Evaluation of dental anomalies in permanent dentition as a part of cleft spectrum – A radiographic study

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Abstract

Objective: The aim of this study was to investigate radiographically the prevalence of dental anomalies in cleft patients. Materials and Methods: The data were recorded from patients 2016 to 2018. This is a retrospective review of panoramic radiographs of 200 subjects with cleft lip and/or palate that were evaluated from their file records and investigated for dental anomalies. Results: Dental anomalies found in cleft lip and/or palate patients were missing teeth in 64 patients (32%), maxillary lateral incisor with higher incidence. Supernumerary teeth were found in three patients (1.5%), 27 (13.5%) had microdontia, structural anomalies were seen in 3 (1.5%) patients. About 52% of the individuals had at least one dental anomaly the most common dental anomaly that was found to be tooth agenesis (33% of individuals) followed by microdontia (12%), supernumerary teeth (1.5%), taurodontism (1%), and fusion (0.5%). Conclusion: Findings of the study add to the data of previous studies done on correlation between cleft and incidence of dental anomalies. These will help in providing the comprehensive treatment plan for cleft patients which also include dental and orthodontic treatment to have better outcome. This study showcases a thorough and complete variants of dental anomalies present in a small sample of cleft lip and/or palate patients, larger multi institutional trial studies are recommended to successfully understand the cause of each dental anomaly with spectrum of clefts.

Keywords: Dental anomaly, microdontia, oral clefts, supernumerary teeth, tooth agenesis

Introduction

Cleft lip and/or palate may affect the face to greater or lesser extent, depending on its extension, leading to varied degree of morphologic and functional incapacity. Oral cavity of patients with clefts reveals consequences of cleft on dental arches to varying extent, with lack of alignment between dental arches and dental anomalies of number, shape, structure, and position. The alveolar process is only affected in complete cleft, and thus, one cannot assume all types of cleft have same influence on tooth eruption, especially at cleft area. Clinician involved in managing dentition of unilateral cleft lip and palate patients should be considered, the high frequency dental anomalies both in and outside cleft area before dental treatment planning. The primary aim of this study was to radiographically evaluate the dental phenotypes (hypodontia, transposition, supernumerary teeth, impacted tooth, tooth agenesis, and microdontia) in and outside the cleft area in permanent dentition of oral cleft individuals using orthopantomograms and to compare the prevalence of anomalies between genders and cleft types (clefts involving the lip alone, lip alveolus and palate unilaterally, lip alveolus and palate bilaterally, and palate alone).

Materials and Methods

Retrospective study involving 200 orthopantomograms out of 216 patients who were treated for cleft lip and palate between 2016 and 2018. The Institutional Review Board approval was not required as it was radiographic study. The age of the patient from both genders included was from 8 to 25 year. Patients below 8 years and above 25 years of age were excluded from the study. Deciduous teeth anomalies were excluded from the study. Each patient was evaluated based on the orthopantomograms taken. All the radiographs were assessed by a single observer. The predictor variables included gender and type of cleft which was grouped under four groups namely:-

1. Cleft lip
2. Cleft palate
3. Unilateral cleft lip, alveolus, and palate (UCLAP)
4. Bilateral cleft lip, alveolus, and palate (BCLAP).

The outcome variables included evaluation for dental anomalies, that is, tooth agenesis, supernumerary teeth, missing teeth, transposition, microdontia, impacted teeth, and structural anomalies (taurodontism, germination, and fusion).

**Results**

There were 216 cleft lip and palate patients who were treated out of which 16 were excluded for lack of proper or missing radiograph. The study included 200 patients in the age group of 8–25 years with a mean age of 14.6 years. Age frequency was high 67 (33.5%) patients between 18 and 25 years, and least 36 (18%) between 11 and 13 years Table 1.

Even number of males and females were in this study (1:1). The results of the comparison of type of cleft and sex are tabulated in Table 2 and the comparison of type of dental anomaly and sex is given in Table 3.

The most common cleft type was found to be UCLAP \((n=90)\) in both males and females (47 in males and 43 in females) which were followed by cleft lip \((n=43)\), cleft palate \((n=35)\), and BCLAP \((n=32)\), as shown in Table 4.

The incidence of cleft palate was more in females (19%) than in males (16%) and that of cleft lip was found to be more in males (25%) as compared to females (18%). Incidentally, the BCLAP frequency was similar in both males and females in the study group [Table 4] Greater frequency of cleft was seen on the left side than on right, as shown in Table 5.

About 52% of the individuals had at least one dental anomaly. The most common dental anomaly was tooth agenesis (32%) followed by microdontia (12%), supernumerary teeth (1.5%), taurodontism (1%), and fusion (0.5%). In 90 UCLAP patients, the incidence of dental anomalies was 69 (76.66%), and in the 32 BCLAP, the incidence of dental anomalies was 56 (175%) that is suggestive of multiple number of teeth affected in these individuals and in 35 cleft palates and 43 cleft lips the incidence of total number of teeth affected was 21, that is., 60% and 48.8%, respectively, in the groups, as shown in Table 6.

**Discussion**

Major contributor for congenital birth anomalies is from spectrum of cleft of lip and palate, with reported incidence of between 3.7 per 1000 and 0.4 per 1000 live births.\(^2\) Significant racial differences in incidence exist, with highest incidence reported in American Indians and lowest found in black population. The condition presents in wide variety of forms, usually an isolated anomaly (non syndromic), but it also may be associated with other congenital defects (syndromic). Literature search have shown higher prevalence of dental anomalies in patients with cleft lip and/or palate.\(^{3-5}\)

| Table 1: Age frequency |
|------------------------|
| **Column1** | Female | Male | Total |
| 8–10 | 21 | 27 | 48 |
| 11–13 | 20 | 16 | 36 |
| 14–17 | 26 | 23 | 49 |
| 18–25 | 33 | 34 | 67 |

| Table 2: Variation of cleft subgroups between sexes |
|------------------------|----------------|----------------|
| Type of cleft (in detail) | Sex | Total |
| f | m | |
| a1L: Cleft lip involving alveolus left side | 11 | 12 | 23 |
| a1R: Cleft lip involving alveolus Right side | 2 | 3 | 5 |
| a2L: Cleft lip not involving alveolus Left side | 4 | 6 | 10 |
| a2R: Cleft lip not involving alveolus Right side | 1 | 4 | 5 |
| b1: Cleft of secondary palate | 15 | 13 | 28 |
| b2: Cleft of soft palate | 4 | 3 | 7 |
| c1: UCLAP on left side | 35 | 34 | 69 |
| c2: UCLAP on right side | 12 | 9 | 21 |
| D: Make it small | 16 | 16 | 32 |
| Total | 100 | 100 | 200 |

| Table 3: Incidence of dental anomaly in gender |
|------------------------|----------------|----------------|
| Dental anomaly | Male | Female | Total |
| Agenesis | 34 | 34 | 64 (32%) |
| Microdontia | 12 | 15 | 27 |
| Impaction | 1 | 2 | 3 |
| Supernumerary | 2 | 1 | 3 |
| Structural abnormality (taurodontism+fusion) | 0 | 3 | 3 |

| Table 4: Variation of cleft group between sexes |
|------------------------|----------------|----------------|
| Cleft groups (broadly) | Sex | Total |
| F | m | |
| a | 18 | 25 | 43 |
| b | 19 | 16 | 35 |
| c | 47 | 43 | 90 |
| d | 16 | 16 | 32 |
| Total | 100 | 100 | 200 |

| Table 5: Correlation of cleft side with gender |
|------------------------|----------------|----------------|
| Cleft side | Male | Female | Total |
| Left | 50 | 52 | 102 |
| Right | 15 | 16 | 31 |
| Central+bilateral | 35 | 32 | 67 |
| Total | 100 | 100 | 200 |
In this study, the classification of cleft types is based on dental development which is given by Granjeiro and Vieira with the goal of identifying subgroups that may have genetic contributions. In addition to the major categories, the study included detailed descriptions of subphenotypes with incidence of dental anomaly.\textsuperscript{[6]}

Cleft lip and palate patients show higher incidence of dental development disturbances when compared to general population.\textsuperscript{[7]} The study of common pattern of dental anomalies such as shape, number, and location in cleft areas or arch will help in effective orthodontic planning.\textsuperscript{[8]}

Since dental anomalies may complicate dental treatment, we investigated the prevalence of dental anomalies in four cleft groups. In this study, 200 patients who were treated for various clefts in our unit were included to compare the prevalence of anomalies between genders and cleft types using orthopantomogram. Four groups included to identify the prevalence in different spectrum, that is, cleft lip, cleft palate, UCLAP, and BCLAP.

Equal number of males and females were included in our study of age group of 8–25 years with a mean age group of 14.6 years. The left side was the commonly affected side in our study group. Similar observation of 68% was recorded in a study by Tsai \textit{et al.}\textsuperscript{[9]} and UCLAP was common cleft type which was followed by cleft lip, cleft palate, and BCLAP similar to the findings of study by Menzes and Vieira. The incidence of cleft palate was more in females than in males and that of cleft lip was found to be more in males as compared to females. Incidentally, the BCLAP frequency was similar in both males and females in the study group.

In this present study, 52% of the patients had at least one dental anomaly. In contrast to our study, Akcam \textit{et al.}\textsuperscript{[10]} found that 96% of the patients showed dental anomaly which is varied 3.99% in other study.\textsuperscript{[11]} The most common dental anomaly was found to be tooth agenesis followed by microdontia, supernumerary teeth, taurodontism, and fusion.

Dental anomalies such as tooth agenesis accounted for 32% as compared 27% to other reported study.\textsuperscript{[12]} In study by Jamal and Haaza, it was found common missing tooth that was maxillary lateral incisor similar to the findings in this study. The dental anomalies were most severe in BCLAP followed by UCLAP, and then by cleft palate group and cleft lip group. Bilateral clefts were strongly associated with bilateral dental anomalies.\textsuperscript{[12]}

The severity of dental anomaly was found to dependent on the severity of cleft. The dental anomalies occurred predominantly in the cleft area, thus suggesting that the effect of the cleft disturbance is more local than general on the dentition.

**Conclusion**

Comprehensive cleft management includes multidisciplinary approach not only the surgical correction of primary clefts, secondary revisions, and also accurate dental arch alignment with orthodontic treatment to enhance the surgical outcome. This study is another data highlighting the correlation of dental anomalies with cleft lip and/or palate and relationship to severity of clefts. These findings will provide further scope for genetic studies and large multi-center data to determine the cause and possible prevention.

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