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Eruption pattern of permanent maxillary anterior teeth in children with operated complete bilateral cleft lip and palate: A prospective cohort study

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ABSTRACT:
Aim: To evaluate the timing of tooth eruption of permanent maxillary anterior teeth in children with operated complete bilateral cleft lip and palate.**Methods:**This prospective cohort study consisted of 443 subjects aged 7-18 years with operated complete bilateral cleft lip and palate.The mean age of eruption for each permanent maxillary anterior teeth was determined using the Kärber method. Teeth were considered erupted whenever the crown was seen above the gingival barrier. Teeth not present in the oral cavity were considered as unerupted. All the subjects were examined after every 6 months.**Results:**Comparison of mean ages of eruption of maxillary permanent anterior teeth in boys with operated bilateral CLP to that of the calculated mean age of eruption of permanent maxillary anterior teeth, showed a significant delay in eruption pattern of maxillary anterior teeth, with most significant delay being observed in maxillary permanent lateral incisors and canines. Delay in eruption pattern of canines was seen more prevalent in boys than in girls.**Conclusion:**The results of this study suggest that complete bilateral CLP affects the eruption pattern of the the maxillary anterior teeth adjacent to the cleft area.

I. INTRODUCTION:

Many revolutionary and evolutionary changes have occurred in dental practice during the last decade. The single phenomenon that has had the greatest impact on dental practice is the changing pattern of oro-facial diseases and conditions. Such conditions can be attributed to various external factors, such as, race, gender, nutrition, general growth, hereditary etc.

Cleft lip and palate (CLP), being the most common and severe congenital craniofacial anomaly with the global incidence of 0.28 to 3.74 per 1000 live births. The incidence varies widely among the races: about 1 in 800 white newborns, 1 in 2000 black newborns, and 1 in 500 japanese or Navaho indian newborns[1]. The number of infants born every year with CLP in India alone accounts for approximately 28,600, that is, 78 affected newborns are born every day, or 3 infants with clefts are born every hour[2].

CLP appear to be genetically determined, although majority of the cases are of unknown cause or are attributable to teratogenic influences[3]. A variety of genetic modes of inheritance for CLP have been proposed, including dominance, recessiveness, gender linkage, incomplete penetrance and variable gene expressivity[4]. Hence there etiology is multifactorial and are believed to be the result of a complex interaction between multiple genetic and environmental factors[5].

Tooth eruption period both in primary as well as in permanent dentition is influenced by several factors, such as, length of gestational period, disease, gender, race, nutrition and general growth[6-15]. Cleft lip and palate may also influence the eruption pattern of both primary and permanent dentition, resulting in morphological and functional incapacity to variable extents[16]. As shown in previous studies, this congenital craniofacial anomaly may affect the timing of tooth eruption, therefore, the purpose of this study was to determine the timing of tooth eruption of permanent maxillary anterior teeth in children with operated complete bilateral cleft lip and palate.

II. MATERIALS AND METHODS:

Ethical Approval:

The study proposal was submitted to the Research Ethics Committee, SKIMS-MCH, Bemina, Srinagar, Jammu and Kashmir, and ethical approval was obtained. All the children were invited to participate after obtaining the informed consent from parents of children through consent letters. Assent letters were obtained from the older children.

Study area and Sampling method:

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This prospective cohort study was carried out on a total of 443 children aged 7-18 years, with bilateral cleft lip and palate (CLP), reporting in the Out Patient Department of Maxillofacial Surgery & Dentistry, SKIMS-MCH, Bemina, Srinagar, Jammu and Kashmir. The children were clinically examined to evaluate the possible influence of the cleft on the chronology and timing of tooth eruption patternof permanent maxillary anterior teeth using simple random sampling method. The design of the study followed the guidelines published by Strengthening the Reporting of Observational Studies in Epidemiology (STROBE). Before commencement of the study all the study procedures were explained to every child and parents or guardians.

Participants and Eligibility criteria:

A total of 443 subjects aged 7-18 years were clinically examined to evaluate the possible influence of the cleft on the chronology and timing of permanent maxillary anterior tooth eruption. Inclusion criteria: 1. Non-syndromic operated complete bilateral CLP subjects. 2. Subjects in mixed and permanent dentition period. 3. Subjects with no other associated congenital anomaly. Exclusion criteria: 1. Children with special health care needs. 2. Syndromic subjects.

Study Procedure:

This prospective cohort study consisted of 443 subjects aged 7-18 years with operated complete bilateral cleft lip and palate. The subjects were examined by a previously trained single investigator in order to avoid the bias. Teeth were considered erupted whenever the crown was seen above the gingival barrier. Teeth not present in the oral cavity were considered as unerupted. All the subjects were examined after every 6 months. The mean age of eruption for each permanent maxillary anterior teeth was determined using the Kärber method (modified by Hayes and Mantel, 1958)[17]. The results obtained were then entered into the excel sheet and were subjected to statistical analysis.

III. DATA ANALYSIS:

The analysis was carried out using SPSS 20.0 version (Chicago, Inc., USA). The results are presented in frequencies, percentage and mean±SD. The Chi-square test was used to compare categorical variables. P values below 0.05 were considered as statistically significant. Student "t" test was used to assess the possible differences in the age of eruption of maxillary permanent anterior teeth between the genders of subjects with operated complete bilateral CLP.

IV. RESULTS:

Frequency distribution based on demographic analysis showed 46.9%% girls and 54.4% boys. The results obtained for the mean ages of eruption of maxillary anterior permanent teeth are presented in table 2. Comparison of mean ages of eruption of maxillary permanent anterior teeth in boys with operated bilateral CLP to that of the calculated mean age of eruption of permanent maxillary anterior teeth, showed a significant delay in eruption pattern of maxillary anterior teeth (Table5 &6), with most significant delay being observed in maxillary permanent lateral incisors and canines. Delay in eruption pattern of canines was seen more prevalent in boys than in girls.

Table 1: Frequency distribution based on demographic analysis:

Gender	n%
Boys	241 (54.4%)
Girls	202(46.9%)
Total	443(100%)

Table 2: Mean, Standard Deviation in years, of eruption of maxillary anterior teeth in girls and boys:

Tooth	Girls	Boys
	Mean±SD	Mean±SD
Maxillary Central Incisor	7.24±0.8	7.30±0.8
Maxillary Lateral Incisor	8.30±1.0	8.26±1.1
Maxillary Canine	11.54±1.2	11.63±1.3

Table 3: Mean±SD age (in years) of eruption of maxillary permanent anterior teeth in girls with operated bilateral CLP:

Tooth	Girls
	Mean±SD
Maxillary Central Incisor	7.13±1.8

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Maxillary Lateral Incisor	11.03±1.1
Maxillary Canine	15.14±1.2

Table 4: Mean±SD age (in years) of eruption of maxillary permanent anterior teeth in boys with operated bilateral CLP:

Tooth	Boys
	Mean±SD
Maxillary Central Incisor	7.46±1.2
Maxillary Lateral Incisor	10.13±1.1
Maxillary Canine	17.04±0.2

Table 5: Comparison of mean ages of eruption of maxillary permanent anterior teeth in girls with operated bilateral CLP to that of the calculated mean age of eruption of permanent maxillary anterior teeth:

Tooth			
	Calculated Mean±SD	Mean±SD of girls with BCLP	p value
Maxillary Central Incisor	7.24±0.8	7.13±1.8	0.45
Maxillary Lateral Incisor	8.30±1.0	11.03±1.1	0.00**
Maxillary Canine	11.54±1.2	15.14±1.2	0.04*

*Statistically significant difference (p<0.05), BCLP: Bilateral Cleft Lip and Palate

Table 6: Comparison of mean ages of eruption of maxillary permanent anterior teeth in boys with operated bilateral CLP to that of the calculated mean age of eruption of permanent maxillary anterior teeth:

Tooth			
	Calculated Mean±SD	Mean±SD of boys with BCLP	p value
Maxillary Central Incisor	7.30±0.8	7.46±1.2	0.58
Maxillary Lateral Incisor	8.26±1.1	10.13±1.1	0.001**
Maxillary Canine	11.63±1.3	17.04±0.2	0.00**

**Statistically significant difference (p<0.05), BCLP: Bilateral Cleft Lip and Palate

V. DISCUSSION:

Timing of eruption in both primary as well as permanent dentition may differ among the populations. Previous studies showed, a delay in eruption pattern of teeth in subjects with CLP[7, 18]. A delay in eruption pattern of teeth can be attributed to the bone defect. Hence giving a bony support to the teeth adjacent to the cleft and providing the bone through which teeth can erupt, offers maxillary arch continuity and also aids in closure of the oro-nasal fistula.

Alveolar bone grafting has been a controversial issue for may practitioners, and the following definitions have been used to define it. Primary bone grafting, refers to the bone-grafting procedures involving alveolar cleft defects in children younger than 2 years of age, whereas, Secondary bone grafting is one which is performed in mixed dentition stage, between 9 and 12 years of age. Use of primary alveolar cleft graft does not necessarily preclude a later[19]. **El Deeb** and colleagues have recommended the placement of graft between 9 and 12 years of age, when the canine root is one quarter to half formed. They found that the morphologic conditions will be unaffected by the surgical procedures[20].

Comparison of data revealed that, both boys and girls, showed a significant delay in eruption pattern of maxillary anterior teeth (Table5 &6), with most significant delay being observed in maxillary permanent lateral incisors and canines.

Factors responsible for the delay in the eruption pattern of teeth at the cleft area could be attributed to the presence of surgical scarring, traumatic effect of surgery, deficient blood supply in the cleft area, and insufficient bone support[21,22].

The delay in the eruption pattern of maxillary permanent lateral incisor can be related to its morphological changes, such as duplication, shape alterations, or even the absence of this tooth (**Peterka et al.** 1993, 1996)[23, 24].

Analysing the influence of the cleft on the eruption pattern of teeth helps, in restoring masticatory function speech, and oro-facial aesthetics, so as to achieve as nearly normal a condition as possible. Hence, it should be

emphasized that epidemiological surveys like this are extremely important so that a proper provision of pre-surgical and post-surgical treatment phases are considered.

VI. CONCLUSION:

The results of this study suggest that complete bilateral CLP affects the eruption pattern of the the maxillary anterior teeth adjacent to the cleft area. Knowledge of the eruption pattern of teeth in children with complete bilateral CLP offers an important information to the practitioners, working in the rehabilitation process of such patients.

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