ORIGINAL ARTICLE

CHANGE IN MAXILLARY AND MANDIBULAR POSTERIOR DENTOALVEOLAR HEIGHTS WITH VARIATION IN LOWER ANTERIOR FACIAL HEIGHT

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ABSTRACT

Balanced facial profile is associated with normal value of lower anterior facial height. Variation in lower anterior facial height can be resulted from abnormal vertical growth of posterior dentoalveolar segments. During orthodontic treatment posterior dentoalveolar segment at fault must be corrected. The objective of this study was to find the change in maxillary and mandibular posterior dentoalveolar heights with variation in lower anterior facial height.

The material for this cross-sectional comparative study consisted of 190 lateral cephalometric radiographs of patients with age more than 12 years coming to the orthodontic department of a tertiary care hospital in one year. Patients were divided into 3 groups on the basis of normal, increased or decreased lower anterior facial height. The radiographs were traced manually on the acetate paper to measure the total and lower anterior facial height, maxillary posterior dentoalveolar height and mandibular posterior dentoalveolar height. SPSS was used to calculate mean and standard deviation.

The p-value for all the results were < .05 when comparison was made between maxillary posterior dentoalveolar height in increased, normal and decreased lower anterior facial height groups. Similarly statistically significant difference was found when mandibular posterior dentoalveolar height was compared between increased, normal and decreased lower anterior facial height groups.

It was concluded from the study that heights of maxillary and mandibular posterior dentoalveolar segments change with the variation in lower anterior facial height.

Key Words: *Lower anterior facial height, vertical dysplasia, posterior dentoalveolar height.*

INTRODUCTION

Lower anterior facial height (LAFH) is a linear distance measured from anterior nasal spine (ANS) to menton (Me). In a well proportionate face this value must be 55% of the distance measured from point nasion to point menton.[1-4] Harmony and balance of the face is affected in persons with increased or decreased LAFH. Variation in LAFH is associated with abnormal vertical development of maxillary posterior dentoalveolar height (MxPDH) and mandibular posterior dentoalveolar height (MnPDH).[4-6] This abnormal vertical development is expressed as either an increase or decrease in MxPDH or MnPDH. These abnormal values must be brought with in normal range during orthodontic treatment to get a balanced profile.

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For this reason researchers have investigated changes in MxPDH and MnPDH with variation in LAFH. The findings of these studies are variable. Some studies have shown that with variation in LAFH, both MxPDH and MnPDH are changed while some other studies have shown change only in either of MxPDH or MxPDH. Martina R et al[6] found change in both MxPDH and MnPDH in patients with decreased or increased LAFH. Enoki, Telles and Matsumoto4 showed increase in MxPDH and MnPDH in patients with increased LAFH but showed decrease only in MnPDH and no difference in MxPDH while comparing subjects with normal and decreased LAFH. Orthodontic correction of the decreased or increased lower anterior facial height include either extrusion or intrusion of the posterior teeth in different ways respectively.[7,8]

The present study was designed to find out variations in MxPDH and MnPDH in patients with increased, normal and decreased LAFH so that while doing orthodontic treatment extrusion or intrusion of posterior teeth will be done only in that posterior dentoalveolar height which is either deficient or excess, which may be either MxPDH or MnPDH or both.

METHODOLOGY

This is a cross-sectional comparative study. In this research 190 lateral cephalometric radiographs of the patients with age greater than 12 years coming to the orthodontic department of a tertiary care hospital in one year were included. Informed consent was taken from selected patients for use of their radiographs.

Inclusion criteria were:

- Male/female patients seeking orthodontics treatment (>12 Years)
- Patients having complete permanent dentition up to first permanent molar.
- Patients with normal lower anterior facial height. (These patient must have upper and lower posterior dentoalveolar heights within the normal range) 9(54%-56%)[4]
- Patients with decreased lower anterior facial height. (< 54 %)[4]
- Patients with increased lower anterior facial height. (> 56%)[4]

Exclusion criteria were:

- Patients who had received orthodontics treatment
- Unilateral or bilateral posterior cross bites
- Patients having altered growth due to trauma.

Data was collected from lateral cephalometric radiograph taken with the patient's Frankfurt horizontal plane parallel to floor, mandible in centric occlusion and lips at rest. Each radiographic film was traced on 8 x 10 inch standard translucent acetate tracing paper, over a standard illuminated view box with lead pencil. Patients were divided into three groups according to LAFH. Palatal and mandibular planes were drawn. Total anterior facial height, LAFH, MxPDH and MnPDH were measured by millimetric scale. All the measurements were recorded on a Proforma. The data was analyzed using SPSS. Descriptive statistics were used to calculate Mean and SD for age, LAFH, MxPDH and MnPDH. Frequency and percentage was presented for gender. One way ANOVA test was used to compare MxPDH and MnPDH between the three groups. A p value of <0.05 was considered as significant.

RESULTS

In this study 69 (36%) patients were male and 121 (64%) patients were female. Thirty four (18%) patients had normal LAFH, 102 (54%) subjects had decreased LAFH and 54 (28%) patients had increased LAFH. (Fig 1)

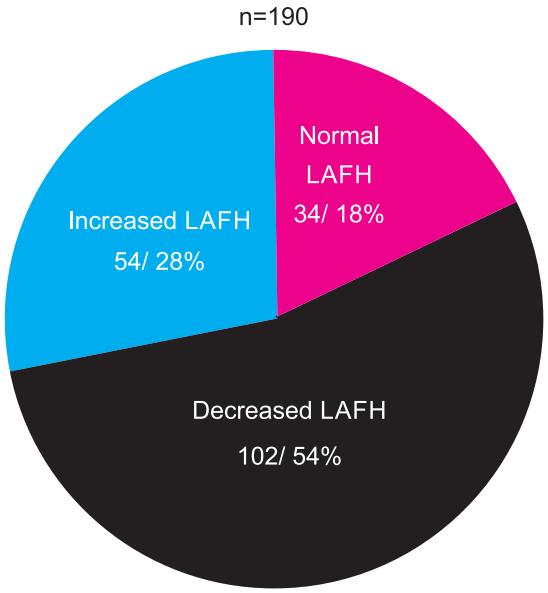

Fig 1: Distribution of patients according to lower anterior facial height groups

TABLE 1: MULTIPLE COMPARISONS TEST (TURKEY HSD)

Dependent variable	(I) LAFH Height Group	(J) LAFH Height Group	Mean Difference (I-J)	Std. Error	Sig
Maxillary Posterior Dentoalveolar Height	Normal LAFH	Decreased LAFH	2.946*	.496	.000
		Increased LAFH	- 1.709*	.548	.005
	Decreased LAFH	Normal LAFH	- 2.946*	.496	.000
		Increased LAFH	- 4.655*	.422	.000
	Increased LAFH	Normal LAFH	2.946*	.548	.005
		Increased LAFH	4.655*	.422	.000
Mandibular Posterior Dentoalveolar Height	Normal LAFH	Decreased LAFH	2.196*	.598	.005
		Increased LAFH	- .521*	.662	.013
	Decreased LAFH	Normal LAFH	- 2.196*	.598	.005
		Increased LAFH	- 2.717*	.509	.000
	Increased LAFH	Normal LAFH	.521*	.662	.013
		Decreased LAFH	2.717*	.509	.000

* mean difference is significant at p = .05 LAFH = Lower anterior facial height

TABLE 2: MEANS OF MxPDH ACCORDING TO LAFH GROUPS AND GENDER

LAFH Group	Gender	n	Mean (mm)	Std Dev (mm)
Normal LAFH	Male	10	25.75	.92
	Female	24	23.60	1.05
	Total	34	24.23	1.41
Decreased LAFH	Male	35	21.11	2.74
	Female	67	21.38	2.56
	Total	102	21.28	2.61
Increased LAFH	Male	24	26.97	3.02
	Female	30	25.11	2.35
	Total	54	25.94	2.80
Total	Male	69	23.82	3.84
	Female	121	22.74	2.78
	Total	190	23.13	3.24

MxPDH=Maxillary posterior dentoalveolar height
LAFH=Lower anterior facial height

TABLE 3: MEANS OF MNPDH ACCORDING TO LAFH GROUPS AND GENDER

LAFH Group	Gender	n	Mean (mm)	Std Dev (mm)
Normal LAFH	Male	10	36.05	1.01
	Female	24	32.14	1.91
	Total	34	33.29	2.46
Decreased LAFH	Male	35	32.20	2.11
	Female	67	31.01	2.97
	Total	102	31.42	2.76
Increased LAFH	Male	24	35.77	3.60
	Female	30	34.66	3.80
	Total	54	35.15	3.72
Total	Male	69	34.00	3.19
	Female	121	32.14	3.37
	Total	190	32.81	3.42

MnPDH=Mandibular posterior dentoalveolar height
LAFH=Lower anterior facial height

The results clearly showed that there was a statistically significant difference between means of MxPDH in individuals with increased, normal and decreased LAFH groups. Similarly there was also a statistically significant difference between means of MnPDH in individuals with increased, normal and decreased LAFH groups. Table 1 shows comparison of MxPDH and MnPDH in three LAFH groups. Table 2 shows the mean of MxPDH for the whole sample as well as for the three LAFH groups and also according to gender. Table 3 shows the means for MnPDH in the whole sample as well as for the three LAFH groups and also according to gender.

DISCUSSION

As already mentioned correction of vertical dysplasia is very important in achieving balanced profile after orthodontic treatment. Many studies have been carried out for its diagnosis and its implication on the related dentoalveolar structures so that every effort should be made to treat and correct the posterior dentoalveolar height at fault.

The result of this study were comparable with the previous research of Field and Proffit[11] in which they found a statistical difference between the means of MxPDH in three LAFH groups as well as between the means of MnPDH in three LAFH groups. The results also supported the findings by Schendel.[12] The results also matched the findings of Opdebeeck[13], Martina[14] and Kuitert.[15]

Some studies showed slightly different results from this study by showing that with the variation in LAFH, height of posterior alveolar segments remained the same. In the studies by Isaacson[16] and Jason[17] no statistically significant difference was found between the MnPDH of patients with normal LAFH and decreased LAFH and statistically significant difference was found between the other groups.

Means of MxPDH and MnPDH in normal LAFH group in this study are higher than the values mentioned in the study by Zafar-Ul-Islam.[18] The findings of this study should be considered during treatment planning and deciding about types of mechanics and appliance so that extrusive or intrusive mechanics can be done for the posterior dentoalveolar height which is at fault. By correcting the maxillary and mandibular posterior dentoalveolar heights, LAFH can be brought into the normal range which ultimately results in the improvement of facial profile after orthodontic treatment.

CONCLUSION

There is statistically significant difference between MxPDHs in normal, increased and decreased LAFH groups, similarly statistically significant difference is found between MnPDHs in increased, normal and decreased LAFH groups. This study gave a comprehensive view of the variation in posterior dentoalveolar heights with the vertical dysplasia, so Individuals with such problems should be managed carefully by selecting the appropriate mechanics best suited for these individuals, so that better results can be achieved.

REFERENCES

1 Cheema AA, Ijaz A. Proportion of maxillary vertical excess in dental patients Visiting the children's hospital, Lahore. Pak Oral Dent J 2006; 26(1): 43-50.

2 Sukhia HR, Sukhia RH. Lower facial height treatment changes in bi-maxillary protrusion orthodontic cases. Pak Oral Dent J 2013; 33(1): 65-70.

3 Rasool G, Ijaz W, Ayub A, Raza HA, Gul H. Assessment of lower anterior face height in local Khyber Pakhtunkhwa population. Pak Orthod J 2011; 3(2): 49-52.

4 Enoki C, Telles CDS, Matsumoto MAN. Dental-skeletal dimensions in growing individuals with variations in the lower facial height. Braz Dent J 2004; 15: 68-74.

5 Karpagam S, Rabin K, Mathew G, Koshy S. Correction of anterior open bite in a case of achondroplasia. Indian J Dent Res 2005; 16: 159-66.

6 Martina R, Farella M, Tagliaferri R, Michelotti A, Quaremba G, Eijden TMGJV. The relationship between molar dentoalveolar and craniofacial heights. Angle Orthod 2005; 75: 974-79.

7 Sarver DM, Proffit WR. Special Considerations in diagnosis and treatment planning. In: Graber TM, Vanarsdall RL, Vig KWL (edi). Orthodontics: current principles and techniques. 5th ed. St Louis: Mosby 2011: 59-98.

8 Proffit WR, Fields HW, Sarver DM. Orthodontic treatment planning: limitations, controversies, and special problems. In: Proffit WR, Fields HW, Sarver DM (edi). Contemporary orthodontics. 5th ed. St Louis: Mosby 2013: 268-327.

9 Proffit WR, Sarver DM. Diagnosis: gathering and organizing the appropriate information. In: Proffit WR, White JRP, Sarver DM (edi). Contemporary treatment of dentofacial deformity.1st ed. St Louis: Mosby 2003: 127-71.

10 Loi H, Nakata S, Nakasima A, Counts AL. Comparison of cephalometric norms between Japanese and Caucasian adults in antero-posterior and vertical dimension. Eur J Orthod 2007; 29:493-99.

11 Fields HW, Proffit WR, Nixon WL, Phillips C, Stanek E. Facial pattern difference in long-faced children and adults. Am J Orthod Dentofac Orthop 1984; 85: 217-23.

12 Schendel SA, Eisenfeld J, Bell WH, Epker BN, Mishelevich DJ. The long face syndrome: vertical maxillary excess. Am J Orthod 1976; 70: 398-408.

13 Opdebeeck H, Bell WH. The short face syndrome. Am J Orthod 1978; 73: 499-511.

14 Martina R, Farella M, Tagliaferri R, Michelotti A, Quaremba G, Eijden TMGJV. The relationship between molar dentoalveolar and craniofacial heights. Angle Orthod 2005; 75: 974-79.

15 Kuitert R, Beckmann S, Loenen MV, Tuinzing B, Zentner A. Dentoalveolar compensation in subjects with vertical skeletal dysplasia. Am J Orthod Dentofacial Orthop 2006; 649-57.

16 Isaacson JR, Isaacson RJ, Speidel TM, Worms FW. Extreme variation in vertical facial growth and associated variation in skeletal and dental relations. Angle Orthod 1971; 41: 219-29.

17 Janson GRP, Metaxas A, Woodside DG. Variation in maxillary and mandibular molar and incisor vertical dimension in 12-years-old subjects with excess, normal, and short lower anterior face height. Am J Orthod Dentofacial Orthop 1994; 106: 409-18.

18 Zafar-Ul-Islam, Shaikh A, Fida M. Dentoalveolar heights in skeletal class I normodivergent facial patterns. J Coll Physicians Surg Pak 2012; 22(1): 5-9.