

ANALYSIS OF VERTICAL FACIAL MORPHOLOGY IN ORTHODONTIC PATIENTS WITH HYPODONTIA

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ABSTRACT

Objective: The objective of this study was to evaluate the vertical facial morphology in patients with hypodontia.

Materials and Methods: This cross-sectional study was conducted at the Orthodontics department, Khyber College of Dentistry, Peshawar, from July to December 2018. After the institutional review board approved the proposed study, a total of 155 subjects for the sample were recruited based on a convenient sampling technique.

Results: Out of 155 patients, 90 were male, and 65 were female. Age was between 18 and 25 years, with the mean age of 19.51 years. Records of the sample were evaluated. Vertical facial parameters (Sn-Mp, FMA, and MMA) were determined using lateral cephalograms. The percentage of patients with normal vertical facial morphology (45.2%) was higher than the percentage of patients with low vertical facial morphology (35.5%) and high vertical facial morphology (19.4%). There was a tendency towards low vertical facial pattern in patients with hypodontia. There was no significant difference between the vertical parameters of males and females ($P = > 0.05$).

Conclusion: This study concluded that patients with hypodontia tend to have a low vertical facial morphology, and the early rehabilitation of the missing teeth can facilitate the vertical growth of the collapsed jaws.

Keywords: Hypodontia, vertical facial morphology, lateral cephalograms

INTRODUCTION

Hypodontia is the congenital missing of one or more teeth and is the common anomaly encountered by orthodontics.^{1,2} Different terminologies are used to describe hypodontia such as a reduction in teeth number, teeth aplasia, congenitally missing teeth, the absence of teeth, agenesis of teeth, and lack of teeth.³ Hypodontia is developmental missing of less than six teeth, oligodontia is developmental missing of six or more teeth, and anodontia is developmental missing of all dentition.^{4,5}

Hypodontia is considered rare in the deciduous dentition and is not as common as in the permanent dentition. Most cases present as unilateral

hypodontia, with mostly one or two teeth missing.⁶ In hypodontia, there are disturbances during the initial stages of tooth formation: Initiation and proliferation.⁷ Hypodontia can occur isolated or can be associated with other dental abnormalities, such as a cleft lip and palate as well as with more than 50 syndromes.⁸

The etiology of hypodontia is multifactorial and may be caused by genetic and environmental factors.^{8,9} Evidence supporting a genetic etiology for hypodontia has been presented.¹⁰ Mutations in AXIN2, PAX9, and MSX1 have been determined in families with hypodontia.^{7,11} The pattern and distribution of the congenitally absent teeth depend on the population investigated.¹² The third molars and mandibular second premolars are the most frequently missing teeth. The maxillary lateral incisors are the next followed by maxillary second premolars and the mandibular central incisors.¹³

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Hypodontia causes severe aesthetic and functional problems and needs multidisciplinary treatments.¹⁴ In many cases of hypodontia, orthodontic treatment can facilitate any restorative treatment, or sometimes even eliminate the need for it.¹⁵

Children with hypodontia or anodontia show certain dentofacial characteristics, including maxillary retrusion due to sagittally underdeveloped maxilla, forward-upward displacement of the mandible, and decreased lower anterior facial height.¹⁶ A study conducted by Bondarets et al. concluded that patients with severe hypodontia had decreased occlusal vertical dimension and was further amplified by the absence of teeth.¹⁷ Another study by Chan et al. showed that patients with hypodontia tend to have a shorter face and flatter mandible and as the severity of hypodontia increased to 10 or more missing teeth, a tendency to develop a class III skeletal relationship was noted.¹⁸

This study aimed to analyze the vertical facial morphology among orthodontic patients with hypodontia and establish if hypodontia is related to a reduction in vertical facial morphology.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Orthodontics department, Khyber College of Dentistry, Peshawar, from July to December 2018. After the institutional review board approved the proposed study, a total of 155 subjects for the sample were recruited based on a convenient sampling technique. Of the total sample, 90 were males, and 65 were females. The inclusion criteria were patients above 17 years of age, one to five congenitally absent permanent teeth and good records. The exclusion criteria were the presence of any syndrome, cleft lip and palate, history of extraction, history of trauma, previous orthodontic treatment, any significant medical history, and incomplete records. The congenital absence of teeth was determined by history, clinical, and radiographic examination using an orthopantomogram (OPG). The vertical facial morphology was determined by cephalometric analysis of standardized lateral cephalometric radiographs with the following parameters.

1. Sella-Nasion-Mandibular plane (SN-MP) angle, the angle formed by projecting Sella-Nasion plane on Mandibular-plane

(Gonion-Menton).

2. Frankfort-Mandibular plane angle (FMA), the angle formed by projecting Frankfort plane on Mandibular plane.
3. Maxillo-Mandibular plane angle (MMA), the angle formed by projecting Maxillary plane on Mandibular plane.

Statistical Analysis

The mean and standard deviation for continuous variables like age, Sella-Nasion-Mandibular plane angle, Frankfort-Mandibular plane angle, and Maxillo-Mandibular plane angle was calculated using SPSS Version 23. An independent sample t-test was used to evaluate gender differences.

RESULTS

Out of a total of 155 patients, the study comprised of 90 males (58.1%) and 65 females (41.9%). Age ranged between 18 and 25 years (mean 19.51±1.29). Table 1 shows the vertical parameter values. The mean value of the Sella-Nasion-Mandibular plane (Sn-Mp) angle was 28.45±3.49. The mean value of the Frankfort-Mandibular plane angle (FMA) was 23.29±4.81. The mean value of the Maxillo-Mandibular plane angle (MMA) was 23.29±4.49.

Of 155 patients, 70 patients (45.2%) exhibited a normal vertical angle. Fifty-five patients (35.5%) showed a low vertical angle. Thirty patients (19.4%) showed a high vertical angle. Table 1 also shows the vertical parameters mean value of males and females. Table 2 shows the gender-wise comparison of vertical parameters using the independent sample t-test. The difference between male and female vertical angles was found to be insignificant with P-value > 0.05.

DISCUSSION

The objective of this study was to analyze the vertical facial morphology in hypodontia patients. The results of this study showed that there were more patients in the normal facial morphology category than low and high facial morphology. The percentage of low facial morphology was more significant than high facial morphology.

Previous studies on craniofacial development and morphology in patients with hypodontia have produced quite conflicting results.¹⁹ In the present

Table: 1 Descriptive Statistics for age, gender, and vertical parameters distribution

Variable	GENDER DISTRIBUTION		
	Male		90
Female		65	41.9
AGE AND VERTICAL PARAMETERS			
		Mean	Std.Deviation
Age		19.5161	1.29612
SnMp		28.4516	3.49247
FMA		23.2903	4.81606
MMA		23.2903	4.49526
VERTICAL ANGLE DISTRIBUTION			
		Frequency	Percent
Normal		70	45.2
Low		55	35.5
High		30	19.4
GENDER WISE VERTICAL PARAMETERS			
	Levels	Mean	Std.Deviation
SnMp	Male	28.2222	3.71083
	Female	28.7692	3.16608
FMA	Male	23.0000	5.00561
	Female	23.6923	4.54809
MMA	Male	23.3889	4.3851
	Female	23.1538	4.6745

Table: 2 GENDER WISE COMPARISON OF VERTICAL PARAMETERS USING INDEPENDENT SAMPLE t TEST

	t-test for Equality of Means						
	t	df	P-value	Mean Difference	Std. Error Difference	95% Confidence Interval	
						Lower	Upper
SnMp	-.962	153	.338	-.54701	.56862	-1.67038	.57636
FMA	-.882	153	.379	-.69231	.78450	-2.24215	.85754
MMA	.320	153	.749	.23504	.73386	-1.21476	1.68485

study, we selected the vertical relationship of the mandible with cranial base, Frankfort plane, and maxilla by means of cephalometric parameters such as the Sella-Nasion-Mandibular plane (SN-MP) angle, Frankfort-Mandibular plane angle (FMA) and Maxillo-Mandibular plane angle (MMA) respectively.

The results showed that there is a more tendency towards a low angle than a high angle in hypodontia patients. This was in agreement with the findings of a study conducted by Komerik et al. who concluded that in a vertical plane, hypodontia patients exhibited short face, deep bite, counter-clockwise rotation of the mandible and clockwise rotation of the maxilla.²⁰

In this study, the FMA and MMA were in the low range of normal. A study by Chung et al. showed that there was a significant reduction in the MMA with increasing severity of hypodontia.²¹ Chan et al. found that the mandibular plane was flatter in the hypodontia group compared with the control group as indicated by the decrease in Sn-Mp angle and FMA.¹⁸ The mean value of the Sn-Mp angle was in a normal range. A study by Kreczi et al. concluded that there was no predominance either of the vertical nor the horizontal mandibular growth pattern in persons with hypodontia.²² Another study by Bertl et al. found that cross-sectional mandibular size and shape differ significantly between patients with and without agenesis of the lower second premolar.²³

This study showed that the sample has more patients in the normal vertical angle range. Also, there was a great percentage of patients with a low vertical angle. The early correction of collapsed lower anterior facial height, due to forward displacement of the mandible, plays a significant role in normalizing the function of masticatory and perioral muscles, improving facial aesthetics and consequently affecting the growth pattern of basal bone.¹⁶ Cvetanka et al. found that hypodontia have a negative influence on the craniofacial morphology according to the number of missing teeth and leads to aesthetic and functional disturbances.²⁴

The independent-sample t-test showed that there was no significant difference between the Sn-Mp angle, FMA, and MMA of males and females. The P-value was > 0.05 for all the vertical parameters.

CONCLUSION

Individuals with hypodontia have a tendency towards low vertical facial morphology. Early detection is necessary to minimize the complications of hypodontia. Early placement of dentures in severe cases of hypodontia in growing individuals can provide better conditions for the growth and development of the orofacial structures.

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