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Phonological Processes in Repaired Tessier Type -3 & 10 Cleft- A Rare Case Report

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Abstract

Tessier type 3 & 10 clefts are grouped under rare craniofacial clefts [1, 2]. The occurrence of rare craniofacial clefts is reported in 0.7–5.4 out of 1000 cases of cleft lip and palate[3]. Tessier facial clefts involve mouth, maxilla, eyes, nose, and forehead; and may extend to viscerocranium and neurocranium too. These clefts are numbered from 0 to 14, representing the extension of the cleft. These clefts can be described as oro-occular cleft and fronto-nasal dysplasia [1].

Phonological processes provide provisional pronunciations during the developmental period of a child as he masters adult like pronunciations [3]. They also influence the lexical and grammatical

competence in a child [4].There is variety of phonological processes identified in children and they vary across languages [5]. These processes gradually get suppressed as the child's phonetic and language skills mature [3]. However, in some children, these processes remain un-suppressed indicating poor mastery on the production of speech sounds of the native language of the child [6].

Keywords: Tessier type 3&10 clefts, craniofacial clefts, phonological processes, pronunciations, phonetic skills.

Background

Several studies suggest that the speech sound errors in children with cleft lip and palate (CLP) are not merely articulation disorder but are errors with phonological consequences [7]. Different phonological processes have been noted in children with CLP such as, final consonant deletion, initial consonant deletion, nasalization, velar assimilation, nasal assimilation, backing, nasal preference, and glottal insertion [7, 8]. Delayed suppression of phonological processes in children with CLP compared to age matched peers has also been reported,[9].

Due to dearth of study on Phonological processes in repaired Tessier Type-3& 10 cleft, the case report is aimed to identifying the number and types of phonological processes characteristic in children with Repaired Tessier Type -3 & 10 Cleft. The case report study will provide in-depth information in to the Phonological processes in Tessier type-3 & 10 cleft.

Case Report

A 5-years- old boy, diagnosed with Tessier type-3&10clefts had the following deformities: frontal encephalocele, eyelid coloboma, mongoloid eye and fronto nasal dysplasia, (Figure. 2 & 3).He had undergone facial repair with an interdigitating local flap at 3 years age and palatoplasty the following year. Present examination revealedUpper eyelid coloboma of the left eye, epicanthal fold and microphthalmia on the left. Aesthetically balanced surgical closure was achieved using multiple Z- Plasty flaps, taking care of not damaging Infraorbital nerve and lacrimal duct. Symmetry of nose and lip was completely achieved. Sutures were removed on 7th post-operative day. At 5 years of age the coloboma of eyelid was repaired.

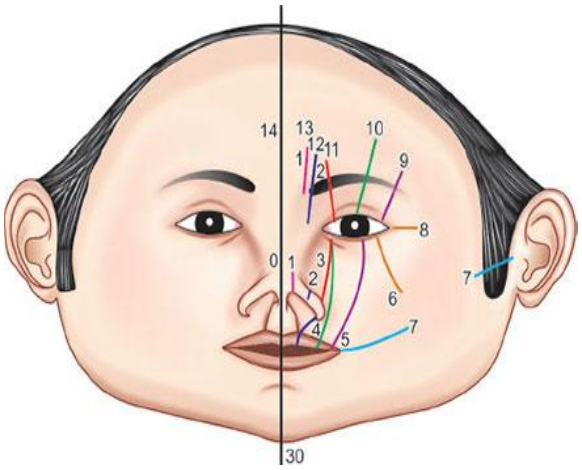

Figure 1: Tessier craniofacial cleft classification, Oral Nasal: Clefts 0-3, Oral-Ocular: Clefts 4-6, Lateral Facial: Cleft 7-9, Cranial: 10-14.

Figure.2,Pre-Operative Photograph.

Figure.3,Post-Operative Photograph.

The Photo articulation test (Developed by AYJNIHH, Mumbai) in Hindi was administered as an assessment tool. A total of 16 vowels, 30 consonants in initial, medial and final position and 11 blends were assessed. Initially consent for the study was taken from the parents of the child. The child was made comfortable and rapport was built. The examiner showed the pictures of the test and the child was asked to name the pictures.In case the child failed to name the picture, examiner named the picture and child was asked to repeat the same, and if the child was not able to identify the picture, verbal cues followed by modeling were utilized. When the child was successful in naming or repeating after the examiner, he was asked to repeat the target word to check for consistency. The responses were recorded using Apple Iphone-13 audio and videorecorder. The speech samples thus obtained were transcribed by the examiner who was native speaker of Hindi, using International Phonetic Alphabet (IPA).

The words transcribed were analyzed sound by sound to identify the presence of phonological processes [10, 11]. A total number of processes identified were listed separately. In instances, where the same phonological processes occurred more than once in the same word, the same was noted for further analysis. After identifying the number of phonological processes occurring, the data was further analyzed qualitatively for identifying the different types of phonological process.

Indian Studies on phonological processes in typically developing children.

The researches on phonological processes aremostly from Western languages. However, there are various few studies have been done focusing on the different Indian languages.

Table 1: Details of studies done on Phonological processes in typically developing children in Indian languages.

Sl. No.	Authors Name	Language in which Studies done	Age Group in which studies done	Phonological Processes
1	Sunil, A. (1998)	Kannada	3-4 years	Fronting, cluster reduction, initial consonant deletion and affrication
2	Jayashree, B. (1999)	Kannada	4-5 years	Fronting, cluster reduction and stopping
3	Ramadevi, K. J. S. (2001)	Kannada	5-6 years	Stridency deletion, deaspiration and retroflex deletion
4	Sameer, M. (1998)	Malayalam	3-4 years	Cluster reduction, final consonant deletion, epenthesis and deaffrication
5	Bharathy, R.(2001)	Tamil	3-4 years	Epenthesis, cluster reduction, gliding, nasal assimilation, voicing, deaffrication and fronting
6	Ranjan, R. (1999)	Hindi	4-5 years	Cluster reduction, partial reduplication and aspiration
7	Santhosh, M. (2001)	Hindi	3-4 years	Cluster reduction, epenthesis, fronting, gliding, metathesis, nasalization etc.
8	Rahul, M. (2006)	Hindi	2-3 years	Retroflex fronting, affrication, stopping
9	Ramandeep, K,et al.,(2017)	Hindi	3-4 years	Consonant deletion, weak syllable deletion, epenthesis, fronting, palatalization, stopping, and aspiration

Table 2: Details of Phonological processes identified in RepairedTessier Type- 3& 10 Cleft.

Sl No.	Phonological Processes	Repaired Tessier Type- 3 & 10 Cleft
1	Sound addition	+
2	Glottal fronting	+
3	Dental fronting	+
4	Initial consonant deletion	+
5	Metathesis	+
6	Pharyngeal replacement	+
7	Depalatalisation	+
8	Cluster substitution	+
9	Nasal assimilation	+
10	Liquid gliding	+
11	Deaffrication	+
12	Stopping	+
13	Other backing	+
14	Other substitutions	+
15	Affrication	+
16	Cluster simplification	+
17	Alveolar fronting	+
18	Context sensitive voicing	+
19	Glottal replacement	+
20	Nasal substitution	+
21	Frication	+
22	Syllable deletion	+
23	Retroflex fronting	+

Table 2, indicates the number and types of phonological processes present in repaired tessier type-3 & 10 cleft. There were 23 phonological processes were identified in repaired tessier type-

3 & 10 cleft, which are Sound addition, Glottal fronting, Dental fronting, Initial consonant deletion, Metathesis, Pharyngeal replacement, Depalatalisation, Cluster substitution, Nasal assimilation, Liquid gliding, Deaffrication, Stopping, Other backing, Other substitutions, Affrication, Cluster simplification, Alveolar fronting, Context sensitive voicing, Glottal replacement, Nasal substitution, Frication, Syllable deletion, Retroflex fronting.

The phonological process identified in repaired tessier type-3 & 10 cleft is significantly more than that noted in studies done ontypically developing children listed in Table 1. Hence the child with repaired Tessier Type-3& 10cleft had more number of phonological processes compared to typically developing children.

Discussion

Case report results revealed that the child with repaired tessier type-3& 10 cleft had a greater number of phonological processes than compared to the studies done on typically developing children. This could be due to the fact that children with repaired tessier type-3 & 10 cleft are known to be at risk for not only phonetic based disorders but also phonologic disorders (21, 22 & 23). This phonologic disorders in children with repaired tessier type-3 & 10 cleft can be due to delayed acquisition of expressive language and /or due to the structural deviations present(24, 25),which may also be due to delayed suppression of developmental processes (25, 26).

Children with repaired tessier type- 3 & 10 cleft exhibited, 23 different processes, where 11 phonological processes such as retroflex fronting, depalatalization, deaffrication, stopping, other backing, affrication, cluster simplification, context sensitive voicing, liquid gliding, nasal assimilation and syllable deletion were developmental in nature (10, 12)). The remaining of the phonological processes glottal replacement, nasal substitution, pharyngeal replacement, frication, other substitutions, alveolar fronting, sound addition, cluster substitution and glottal fronting, Metathesis, Glottal fronting, Dental fronting, Initial consonant deletion are intrinsic in nature.

Children with corrected cleft lip and palate are known to have phonological disorders due to a delay in expressive language or an underlying physical deficiency (9, 24).

The articulatory errors in child with repaired tessier type-3& 10cleft are many and complex in nature. They are dependent on the age of surgery; the type and extent of cleft, age of initiation of speech therapy etc., (27). Children with repaired tessier type-3 & 10 cleft fail to develop smooth co-ordination between the velopharyngeal movement and movement between other articulators of speech (28). They also develop compensatory articulations where the place of articulation of phoneme is shifted more posteriorly in the vocal tract (29).

The results of case report indicate that, in child with repaired tessier type-3& 10cleft, the percentage of phonological processes are more. This indicates that child with repaired tessier type-3& 10cleft are far beyond typically developing children in terms of phonological processes suppression. Hence the delay in suppression can also be one of the causes of more number of processes.

Glottal replacement, nasal substitution and frication were found to be more prominent, the findings of the present case report support the findings of previous studies which report that children with velopharyngeal dysfunction are prone to use glottal replacement and nasal substitution as a compensatory mechanism (22, 30).

The child diagnosed with tessier type-3& 10cleft had undergone surgery after the age of 3years. Delayed surgery is known to be the primary cause of development of compensatory articulation which can become habituated. Lack of speech therapy following surgery can also be a contributing factor. Persistent use of compensatory articulation might have resulted in the productiveness of these processes [9].

Thus, the use of compensatory articulation leads to atypical phonological processes in childwith repaired tessier type-3 & 10 cleft, which they use to communicate with family and friends. Further, as the family and friends also would have accustomedto children's erroneous processes, they would not have attempted to correct themselves. Thus, resulting in an increase in their percentage of occurrence.

Conclusion

The results of the case study indicated that the number of phonological processes occurring in children with repaired tessier type-3 & 10 cleftis much greater than the typically developing

children, possibly due to delay in surgery as well as not availing speech language therapy. With respect to the type of processes, children with repaired tessier type-3 & 10 cleft had different processes compared to typically developing children, amongst them Glottal replacement, nasal substitution and frication were the most productive processes. Both these observations could be due to the presence of structural variations and persistent use of compensatory articulation by children with repaired tessier type-3 & 10 cleft.

Children with repaired tessier type-3 & 10 cleft, hence require to undergo corrective surgery at an early age and to avail speech language therapy which will promote the development of normal speech and language skills.

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