Objective. The aim of this study was to report the clinicopathologic and radiologic features of 143 benign fibro-osseous lesions (BFOLs).

Study Design. Clinical and radiologic information were retrieved from the patients files, and histologic features were reviewed from hematoxylin and eosin–stained histologic slides.

Results. There were 22 ossifying fibromas (OFs), 21 fibrous dysplasias (FDs) and 100 osseous dysplasias (ODs; 65 florid, 18 focal, and 17 periapical). The mean age of the FD/OF patients was a decade lower than those with OD. The mandible was more affected than the maxilla, except in FDs. All FDs and OFs presented local swelling, whereas this was observed in <40% of the ODs. Radiologic images of the florid/periapical ODs and OFs were predominantly mixed, whereas FDs and focal ODs were predominantly radiopaque.

Conclusions. Florid OD, OF, and FD were the most common diagnoses, and the clinicopathologic and radiologic features were somewhat distinct from the characteristics of other populations. (Oral Surg Oral Med Oral Pathol Oral Radiol 2013;115:e56-e65)

Benign fibro-osseous lesions (BFOLs) represent a group of conditions that share the same basic evolutive mechanism and are characterized by the replacement of normal bone with a fibrous connective tissue that gradually undergoes mineralization. Although the subtypes of BFOLs present similar microscopic features, the demographic, clinical and radiologic characteristics of each individual group are unique. The clinical classification of BFOL subtypes has represented a challenge for decades, owing to the lack of concordance in the terminology for these conditions as well as their histologic aspects. Several classification strategies have been proposed within the past 20 years, presumed most of these aim at distinguishing these lesions into 3 groups according to their developmental, reactive, or neoplastic origins. Despite these difficulties, the diagnosis of these lesions should always include demographic (age, sex, and ethnic), clinical (site and number of lesions), and radiologic (type of image and borders) information. A recent extensive review of BFOLs of the craniofacial complex has resulted in the inclusion of diagnoses such as osseous dysplasias (monostotic and poliostotic fibrous dysplasia, McCune-Albright syndrome, osteitis deformans, and segmental odontomaxillary dysplasia), cemento-osseous dysplasias (focal and florid), inflammatory and reactive processes (focal and diffuse sclerosing osteomyelitis and proliferative periostitis), metabolic diseases (hyperparathyroidism), and neoplastic lesions (ossifying fibroma, hyperparathyroidism–jaw lesions syndrome, trabecular juvenile ossifying fibroma, psammomatoid juvenile ossifying fibroma, and gigantiform cementoma). However, for classification purposes, most studies have included in this group the fibrous dysplasias (FDs; monostotic, poliostotic, craniofacial, and McCune-Albright syndrome), osseous dysplasias (ODs; periapical, focal, and florid), familial gigantiform cementomas, and ossifying fibromas (OFs; conventional, trabecular juvenile, and psammomatoid juvenile).

The frequency and specific characteristics of BFOLs in South America have not been studied. Therefore, the aim of the present study was to report the frequency, demographic, clinical, and radiologic features of a cohort of 143 oral BFOLs in southeastern Brazil over a 9-year period.

MATERIALS AND METHODS
All consecutive cases diagnosed at an oral diagnosis service in Brazil as BFOL from October 2002 to December 2011, according to the criteria of Barnes et al. and Speight and Carlos, were retrieved. All of the
cases were primarily diagnosed both clinically and histologically. The demographic and clinical information was obtained from each individual patient’s clinical files and laboratory registries. Each case was accompanied by radiographs, from which all radiologic information was obtained after a review under reduced ambient lighting. The radiographs were mostly taken at the oral radiology department of the same institution; however, several patients received radiographs from external public and private services. The 5-μm-thick hematoxylin and eosin (HE)–stained sections were reviewed under light microscopy by 2 of the authors (J.N.S.N. and F.R.P.) to confirm the diagnosis of cases subjected to surgical procedures for both diagnostic and treatment purposes. Three cases that provided insufficient information to confirm the diagnosis and 4 cases that lacked complete clinical information in either the patient registries, available radiographs, HE-stained histologic slides, or paraffin-embedded specimens were excluded from this study.

This was a retrospective study that evaluated data from clinical and laboratory records. The patients were not examined or interviewed directly for this study. Our investigation was performed in compliance with the Helsinki declaration and guidelines.

RESULTS

Of a total of 143 BFOL cases reviewed, we identified 65 florid ODs (45.4%), 22 OFs (15.4%), 21 FDs (14.7%), 18 focal ODs (12.6%), and 17 periapical ODs (11.9%). The mean age of the patients presenting with FDs and OFs was more than a decade lower than the mean age of the patients presenting with florid and focal ODs. Women represented the majority of the affected patients, with frequencies of 100%, 95%, and 91% for periapical ODs, florid ODs, and OFs, respectively. Similarly, patients of African descent comprised the majority of all BFOL patients. The mandible was affected more frequently than the maxilla, except in cases of FD. In florid OD, the mandible was affected in all cases, and the maxilla was concomitantly affected in 64% of the cases, owing to multiple simultaneously affected sites. All except 1 case of periapical OD involved the anterior mandible. Most OF cases also affected the mandible, with predilection for the posterior region. In contrast to other BFOL groups, FD was diagnosed in the maxilla in 57% of cases (Table I). All FD and OF cases exhibited local swelling, a feature that was found in <40% of all OD cases.

Radiologic images associated with florid OD, periapical OD, and OF were predominantly mixed, whereas they were mostly radiopaque in FD and focal OD. Most of the focal and periapical OD and OF cases had well-defined radiographic presentations, whereas the florid OD and FD cases were predominantly poor (Table I). Figures 1-9 show radiologic and transsurgical images and Figures 10 and 11 show gross images of the surgical specimens. Figures 12-17 demonstrate representative microscopic features of the BFOLS.

Table II presents the distribution of radiologic features observed in OF, FD, and focal OD. Cortical sclerosis was more common in patients with OF than in those with focal OD. Displacement of the mandibular canal and of the teeth was more common in OF. Furthermore, root resorption was found only in this group. Both OF and FD were similarly associated with maxillary sinus involvement and swelling of the inferior border of the mandible.

Follow-up information was available for 77 patients (54% of the sample). Thirty-nine patients affected by florid OD were followed for a mean period of 31.2 months (SD 30.22, ranging from 5 to 107 months). Thirty-six patients were reported to be asymptomatic at the final evaluation, whereas 3 patients reported constant discomfort in the affected areas (not associated with purulent discharge). Only 4 patients were surgically managed because of osteomyelitis. Seven patients affected by OF were followed for a mean period of 47.9 months (SD 31.32, ranging from 11 to 102 months), and all were managed by conservative surgical procedures without recurrence. In the FD group, 11 patients were followed for a mean period of 22.8 months (SD 19.34, ranging from 4 to 55 months), and 6 were managed with conservative osteotomies, 3 of whom reported persistent postoperative local swelling. Five patients were followed without surgical intervention for discrete swelling of the affected area in the absence of other complaints. Twelve patients with focal OD were followed for a mean period of 34 months (SD 31.63, ranging from 6 to 103 months). Four patients were managed by surgical removal of the lesions, and all were reported to be asymptomatic at the final evaluation. In the periapical OD group, 8 patients were followed for a mean period of 13.1 months (SD 5.84, ranging from 6 to 24 months). Only 1 patient was managed by surgical exploration of the affected area owing to persistent discomfort in the region, and all of the patients were asymptomatic on final consultation.

DISCUSSION

BFOLs represent a heterogeneous group of pathologic conditions characterized by the replacement of normal bone with a fibrous tissue that undergoes subsequent abnormal mineralization. In general, the etiology of these conditions is unknown, but considering the marked predilection for OD in women of African heritage, the involvement of hormonal and genetic factors has been postulated. Additionally, some clinical sub-
types of this group, such as McCune-Albright syndrome and FD, are associated with endocrine and specific genetic alterations. The correct diagnosis of these conditions depends on their clinical, radiologic, and histologic features, and, though challenging, it is essential for the proper treatment of each subtype, which are classified according to their developmental, reactive, or neoplastic behavior. The present study aimed at evaluating the clinical, radiologic, and microscopic features of a series of oral and maxillofacial BFOLs from Rio de Janeiro, Brazil.

The true incidence of each individual BFOL subtype is unknown, and the data derived from reported studies directly depend on the source of the cases (oral pathol-

<table>
<thead>
<tr>
<th>Table 1. The distribution of the demographic, clinical, and radiologic features of 143 benign fibro-osseous lesions</th>
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<tbody>
<tr>
<td>Parameter</td>
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<tr>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Age</td>
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<tr>
<td>Mean</td>
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<tr>
<td>Range</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
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<tr>
<td>Ethnicity</td>
</tr>
<tr>
<td>Sub-Saharan African origin</td>
</tr>
<tr>
<td>Caucasian</td>
</tr>
<tr>
<td>Site*</td>
</tr>
<tr>
<td>Mandible</td>
</tr>
<tr>
<td>Anterior</td>
</tr>
<tr>
<td>Posterior</td>
</tr>
<tr>
<td>Not specified</td>
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<tr>
<td>Maxilla</td>
</tr>
<tr>
<td>Anterior</td>
</tr>
<tr>
<td>Posterior</td>
</tr>
<tr>
<td>Not specified</td>
</tr>
<tr>
<td>Local swelling</td>
</tr>
<tr>
<td>Type of image</td>
</tr>
<tr>
<td>Radiolucent</td>
</tr>
<tr>
<td>Mixed</td>
</tr>
<tr>
<td>Radiopaque</td>
</tr>
<tr>
<td>Limits of the image</td>
</tr>
<tr>
<td>Well defined</td>
</tr>
<tr>
<td>Poorly defined</td>
</tr>
</tbody>
</table>

FloOD, florid osseous dysplasia; OF, ossifying fibroma; FD, fibrous dysplasia; FocOD, focal osseous dysplasia; PerOD, periapical osseous dysplasia.

*The site of the lesions was not specified for FloOD, because most patients presented with multiple lesions in both anterior and posterior zones of the maxilla.

Fig. 1. Fibrous dysplasia: poorly defined radiopaque lesion of the right maxilla.
ogy laboratories, oral and maxillofacial services) and the classification used. Ogunsalu et al.\(^8\) reported on 32 BFOL cases from Jamaica and noted that FD (15 cases, 47%) and OF (10 cases, 31%) were the 2 most common lesion subtypes. In contrast, Alsharif et al.\(^9\) reported on 127 surgically treated BFOLs from China, in which OF (98 cases, 77%) represented the most common BFOL subtype, followed by FD (29 cases, 23%). Wora-wongvasu and Songkampol\(^10\) reported that OF (62 cases, 51%) and FD (52 cases, 43%) were the 2 most common diagnoses of 122 BFOL cases evaluated from Thailand. These 3 studies were designed using data from oral pathology services or included only surgically treated BFOLs; explaining why OD cases were uncommon in these studies. The present study focused on BFOL cases diagnosed in an oral diagnostic clinic, including BFOL diagnosed through biopsies (mostly FD, OF, and some cases of OD), and through radiologically detected features (mostly periapical and florid

![Fig. 2. Fibrous dysplasia: computerized tomographic scan showing complete obliteration of the right maxillary sinus (same patient as in Figure 1).](image1)

![Fig. 3. Fibrous dysplasia: ground-glass radiologic presentation of a lesion on the left maxilla.](image2)

![Fig. 4. Ossifying fibroma: root resorption associated with a right maxillary lesion.](image3)

![Fig. 5. Ossifying fibroma: well defined mixed radiologic lesion of the right maxilla.](image4)

![Fig. 6. Ossifying fibroma: surgical view showing complete detachment of the lesion from the adjacent normal bone (same patient as in Figure 5).](image5)
FD is considered to be a developmental disorder of the bone with a predilection for the long bones (femur), ribs, and craniofacial bones.\textsuperscript{6} The etiology of FD is associated with an activating mutation in the gene encoding the $\alpha$-subunit of stimulatory G protein (Gs-alpha, located at 20ql3.2-13.3). This mutation perturbs guanosine triphosphatase function by prolonging Gs-alpha activation, increasing cyclic adenosine monophosphate production and stimulating endocrine receptors. As a result, this mutation ultimately affects the proliferation and differentiation of preosteoblasts.\textsuperscript{1,6,11}

Most patients present with the monostotic form of FD (up to 85\% of cases), which is usually diagnosed within the 1st to 3rd decades of life, without sex or race predilection.\textsuperscript{1,6-10,12,13} Notably, there is a second age peak for the development of FD within the 5th to 6th decades of adult life, probably owing to the indolent course of this disease, which can in some cases remain undiagnosed until an older age. The mean age of the patients with FD in the cohort examined in our study can be explained by the specific characteristics of the disease subtypes. Ten percent of the patients with monostotic FD have craniofacial involvement, which can be subdivided into cranial (including frontal, parietal, sphenoidal, and occipital bones) and maxillary involvement, with both bone regions being almost equally affected.\textsuperscript{14} The maxilla is reportedly the most commonly FD-affected bone.\textsuperscript{1,7,8,10} as supported by our present findings. However, other studies have reported similar extents of maxillary and
mandibular involvement. Poliostotic cases are less common and are associated with skin pigmentation and endocrine disturbances in up to 3% of the total cases (McCune-Albright syndrome), with particular penetrance in young female patients. All of the FD patients reported in the present study were investigated to rule out the possibility of poliostotic disease and endocrine involvement. Interestingly, a 23-year-old woman presenting with maxillary monostotic FD also presented café-au-lait skin pigmentation on the neck and has been followed for almost 5 years, with no other osseous, cutaneous, or endocrine involvement.

Most cases present as a painless swelling of the affected area and radiographs show that the majority of cases are diagnosed as presenting poorly defined mixed and radiopaque images, as confirmed by the current results. FD has been reported to induce swelling of the buccolingual and inferior mandible cortical bone in up to 80% of cases, displacement of the inferior mandibular canal in more than 60% of cases, involvement of the maxillary sinus in almost all maxillary cases, displacement of teeth/roots in up to 50% of cases and root resorption in < 5% of cases. With the exception of swelling of the mandibular cortical plates, the results of this study showed lower frequencies for all of the above-mentioned parameters, possibly due to early detection of the lesions.

Biopsy is essential for the diagnosis of FD, and the treatment of FD can be quite variable, varying from cosmetic surgery, follow-up, and patient education to bisphosphonate therapy for poliostotic cases.
ential microscopic features for the diagnosis of FD should include the presence of relatively cellular fibrous tissue associated with woven bone trabeculae and, to a lesser extent, lamellar trabeculae, neither of which are usually associated with a peripheral rim of osteoblasts. These trabeculae merge with the adjacent cortical bone to variable extents, depending on the degree of mineralization of each individual lesion.\textsuperscript{3,4,6,7}

OD represents the most common subtype of BFOL and characteristically arises in close proximity to the teeth, above the mandibular canal.\textsuperscript{1} This site distribution and the regular occurrence of cementum-like material suggest that this subtype likely originates from the periodontal ligament.\textsuperscript{4,16} Nonetheless, despite its proximity to the periodontal ligament, that structure remains visible and intact in the majority of cases.\textsuperscript{17} The classification of periapical, focal, and florid OD depends on the clinical and radiologic features of each case, because the microscopic features are essentially the same.\textsuperscript{4,17-21} Florid and periapical OD exhibit a prominent predilection for female adults of East Asian or African descent.\textsuperscript{1,4,16-21} The Brazilian population is highly heterogeneous with European, African, and Amerindian influences, and it is difficult to classify most individuals within a specific ethnic subgroup. In the present study, the patients were classified as being of sub-Saharan African and European origin; there were no patients of East Asian origin within the cohort. This is not unexpected, because Rio de Janeiro was mainly colonized by Europeans (mostly Portuguese) and Africans, whereas East Asian individuals colonized mostly the southern part of the country (especially São Paulo and Paraná states).

Although previous reports have generally suggested that OD is usually asymptomatic and is discovered on routine dental radiographs,\textsuperscript{20,21} Kawai et al.\textsuperscript{17} demonstrated that of 54 patients, 59\% presented at least 1 sign or symptom of inflammation, including pain, swelling, purulent discharge, and tenderness on palpation or had

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**Fig. 14.** Osseous dysplasia: predominantly fibroblastic proliferative stroma associated with sparse bone deposition (HE, ×20).

**Fig. 15.** Osseous dysplasia: mature lesion with a trabecular bone pattern (HE, ×20).

**Fig. 16.** Florid osseous dysplasia: area of dense bone, inflammation and hemorrhage (HE, ×20).

**Fig. 17.** Ossifying fibroma: proliferative storiform fibroblastic stroma with few foci of calcification (HE, ×40).
Table II. Distribution of the radiologic features observed in ossifying fibroma (OF), fibrous dysplasia (FD), and focal osseous dysplasias (FocOD)*

<table>
<thead>
<tr>
<th>Radiologic feature</th>
<th>Group</th>
<th>OF (n = 15)</th>
<th>FD (n = 17)</th>
<th>FocOD (n = 14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortical sclerosis</td>
<td>8/15 (53%)</td>
<td>—</td>
<td>3/14 (21%)</td>
<td></td>
</tr>
<tr>
<td>Displacement of the</td>
<td>5/9 (56%)</td>
<td>1/5 (20%)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>mandibular canal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement of the</td>
<td>2/3 (67%)</td>
<td>7/11 (64%)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>maxillary sinus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tooth displacement</td>
<td>9/15 (60%)</td>
<td>4/17 (24%)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Root resorption</td>
<td>2/15 (13%)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Swelling of the inferior</td>
<td>8/12 (67%)</td>
<td>5/7 (71%)</td>
<td>1/14 (7%)</td>
<td></td>
</tr>
<tr>
<td>border of the mandible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The radiologic features were analyzed only when panoramic and periapical radiographs were available and when applicable to each specific parameter (e.g., displacement of the mandibular canal only in mandibular posterior lesions).

delayed wound healing after tooth extraction. MacDonald-Jankowski18 reported that 16 of 23 florid OD cases were symptomatic at diagnosis. However, because only cases involving histologic diagnoses were included in that study, the results might have been biased by cases with pre-existing indication warranting surgical management. The same author had previously reported a series of 16 asymptomatic cases of florid OD derived from a review of radiographic studies, with only 2 cases presenting with local swelling of the affected areas.19 Our results demonstrated that local swelling was present in up to 40% of the OD cases, although most of the cases were diagnosed on routine radiographic examination. In a systematic review of florid OD, MacDonald-Jankowski20 additionally cited that pain was most common in East Asian and older patients, which was probably attributable to late diagnosis. Interestingly, Kawai et al.17 also reported that OD tends to occur at a more advanced age in Japanese men compared with Japanese women, likely owing to hormonal factors. In the present study, there were no differences in the mean age of men and women affected by OD. However, the low number of affected men in this cohort limits the statistical value of this finding. Review of the published data shows that most cases of florid OD are diagnosed as asymptomatic lesions that can be associated with local swelling in up to 30% of cases and are usually diagnosed after routine radiologic examination.18-20 Pain and purulent discharge/fistula formation can be present in up to 50% and 20% of the cases, respectively, and are mostly associated with older patients, especially owing to superimposed infection and osteomyelitis in edentulous areas.18-20

The posterior area of the mandible is the most frequently affected region, particularly in florid and focal OD, whereas periapical OD exhibits a predilection for the anterior mandible.20,21 This distribution is reinforced by the present findings. The distribution of radiolucent/mixed/radiopaque images for OD appears relatively equal. The pattern of the radiologic images depends on the gradual evolution of the lesions and, consequently, the age of the patients.21 Although OD exhibits well-defined radiographic borders, the presence of a sclerotic radiopaque border is reported in <25% of the cases.21 Root resorption and teeth displacement are highly uncommon in OD.24 Histologic characteristics of OD can be indistinguishable from other BFOLs and comprise a spectrum of patterns ranging from predominantly fibrous tissue to dense mineralized bone trabeculae with peripheral osteoblasts and cementum-like deposits.3,4,6,7

Familial gigantiform cementoma is a poorly understood condition that is characterized by the presence of intraosseous lesions identical to those found in florid OD. It is associated with an autosomal dominant trait that does not exhibit any particular racial predilection and develops during childhood, frequently causing bone expansion in early adulthood only.1-4 Few cases of this condition have been reported. Some cases of florid OD have demonstrated familial involvement, and some cases of gigantiform cementomas have been described as isolated cases, reinforcing the superimposed clinical features of both conditions. Although there were no cases of familial gigantiform cementoma in the present cohort, 2 adult patients affected by florid OD were siblings. Regardless of familial involvement, these patients did not present detectable bone expansion, and both alterations were discovered in routine radiographs when the patients were in their 50s and 60s.

OF comprises a group of BFOLs that exhibit neoplastic behavior.1 Among the 3 subtypes, conventional OF is the most common and usually affects female adults in their 2nd to 4th decades of life.6,8-10,22-26 The mean age of OF at diagnosis exhibits geographic variation. For example, higher mean ages of OF are found in Asia than in Africa.25 Whether this variation is attributable to geographic or racial factors or whether it is attributable to differences in diagnosis remains unknown. More than 70% of conventional OF cases are reported to affect the mandible, particularly in the posterior regions. Painless bone swelling is the most common sign associated with this condition,4,9,10,21,24,25 and this is supported by the present results. Most OF cases present with mixed radiologic images, but radiolucent cases can represent up to 20% of cases, similar to the results described in the present study. The fibrous tissue in conventional OF varies in hypercellularity and is usually distributed in a storiform pattern with interspersed trabeculae of woven and lamellar bone and/or spherules of cementum-like material.1,3,4,6,23
OF typically presents as a thin layer of fibrous tissue or an abrupt separation from the cortical bone, which accounts for its radiologically well defined images and low recurrence rates after conservative surgical management.\textsuperscript{3,4,7,23,24} However, although virtually all OF cases show a well defined radiological perimeter, a sclerotic cortical line is observed in <50% of the cases.\textsuperscript{22,24,25} OF can induce swelling of the buccolingual and inferior mandibular cortical bone in ≤30% of all cases, displacement of the inferior mandibular canal in >50% of all cases, involvement of the maxillary sinus in >80% of maxillary cases, displacement of teeth/roots in ≤25% of all cases, and root resorption in ≤20% of all cases.\textsuperscript{22,24,25} The present results support these findings.

Current knowledge recognizes the existence of 2 different groups of more aggressive OF. The lesions that are initially associated with younger patients with anterior maxillary involvement are classified as juvenile OF (juvenile active OF or juvenile aggressive OF).\textsuperscript{1} This term encompasses 2 different entities: trabecular juvenile OF and psammomatoid juvenile OF. Notably, some cases included under this classification do not affect youngsters and are found at other sites, such as the posterior mandible.\textsuperscript{1,3,5} Trabecular juvenile OF usually affects children and adolescents <15 years old regardless of sex and with a slight predilection for the maxilla.\textsuperscript{1} This condition is characterized by the appearance of hypercellular fibrous tissue, trabecular disposition of bone, a peripheral rim of osteoblasts, osteoid formation, some myxoid areas, and eventual mitoses of connective tissue cells.\textsuperscript{1,4-6} Psammomatoid juvenile OF exhibits slight male predilection, and although it mostly affects youngsters, it is also diagnosed in adults.\textsuperscript{1,27} The condition has a predilection for the orbital and paranasal sinuses, and is characterized by the presence of a hypercellular stroma and psammoma-like calcifications.\textsuperscript{27} Myxoid areas, as well as aneurysmal bone cyst-like areas, can also be found.\textsuperscript{1,4-6} Both juvenile OF subtypes frequently require more aggressive treatment owing to their biologic behavior and potential for local destruction.\textsuperscript{4,27} Although these 2 conditions have been classified as a single condition (juvenile OF), there is evidence indicating that they are in fact 2 different conditions. Apart from the distinct pathologic features from both variants, demographic and clinical features support this concept.\textsuperscript{1,5} The present study found only 1 psammomatoid OF, affecting the maxilla of a 13-year-old girl.

Owing to the similarities among the histologic features of BFOLs, it is essential to follow strict parameters during diagnostic procedures. The differential diagnosis of conventional OF and focal OD can be challenging in many cases; demographic, clinical, radiologic, gross, and microscopic features are essential for distinguishing between these 2 entities. Both subtypes exhibit a predilection for the mandible, especially the posterior region. Whereas OD exhibits a predilection for women of sub-Saharan African descent, OF generally does not show a specific ethnic predilection. OF appears to affect adults 1 decade younger than patients affected by OD, and the latter usually presents smaller lesions without local swelling compared with OF.\textsuperscript{16} OF mostly presents as a well defined radiolucent-to-radiopaque image, whereas OD usually presents as an irregular mixed-to-radiopaque image. In addition, OD appears to be more frequently associated with tooth apices than OF.\textsuperscript{28} Gross histologic analysis reveals that most OD cases are composed of multiple fragments, whereas most OF cases are individual, unique, well defined specimens. Whereas OD is characterized by the presence of wide curved trabeculae and irregularly shaped cementum-like masses, OF is composed of thin isolated trabeculae with abundant peripheral osteoblasts.\textsuperscript{16} OD usually presents with cavernous vessels close to the bone trabeculae and is accompanied by hemorrhaging, whereas OF presents an increased stromal cellularity arranged in a storiform pattern.\textsuperscript{29} FD and OF can also exhibit similar clinical, radiologic, and histologic features. As a result, distinguishing between them can be challenging. Toyosama et al.\textsuperscript{30} compared OF cases with gnathic and extragnathic FD cases, demonstrating that the expression of osteocalcin was strong in calcified regions in FD, but weak in OF. In addition, mutations at the Arg201 codon of the gene encoding the Gs-alpha protein (GNAS), a validated marker for extragnathic FD, were found in all gnathic and extragnathic FD cases, but not in OF. Patel et al.\textsuperscript{31} have recently found that there were no Arg201 codon mutations in any of their OD and OF cases, reinforcing the utility of GNAS as a molecular marker for FD. Nevertheless, it is important to acknowledge that some studies are limited by cohort number and that gnathic and extragnathic FD can show other distinct radiologic and histologic profiles that should be accounted for in routine diagnostic practice.

Some BFOLs can present additional microscopic features of aggressiveness, such as stromal hypercellularity, pleomorphism, and large amounts of osteoid formation, characteristics that should be carefully studied to evaluate the possibility of low-grade osteosarcoma. These specific cases have been referred to as “atypical BFOL.”\textsuperscript{32} Although this terminology has been a matter of controversy, it is important to treat these cases according to their aggressiveness and to follow these patients to establish the real biologic behavior of these borderline lesions.\textsuperscript{32} A recent study has shown that immunohistochemical detection of MDM2
and CDK4 expression can be used as additional diagnostic tools in distinguishing low-grade osteosarcomas from other BFOLs, because these markers are highly expressed in osteosarcomas but not in BFOLs. In conclusion, florid OD, OF, and FD were the most common BFOLs diagnosed in an oral diagnosis service in Brazil over a 9-year period. The demographic, clinical, and radiologic features of these cases, such as frequency of ODs, age distribution, and radiologic features of FDs, appeared to differ from case series described in other populations. Future studies from South American populations are encouraged to enhance our understanding of the true incidence of BFOL in both clinical and laboratory practice in this specific geographic region.

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