

Craniofacial Morphologic Variations and Its Association with Hypodontia Pattern (Anterior) in South Indian Female Population

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The aim of this study was to survey the association of congenitally missing anterior tooth and variations in craniofacial morphology in South Indian female patients. A total of 15 female patients with congenitally missing tooth in the maxillary anterior region were selected. 16 linear and 6 angular measurements were done on the lateral cephalograms of each subject with Legan and Burstone analysis. The cephalometric data was statistically analyzed and compared among each patient and against the cephalometric norms for the South Indian standards using Legan and Burstone analysis. The anterior hypodontia pattern showed shorter posterior cranial base length, significantly more retrognathic maxilla and prognathic mandible, flat chin, decreased upper anterior facial height, decreased mandibular angle and elongation of upper incisors. Patients with anterior hypodontia pattern have characteristic variations in craniofacial morphology. The dentofacial variations seen in persons with congenitally missing tooth is actually a functional compensation.

Key words: Anterior hypodontia pattern, Legan and Burstone analysis,
Craniofacial morphology, South Indian Female population.

Tooth agenesis or congenital absence of at least one permanent tooth is the most frequently encountered dental anomaly. According to Moss's functional matrix concept, bone grows in response to the functional relationship established by its functional units¹. Most orthodontic therapy is based firmly on the fact that, when this functional matrix grows or is moved, the related skeletal unit (the alveolar bone) responds appropriately to this morphogenetically primary demand. Teeth serve as a functional unit in the process of jaw growth.

Thus, absence of tooth buds might be correlated with underdevelopment of the apical base.

Several studies have been conducted to find the association between hypodontia pattern and their craniofacial morphology. Toshiya Endo *et al.*, 2006² in their study surveyed the craniofacial morphology variations in anterior, posterior and antero-posterior hypodontia pattern. They concluded that in persons with hypodontia the lateral cephalogram showed shorter anterior and overall cranial base length, shorter maxillary length, retroclination and elongation of mandibular incisors, and a larger interincisal angle than the control group. The total and anterior-posterior hypodontia pattern showed significantly more prognathic mandible, retroclination of maxillary incisors, and counterclockwise-rotated occlusal plane.

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Wisht *et al.*, 1974³ in their study showed shorter maxillary length, retrognathic maxilla and proclined upper incisors in 9 year old children with congenitally missing tooth.

The objective of this study was to survey the association of congenitally missing maxillary anterior tooth and variations in craniofacial morphology in South Indian female patients.

MATERIALS AND METHODS

Total of 15 South Indian female patients in the age group of 17 to 25 years with congenitally missing tooth in the maxillary anterior region were selected. The patients were selected from orthodontic clinic seeking for orthodontic correction with no previous history of orthodontic and prosthodontic treatment.

Selection criteria includes

1. No previous history of accidental avulsion of tooth.
2. No craniofacial anomalies.
3. All 4 second molars should have erupted.
4. Third molars were excluded.

A tooth was diagnosed as a congenitally missing tooth when there was no indication that the tooth had been extracted and when there was no sign of mineralization of the tooth crown, could be predicted on orthopantomograms.

Orthopantomogram and lateral cephalogram with standardized setting was taken for all the 15 female patients included in this study.

Cephalometric analysis

One investigator measured all 15 lateral cephalograms, 2 lateral cephalogram per day to avoid operator error. The cephalograms were traced, interpreted and studied using 16 linear and 6 angular measurements given by Legan and Burstone (Cephalometric analysis for Orthognathic surgery)⁴. The values obtained from the 15 samples were compared among each patient and against the control data of the cephalometric norms for the South Indian standards using Legan and Burstone analysis⁵.

Statistical analysis

Values are expressed as mean \pm S.D for 15 patients and significance of the difference between mean values were determined by using student's *t* test. Statistical analyses were performed by a Stat Mate III Statistical package.

RESULTS

The mean and standard deviation for each measurement in all the 15 patients is given in table 1, with the level of statistical significance. The value is significant at $p < 0.05$.

Cranial base

The Ar-Ptm showed significantly shorter posterior cranial base with mean value of 34.3 (S.D. 3.4).

Antero-posterior relationship (horizontal)

The N-A measurement with mean value -4 and S.D. 3.3 showed significantly retrognathic maxilla compared to the control value of mean -2.4. The ANS- PNS value was also found reduced but not statistically significant. It could be because of the smaller size study group. The N-B measurement with mean value of -3.9 and S.D. 4.9 showed significant mandibular prognathism compared to the control value of -6.5. The N-Pg measurement with mean value of -2.2 and S.D. 5.2 showed significantly flatter chin when compared with the control group. The B-Pg value was also reduced mean 2 and S.D 1.8 than the normal value suggestive of a flatter chin.

Vertical relationship

The N-ANS measurement with mean 50.8 and S.D. 3.4 showed significantly short upper anterior facial height than the control data.

Incisor position

The U1-NF measurement shows significant elongation of the upper incisors with mean 28.9 and S.D. 2.6 than the control data with mean 25.7.

DISCUSSION

Congenitally missing tooth is defined as teeth that fail to erupt in the oral cavity and remain invisible in a radiograph, which implies that this is caused by disturbances during the early stages of tooth development⁶. The most frequently missing tooth are lower second premolars and upper lateral incisors. Congenitally missing tooth is also termed as tooth aplasia, absence of teeth, agenesis of teeth, and lack of teeth.

In a study done by Pusparaja Shetty *et al.*,⁷ the most common missing tooth in the maxillary region in Indian population is the upper lateral incisor. Similar result is obtained from the present

Table 1 . Craniofacial morphology in control group and study group

	Standard values for South Indian Females (n=50)		Observed values for patients included in the study (n=15)		P-value
	Mean	Std. Dev	Mean	Std. Dev	
Cranial base					
Ar-ptm	37.1	2.8	34.3	3.4	0.004
ptm-N	50.5	3.9	52.4	4.1	0.139
Horizontal					
N-A-Pg	1.2	4.6	5.4	7.1	0.073
N-A	-2.4	2.0	-4	3.3	0.045
N-B	-6.5	3.3	-3.9	4.9	0.030
N-Pg	-5.1	3.6	-2.2	5.2	0.026
Vertical- skeletal					
N-ANS	53.2	3.1	50.8	3.4	0.021
ANS-Gn	62.1	5.2	63.2	5.5	0.518
PNS-N	51.6	2.6	51.3	2.9	0.723
MP-HP	19.7	3.9	21.1	5.1	0.298
Vertical - dental					
U1-NF	25.7	3.8	28.9	2.6	0.008
U6-NF	23.0	2.9	23.6	2.4	0.510
L1-MP	39.1	2.7	38.8	4.2	0.817
L6-Mp	32.5	2.8	28.8	8.3	0.153
Maxilla-mandible					
PNS-ANS	53.7	3.5	52.3	3.3	0.214
Ar-GO	49.4	5.0	49.9	6.2	0.768
Go-Pg	74.3	4.8	73.8	3.6	0.771
B-Pg	5.8	1.9	2.0	1.8	<0.001
Ar-GO-Gn	119.6	4.1	114.3	5.6	0.002
Dental					
Op-Hp	7.2	3.5	6.2	3.6	0.380
U1-Nf	120.6	4.6	120.9	10.1	0.922
L1-MP	94.7	10.3	98.3	6.9	0.256

*P value less than 0.05 was considered statistically significant

study. The findings of significant shorter cranial base length, retrognathic maxilla and prognathic mandible and flatter chin is in conformity with the previous studies^{8,9,10}. The chin was significantly flatter and the mandibular plane angle was also reduced suggesting upward rotation of the mandible. Toshiyo *et al.*, Ogaard B *et al.*, and Endo *et al.*, have obtained similar results in their study^{12,13}. Significant proclination and elongation of the maxillary incisors could be a functional compensation for a retrognathic maxilla.

CONCLUSION

The following conclusions were made from the present study. The maxillary anterior

hypodontia group shows smaller posterior cranial base length, retrognathic maxilla and prognathic mandible. The chin was flatter and the mandibular angle was reduced suggestive of prognathic mandible. The upper anterior facial height was reduced. Elongation of the upper incisors was seen. The orthodontist should consider the craniofacial morphological variations in patients with congenitally missing tooth before deciding the treatment plan.

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