation of endogenous peroxidase: 0.3% H2O2/methanol soln. 30 min</td>
</tr>
<tr>
<td>5. 1st layer:</td>
</tr>
<tr>
<td>anti-S-100 protein 1:200 30 min</td>
</tr>
<tr>
<td>anti-Keratin 1:200 30 min</td>
</tr>
<tr>
<td>6. 2nd layer:</td>
</tr>
<tr>
<td>Anti-rabbit Ig G swine serum 1:40 30 min</td>
</tr>
<tr>
<td>7. 3rd layer:</td>
</tr>
<tr>
<td>HRP, rabbit anti- peroxidase 1:100 30 min</td>
</tr>
<tr>
<td>8. Visualization of peroxidase activity: 0.02% 3-3’ diaminobenzidine tetrahydrochloride (DAB)/0.05 M Tris buffer solution (pH 7.6) containing 0.05% H2O2 5 min</td>
</tr>
<tr>
<td>9. Counterstain, Dehydrate and Mount</td>
</tr>
</tbody>
</table>

Results

Histopathology

The tumor tissue in both cases showed combined features of PGCOT and GCA (Fig. 1), the former constituting the dominant type. This consisted of short or interlacing strands of granular cells, each strand being two cell layers thick (Figs. 1 and 2). These cells were polyhedral in shape with abundant granular cytoplasm, and the nuclei had a tendency to show a “back-to-back” arrangement (Fig. 2). The GCA component occurred as discrete follicles of granular cells
intermingled randomly with the PGCOT areas (Figs. 1 and 3). In some parts of the tumor, typical ameloblastoma occurred as occasional islands (Fig. 3) or as areas of transition (Fig. 4). The intervening stroma was of the fibrous connective tissue type with evidence of juxtaepithelial hyalinization in some areas. Special stains revealed that the cytoplasmic contents of the granular cells in both PGCOT and GCA areas were PAS-positive, diastase-resistant and mucicarmine-negative.

**Immunohistochemistry**

Keratin expression was stable and intense in the typical ameloblastoma areas (Fig. 5) but variable and focal in areas of granular cell epithelium (Fig. 5). Positive S-100 staining was detected in both the nuclei and cytoplasm of epithelial cells of typical ameloblastoma (Fig. 6) but only in the nuclei of granular cells (Fig. 6).

Both the granular and non-granular cell epithelium were negative for desmin and vimentin.
immunoreactivity.

Discussion

PGCOT is very similar to GCA in many respects. Clinically and radiologically two entities are indistinguishable from each other[2,3]. Cytologically, they have the same tumor cell type, that is, their granular cells share similar morphologic, histochemical and ultrastructural characteristics. The principal difference so far evident is that each tumor exhibits a distinctive histomorphologic pattern. GCA is essentially a follicular ameloblastoma with large masses of granular cells replacing all or part of the stellate reticulum and frequently the peripheral ameloblasts as well[1]. In contrast, PGCOT is characterized by a monophasic plexiform pattern of granular cell strands, each strand being two cell layers thick. On the basis of histologic criteria, tumor areas showing typical ameloblastoma histology are not found in PGCOT[2,3].

The clinical and radiological presentations of the two current cases were also indistinguishable from PGCOT or GCA per se. Histologically, both cases showed a combination of the characteristics of these two entities. The intimate association of these two tumor types observed in both lesions precludes the possibility that they represented collision tumors. Combined occurrence of odontogenic tumors of other types has also been reported elsewhere[4].

Previous morphologic and ultrastructural studies have shown that the granular cells of GCA are of epithelial origin[5,6]. PGCOT is also believed to be of odontogenic epithelial origin, based on its observed similarities to GCA, its exclusive location within jawbones, and histologic evidence of its association with the surface oral mucosa[2,3]. In the current cases, the presence of areas of transition from typical ameloblastoma to PGCOT and GCA provided further morphologic evidence of an odontogenic epithelial origin for these hybrid lesions.

The present immunohistochemical findings revealed that the granular cells of both PGCOT and GCA areas in this hybrid tumor shared similar patterns of keratin and S-100 protein expression, thus suggesting that these cells also have comparable immunohistochemical characteristics. The observed difference between these staining patterns and those of typical ameloblastoma seems to indicate that cytodifferentiation (that is, cellular transformation from typical ameloblastoma to granular cell epithelium) is associated with a change in antigenic expression. The positive keratin immunoreactivity noted here further supports the epithelial origin of these cells. However, the S-100 positivity also shown by these cells does not imply a neural derivation,
since this marker has also been detected in a wide range of cells of extraneural origin\cite{7,8}.

A review of the pertinent literature disclosed that keratin patterns of ameloblastoma and its variants including GCA have been widely reported. According to previous studies, GCA tends to show variable immunoreactivity for keratin\cite{9-11}. This tumor variant also expresses positivity for alpha-1-antitrypsin and HLA-DR, trace to slight staining or negative reactivity for S-100, vimentin, desmin, filamin and myosin, and no reaction for actin, muramidase, epithelial membrane antigen, neuron-specific enolase, glial fibrillary acidic protein and Leu 7\cite{9,10,12-17}.

In conclusion, the present histomorphologic and immunohistochemical features of two hybrid lesions suggest that the granular cells present in the tumors have a common origin, most probably the odontogenic epithelium.

Acknowledgements

We would like to thank Hari Govindan and Victoria for their technical and secretarial assistance, and to Dato' Dr. M. Jegathesan, Director, Institute for Medical Research, Kuala Lumpur, for his kind support and encouragement. This study was supported by a grant from the University of Malaya (PJP 35/91).

References