The Prevalence and Analysis of Fibro-osseous Lesions of the Jaws in a Turkish Population Fibro-Osseous Lesions of the Jaws

Aysegul Apaydin,1 Ilknur Ozcan,2 Sevde Goksel,2 and Basak Gurtekin3

Departments of 1Oral and Maxillofacial Surgery, and 2Oral and Maxillofacial Radiology, Faculty of Dentistry, Istanbul University, 34893 Fatih, Istanbul, Turkey
3Department of Biostatistics, Istanbul Faculty of Medicine, Istanbul University, 34893 Fatih, Istanbul, Turkey

Introduction

Fibro-osseous lesions (FOL) of the jaws are a diverse group of lesions which are characterized by substitution of normal bone with various mineralized materials. They refer to different entities which present similar radiological, histopathological features but different biological behaviors. This difference in behavior may present a problem in diagnosis and clinical management (2, 3).

Keywords:
- fibro-osseous lesions
- jaws
- fibrous dysplasia
- ossifying fibroma
- osseous dysplasia

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Abstract

Fibro-osseous lesions (FOL) of the jaws are a diverse group which characterized by substitution of normal bone with various mineralized materials. They refer to different entities which present similar radiological, histopathological features but different biological behaviors.

We aimed to analyze the features, relative frequencies of various fibro-osseous lesions of jaws in Turkish population.

This study included 5000 cases were analyzed in a period 2015-2018. Cone Beam Computed Tomography and panoramic x rays were collected. Patients sex, age, clinical, radiological characteristics were evaluated with histopathological diagnosis. The statistical analysis was carried out using SPSS, student-t and Kruskal-Wallis tests.

92 cases were diagnosed as FOLs of the jaws, which is %1.8 of all patients. The most frequent FOL was osseous dysplasia (70.6% (n=65)), fibrous dysplasia (19.5% (n=18)) and ossifying fibroma (9.7% (n=9)). Within 65 osseous dysplasia, periapical osseous dysplasia was 23% (n=15), focal osseous dysplasia 43% (n=28), florid osseous dysplasia 34% (n=22).

It is important to emphasize that the diagnosis of these lesions should be gained with the examination, radiological features and histopathological study. FOLs constitute different conditions and their treatments are based on the complaint of the patient, lesion type, anatomic location and the size of the lesion.

Keywords:
- fibro-osseous lesions, jaws,
- fibrous dysplasia,
- ossifying fibroma,
- osseous dysplasia

FOLs of the maxillofacial region have been classified in different ways. The terms “cementifying ossifying fibroma” and “cementifying osseous dysplasias” have been changed to “ossifying fibroma” and “osseous dysplasias” by Reichart et al(4). This step was taken to finalize the discussion as to whether cementum is produced in these lesions or not. The FOLs are classified into three groups: (1) fibrous dysplasia (FD); (2) ossifying fibroma (OF); and (3) osseous dysplasia (OD) (5). This was a practical classification based on the World Health Organization’s (WHO) criteria. OD has different subtypes. There is some evidence that florid osseous dysplasia (FLOD) is a progressive form of focal osseous dysplasia (FOD). FLOD may be one of its presentations or an early stage of the florid
Eversole et al classified FOLs according to their nature (reactive, developmental, dysplastic, metabolic, and neoplastic) as cemento-osseous dysplasia, bone dysplasia, inflammatory/reactive process, metabolic disease, and neoplastic lesions, respectively (7).

It has been reported that FOLs have some overlapping features due to their different clinicopathological characteristics. Careful clinical and radiological examination is essential to make an accurate diagnosis because each lesion is unique in its manifestation and requires different treatment modalities (4). FD is a developmental condition that is considered a hamartoma, which may cause facial deformities and esthetic and functional problems if it continues to progress during adulthood; therefore, surgical contour correction to trim the excessive bone should be performed. OF is considered a true neoplasm whose margins are well-defined. Trauma, infection, and/or tooth extraction may be proliferative factors. OF growth patterns have a risk for recurrence; therefore, they need to be enucleated with surrounding tissue (2, 8–11). On the contrary, OD does not require a specific treatment because it is considered a reactive lesion, which is not necessarily removed (12, 13).

In the literature, it has been reported that FOLs have shown different epidemiological behaviors in different regions of the world (14–17). It has been reported that OF are mostly seen in Caucasian patients followed by those of African descent. OD in people of color occurs more three times more frequently than in Caucasians (10).

We aimed to analyze the features and relative frequencies of various jaw fibro-osseous lesions of jaws in a sample of the Turkish population.

### Materials and Methods

This retrospective study included the patients who were admitted to the Department of Maxillofacial Surgery and Department of Oral and Maxillofacial Radiology of Dentistry Faculty in Istanbul University.

The study was approved by the Research Ethics Committee of the Faculty of Dentistry, Istanbul University (Code number=2018/87, Decision number=325). Patient’s personal information was obtained anonymously, according to the Helsinki Declaration.

In the period from 2015 to 2018, the files of 5000 patients were investigated. A total of 92 cases were diagnosed as FOL.

Clinical data were obtained through the medical records. Cone beam computed tomography (CBCT) and panoramic x-rays were collected. Clinical information such as patients’ sex, age, and clinical and radiological characteristics were evaluated in combination with histopathological diagnoses. We categorized the cases based on the WHO classification.

The maxilla and the mandible were divided into five regions in order to specify the lesion site: (1) upper right (Region 1); (2) upper left (Region 2); (3) lower left (Region 3); (4) lower anterior (Region 4); and (5) lower right (Region 5).

The statistical analysis was carried out using SPSS (version 21.0), Student’s t and Kruskal-Wallis tests were used at a 95% confidence interval.

### Results

From a total of 5000 cases, 92 cases were diagnosed as FOL of the jaws, which is 1.84% of the total. Of 92 patients, 70 were female (76.1%) and 22 were male (23.9%).

Frequency and sex distribution of FOL of the jaws are presented in Table 1. In our series, female predominance was noticed in each lesion (3, 1:1). The female to male ratio for OD, FD, and OF was 4:1, 1:5:1, and 3:5:1, respectively.

The age of patients ranged from 10 to 75 years. Patients’ were in third decade in OF, fourth decade in periapical OD (POD), FOD, and FD, and in fifth decade in...
FLOD. Age distribution is shown in Table 2. Kruskal-Wallis test was used to compare the ages in FOL. There were no statistically significant differences between groups (p=0.074).

The Student’s t-test was used to compare the mean values of age according to gender. The mean age values of women were significantly higher than men (p=0.011).

The most frequent FOL was OD at 70.65% (n=65) followed by FD 19.56% (n=18) and OF 9.78% (n=9). Within 65 cases of OD, periapical OD was 23.07% (n=15), FOD 43.07% (n=28), and FLOD was approximately 33.84% (n=22).

The location, sign, symptoms, and lesion management are shown in Table 3. The mandible was the most common anatomic location of the FOL cases (86.23%). OD was located mostly in the mandible (93.69%). POD was 94.44%, FOD (100%), and florid osseous dysplasia (FLOD) (89.58%). OF was located in the mandible (77.77%). In contrast, the majority of FD cases were located mostly in the maxilla (55.55%). The majority of the lesions were located in region 4 (lower anterior) (38.40%). Other regions were 3, 5, 2, and 1 (36.95%, 10.88%, 8.69%, and 5.07%, respectively).

The main clinical sign was expansile swelling. All of the FD and OF cases presented painless swelling. Pain was not reported by any of the patients. The infection

**Table 2. Age distribution**

<table>
<thead>
<tr>
<th>FOLs types</th>
<th>n</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Percentile 25th</th>
<th>Percentile 75th</th>
</tr>
</thead>
<tbody>
<tr>
<td>POD</td>
<td>15</td>
<td>39</td>
<td>21</td>
<td>75</td>
<td>34</td>
<td>50</td>
</tr>
<tr>
<td>FOD</td>
<td>28</td>
<td>39</td>
<td>16</td>
<td>61</td>
<td>30.5</td>
<td>52</td>
</tr>
<tr>
<td>FLOD</td>
<td>22</td>
<td>41.5</td>
<td>14</td>
<td>72</td>
<td>38</td>
<td>50</td>
</tr>
<tr>
<td>FD</td>
<td>18</td>
<td>31.5</td>
<td>10</td>
<td>67</td>
<td>16</td>
<td>55</td>
</tr>
<tr>
<td>OF</td>
<td>9</td>
<td>28</td>
<td>11</td>
<td>45</td>
<td>16</td>
<td>36</td>
</tr>
</tbody>
</table>

Kruskal-Wallis χ²: 8.53  p: 0.074

**Table 3. Frequencies of clinical features according to FOLs types**

<table>
<thead>
<tr>
<th>Localisation</th>
<th>Symptom</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 1</td>
<td>Region 2</td>
<td>Region 3</td>
</tr>
<tr>
<td>POD</td>
<td>1 (14.28)</td>
<td>1 (8.3)</td>
</tr>
<tr>
<td>FOD</td>
<td>-</td>
<td>13 (25.5)</td>
</tr>
<tr>
<td>FLOD</td>
<td>2 (28.57)</td>
<td>3 (25)</td>
</tr>
<tr>
<td>FD</td>
<td>-</td>
<td>4 (57.14)</td>
</tr>
<tr>
<td>OF</td>
<td>2 (16.7)</td>
<td>3 (5.9)</td>
</tr>
</tbody>
</table>

Total 7 12 51 53 15 9 34 9 2 59 18 15 92
rate was 9.78% with respect to all FOL cases (n=9) and only noted in OD cases. It was seen mostly in FLOD cases (55.55%).

Curettage (19.56%) and contour correction (16.30%) were performed to treat the patients.

The radiographic features of FOL are shown in Table 4. FD mostly appeared as ground glass lesions (66.66%). Mixed radiolucency and radio-opacity were the most common radiological features in both OF and OD cases. Expansion was noted in all OF cases and 10.76% of the OD cases. Infection was seen in 13.84% of the OD cases. Expansion was seen in infected OD cases.

**Discussion**

In our study most of the lesions were OD. This finding agreed with Waldron’s (11) study results, in which it was reported that these lesions were the most common in contrast to Thai and Jamaican studies in which OD was reported as rare (16–18). Their results may be due to cases analyses using the records of the pathology department (15, 17) since OD is diagnosed clinically and radiologically; therefore, a biopsy is not required. Asymptomatic OD does not require specific treatment or biopsies; thus, there would be no reports.

FLOD has been reported as a rare variant of the osseous lesions. The normal cancellous bone is replaced by dense, acellular cemento-osseous tissue in a fibrous connective tissue. It is considered to be a widespread form of periapical cemental dysplasia. If it is identified in three or four quadrants or is extensive in one jaw, then it is considered as FLOD (19). Therefore, it is fairly easier to identify it amongst FOLs. FOD was the most common (43.07%) of OD in our patients in contrast to some other studies (15).

It has been reported that OD is seen mostly in African patients (59%) in this population’s women (90%) who are in fourth and fifth decade (15, 20–22). Another study mentioned Caucasian population predominance (12). In our study, for which all participants were Caucasian OD prevalence was 80% and most were women. OD was the least common lesion in a Nigerian study in which all of the patients were people of color (0.8%) (8).

Pain is typically an uncommon FOL-associated symptom in patients with lesions; however, similar to our study, Phattarataratip et al. noted pain (71.4%) both with and without associated swelling in their series of OD (18). This can be explained due to susceptibility of OD to infection which produces painful symptoms at a later stage.

FD was the second major type of lesion found among our cases (19.5%); this was in contrast to the studies of Muwazi (Uganda; 87%) (15), Worawongvasu (Thailand; 42.6%) (17), Ajagbe and Dramola (Nigeria; 78%) (8) and Ogunsalu (Jamaica; 62.5%) (16), all of which mentioned that FD was the most common lesion found in their series. However, Lasisi et al. (Nigeria) (23), Alsharif et al. and Cheng et al. (China) (14, 24), Kato et al. (Brazil) (25), and Prabhu et al. (India) (26) reported lower numbers (37.2%, 22.8%, 21.7%, and 14.7%, respectively), similar to our study.

The patients’ ages were in fourth decade, which were different from the Chinese (14), Ugandan (15) and Jamaican (16) studies in which the second or third decade of life was reported.

In our series female patients were predominant (3, 1:1), similar to the report of majority of most countries (2, 14, 15), except a study which was performed in Greece in which a slight predilection for males was shown (27). MacDonald-Jankowski mentioned equal sex distribution.

<table>
<thead>
<tr>
<th>Radiolucent</th>
<th>Mixed</th>
<th>Radioopaque</th>
<th>Ground glass</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>POD</td>
<td>-</td>
<td>15 (100%)</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>FOD</td>
<td>1 (3.57%)</td>
<td>20 (71.42%)</td>
<td>7 (25%)</td>
<td>28</td>
</tr>
<tr>
<td>FLOD</td>
<td>1 (4.54%)</td>
<td>13 (59.09%)</td>
<td>8 (36.36%)</td>
<td>22</td>
</tr>
<tr>
<td>FD</td>
<td>1 (5.55%)</td>
<td>4 (22.22%)</td>
<td>1 (5.55%)</td>
<td>18</td>
</tr>
<tr>
<td>OF</td>
<td>-</td>
<td>9 (100%)</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total n(%)</strong></td>
<td>3 (3.26%)</td>
<td>61 (66.30%)</td>
<td>16 (17.39%)</td>
<td>92</td>
</tr>
</tbody>
</table>

**Table 4. Radiologic features of FOLs types**
Female predilection may be explained based on the osteocalcin level since increased levels have been noted in fibrous dysplasia. Also, gene expression patterns (extracellular matrix composed of collagen molecules COL 11A1 and COL 12A1 and the matrix metalloproteinase enzyme) in women may play a role in this finding. We found that FD was seen slightly more in the maxilla (55.55%), similar to that found in American, Asian, and Chinese studies that reported the maxillary predominance. The most common symptom was bone enlargement in all cases. These symptoms were similar to a number of reports, in which it was also stated that FD was a slow growing, painless tumor. None of our patient had experienced pain. We had only noticed a slight bone expansion. We diagnosed patients according to CBCT images along with clinical examinations.

OF was the less common lesion in our study contrary to Nigerian (62%) and Asian (50.8%) studies in which it was reported as the most common lesion. Muwazzi and Kamulegeya reported that OF was the second common lesion (32.9%) in their study. Most of our cases were female and in third decade of their lives, while some other studies mentioned the second decade. A study from China reported equal gender distribution while another Chinese study mentioned male predominance. Painless swelling was the most common sign, and the location was the mandible almost all of the studies in the literature, similar to our study.

Radiologically, the mixed radiolucency and radioopacity were the most common radiological features in both OF and OD cases. This was similar to the reports of Waldron and Worawongwasu. We investigated the CBCT images of the patients. This gave us more accurate diagnostic information rather than the panoramic images.

It has been reported that some FOL generally occur in people of color. In our region the FOL prevalence was 1.84% (92/5000) within a 3-year period in a sample of the Turkish population. In Spain, it was 0.88% (11/1238) and in Brazil 1.36% (383/27998). The mandible was the most common anatomic location of the FOLs. OD and OF were located mostly in the mandible. In contrast, the majority of FD cases were located mostly in the maxilla. The majority of the lesions were located in region 4 (lower anterior). Other regions were 3, 5, 2, and 1 respectively. In our series, female predominance was noticed.

Although a great number of papers regarding different aspects of FOLs of the jaws exist, there is still much more about this condition that need to be explored. More studies need to focus on understanding the genetic basis beneath the racial and gender predilection for the development of FOLs. It is important to emphasize that the diagnosis of these lesions should be gained through anamnesis, examination, radiological features, intraoperative findings, and histopathological studies even if they present similar clinical and histological features. FOLs constitute different conditions, and their treatments are based on patients’ complaints, lesion types, anatomic location, and lesion sizes.

Conclusion
The most frequent FOL of our cases was OD at 70.65% followed by FD 19.56% and OF 9.78%. Within cases of OD, periapical OD was 23.07%, FOD 43.07%, and FLOD was approximately 33.84%. The mandible was the most common anatomic location of the FOLs. OD and OF were located mostly in the mandible. In contrast, the majority of FD cases were located mostly in the maxilla. The majority of the lesions were located in region 4 (lower anterior). Other regions were 3, 5, 2, and 1 respectively. In our series, female predominance was noticed.

Footnotes
This study was presented as an electronic poster at the annual meeting of American Association of Oral and Maxillofacial Surgeons (AAOMS), 8–13 October, Chicago, 2018
Conflict of Interest: Non to declare
Financial disclosure: Non to declare

References
2. Alawi F: Benign fibro-osseous diseases of the maxillo-

Fig. 1. Radiographic appearance from one of the patients with ossifying fibroma

Fig. 2. Radiographic appearance from one of the patients with periapical osseous dysplasia

Fig. 3. Radiographic appearance from one of the patients with focal osseous dysplasia
Fig. 4. Radiographic appearance from one of the patients with fibrous dysplasia

Fig. 5. Radiographic appearance from one of the patients with florid osseous dysplasia