Original Research Article

COMPARISON OF POSITION OF GLENOID FOSSA IN SKELETAL CLASS I AND CLASS II MALOCCLUSION

ABSTRACT

AIM

To evaluate the mean position of the glenoid fossa in patients with skeletal class I and skeletal class II malocclusions in a specialist care hospital.

METHOD OF RESEACH

A descriptive cross-sectional study

LOCATION AND PEROID OF STUDY

Out Patients Department of Orthodontics, Margalla Institute of Health Sciences Rawalpindi from 1-12-2013 to 30-05-2014

METHODOLOGY

Clinical records of patients, who had approached or had been referred to orthodontics department, were maintained as per Orthodontics protocol including clinical history, physical examination and radiographs inclusive of Lateral Cephalogram. Radiographs were taken with the informed consent of patient or parents as per the requirement in horizontal plane parallel to floor, lower jaw in maximal intercuspation with lips at rest. Patients were segregated into 2 groups of skeletal class I and class II relationships. On Cephalogram, SNA, SNB, ANB, GF-S on FHP and GF-FMN were measured.

The details were assessed on statistical package for social sciences (SPSS version 14). Descriptive statistics were utilized to calculate the frequency and percentages for qualitative variables like gender. Means and standard deviation were analyzed for quantitative variables like SNA, SNB, ANB, GF-S on FHP, and GF-FMN for skeletal class I and class II groups. Independent sample t-test was employed to juxtapose the means and SD for GF-S on FHP and GF-FMN in millimeters for both the groups.

RESULTS:

On conduct of various descriptive statistics / sample tests, results were achieved. $P < 0.05$ was considered significant. Measurement of mean location of glenoid fossa in skeletal class I and skeletal class II groups was end result of the study which was compared subsequently in both groups. Mean GF-S on FH in skeletal class I was 17.47±3.45 mm and in skeletal class II it was 17.01±3.79 mm, which was statistically non consequential ($p = 0.528$). Similarly Mean GF-FMN in skeletal class I was 80.50±6.17 mm and in skeletal class II it came out to be 77.72±7.69 mm, which was statistically substantial ($p=0.048$).

CONCLUSION:

It is inferred from results that difference between glenoid fossa position and FMN point in skeletal class I and Class II malocclusions is statistically significant.

KEY WORDS: Glenoid fossa, skeletal class II, Mandibular retrusion, cranial base, FMN.

INTRODUCTION:

There are various horizontal and vertical variables that define contours of face. The balance of the horizontal and vertical growth is the key parameter for elucidating of a symmetrical facial profile.[1] Complex and intricate interplay of varying growth rate of different parts of the craniofacial region cause malocclusion which results in different skeletal and dental imbalances leading to unbalanced facial profile**.[**2]

The position of the glenoid fossa relative to neighboring skeletal structures is very important and should be considered while doing skeletal analysis of the orthodontics patient as the association of the mandible to the cranial base effects both sagittal and vertical facial imbalances.[1] It is evident that there is difference in growth of maxilla and mandible. There are three places of growth in maxilla, firstly; by formation of bone at circum-maxillary sutures; secondly as a result of periosteal bone deposition at different surfaces; and lastly as a consequence of eruption of teeth increasing in vertical height of alveolar bone. [3,4] There are three processes that governs the growth of mandible which includes Condylar endochondral bone growth; periosteal remodeling of bone at posterior part of the ramus; and bone growth due to teeth eruption. [5,6 **]**

In Skeletal Class II patients, there is either maxillary excess, mandibular deficiency or a combination of both. The treatment goal of a patient with skeletal class II malocclusion having mandibular deficiency is an increase in mandibular growth. This can be accomplished by changes in the components of the TMJ, i.e. (1) condylar modeling, (2) glenoid fossa modeling, (3) anterior condylar displacement in the fossa. Changes can be performed in each component separately or all three in combination.[7] Giuntini V et al proposed to include posterior position of the glenoid fossa among the diagnostic criteria for class II malocclusions.[8] Growth of cranial base determines the position of glenoid fossa. The spatial orientation of the glenoid fossa depends upon change in length of the posterior cranial base. There are two factors during facial

development that dictate the comparative change in position of fossa. Bone remodeling within the fossa and repositioning of the whole temporal bone. [7,9,10]

Anterior displacement of fossa during development results in class III malocclusion. This was attributed to the more upright posterior cranial base. Innocenti et al [11] defined various important factors which determine position of glenoid fossa in distinct sagittal and vertical facial profiles

• In Class II skeletal malocclusion there is more posterior positioning of the glenoid fossa relative to Class III malocclusion.

• A more cranially located glenoid fossa with reference to cranial base is witnessed in individuals who have vertically high angle in contrast to subjects with normal and low vertical angle.

For an accurate orthodontic diagnosis and formulation of treatment plan, an exact understanding of relationship between glenoid fossa and condyle is pivotal. Information regarding growth in various types of malocclusions and dento-skeletal disharmonies is vital to plan orthodontic treatment properly. Despite the important role of the glenoid fossa that has been established from the currently available literature in the etiology of malocclusion and its diagnosis, there is only limited data originating mainly from the western world with limited research on this topic has been conducted in Pakistan.

The rationale of this study is to elucidate the importance of glenoid fossa positioning in diagnosis of skeletal class II malocclusion and it can be used as an end result goal of dentofacial orthopedics treatment in future studies.

METHODOLOGY:

A cross sectional study with 100 subjects (16 males and 84 females) was conducted. Patients' history was taken and clinical examination was performed. Lateral Cephalogram was taken with the patient's Frankfurt horizontal plane parallel to floor, mandible in centric occlusion and lips at rest. On Cephalogram, ANB angle was measured. Patients were divided into 2 groups based on skeletal class I and class II relationships.

On cephalogram, following readings were done:

1. SNA, SNB and ANB angle were measured with the help of protractor.

2. GF-S on FHP: The distance (in mm) between the projections of point glenoid fossa (GF) and point sella (S) onto the Frankfort horizontal plane. (Measured with the help of ruler).

3. GF-FMN: The linear distance (in mm) between glenoid fossa (GF) and frontomaxillary nasal suture (FMN) point. Measured with the help of a ruler)

INCLUSION CRETRIA:

- Patients of either gender
- Patients having CVM stage 5,
- Patients having skeletal class I or class II malocclusion with normal SNA angle.

EXCLUSION CRITERIA:

- Patients having previous orthodontic/orthopedic treatment.
- Patients with any asymmetry of jaws.

STATISTICAL ANALYSIS

The data was analyzed on statistical package for social sciences (SPSS version 14). Descriptive statistics were used to calculate the frequency and percentages for qualitative variables like gender. Means and standard deviation were calculated for quantitative variables like SNA, SNB, ANB, GF-S on FHP, and GF-FMN for skeletal class I and class II groups. Independent sample t-test was used to compare the means and SD for GF-S on FHP and GF-FMN in millimeters for both the groups.

Table 1 : Independent Samples Test Of Patients In Class I And Class Ii Skeletal Relations

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
GF-S on FH	Equal variances assumed	0.498	0.482	0.634	98	0.528	0.4600	0.7260	-0.9808	1.90
	Equal variances not assumed			0.634	97.118	0.528	0.4600	0.7260	-0.9810	1.90
GF-FMN	Equal variances assumed	0.499	0.482	2.000	98	0.048	2.7900	1.3952	0.0214	5.55
	Equal variances not assumed			2.000	93.597	.048	2.7900	1.3952	.0197	5.56

RESULTS:

Independent-samples t-test was used to juxtapose GF-FMN in Group A and Group B, skeletal relation. There was a significant difference in the scores for Group A, (Mean = 80.50, standard deviation = 6.17) and Group B (Mean=77.72, standard deviation = 7.69). T-value of t = 2 and P value, p = 0.048, was calculated. These results suggest that there is a statistically significant difference between GF-FMN in Class I and Class II skeletal realtion.

DISCUSSION:

In this current study, the exact position of the Glenoid Fossa on Lateral Cephalogram was assessed in terms of its distance from Sella (on Frankfort horizontal Plane, mm) and from Fronto-Maxillary nasal suture (GF-FMN, mm). The distances in patients with Skeletal Class I and class II malocclusion were compared. Lack of protrusion of maxilla and existence of retrusive mandible in the Class II sample was part of inclusion criteria of this study. It was determined by the values for SNA, SNB and ANB. Enlow[4] has proposed that maxillary growth has been affected by the development of cranial base. Many previous studies have found association of skeletal Class II with a large saddle angle and distal location of the temporomandibular joint. [3,12]

In our study, patients of Class II malocclusion were found to have distally located glenoid fossa, in contrast to other group of patients with Class I malocclusion. It was revealed by these two parameters (GF-S on FH and GF-FMN).

In this current study, Mean of Glenoid Fossa–Fronto-maxillary nasal suture distance (GF-FMN) in skeletal class II group is 80.50±6.17 while it was 77.72±7.69 in skeletal class I group. These results were statistically significant ($p < 0.048$). Similarly, GF-S in both the groups was 17.47+3.45 and 17.01+3.79, but it was statistically not significant ($p < 0.528$). Giuntini et al [8] had found in their study that mean value of GF-FMN in class II group was 71±4.1mm as compared to in class I group where the values were 67.6±3.5mm and $p < 0.00$. The Mean of Glenoid Fossa–Fronto-maxillary nasal suture distance (GF-FMN) in the Class II group, was found to be 3.2 mm longer than the Mean of Glenoid Fossa–Fronto-maxillary nasal suture distance (GF-FMN) in the skeletal class I Malocclusion group. This finding corroborates an old published report by Droel and Isaacson [13]. They deduced that glenoid fossa was posteriorly

located by a distance of approximately 2.5 mm in skeletal Class II patients in contrast with skeletal Class I malocclusion patients. It is worth mentioning that Droel and Isaacson had included both maxillary protrusion and mandibular deficiency cases in Class II group. However, in our study we were able to find significant difference in glenoid fossa position between the two groups by including only those Class II malocclusion patient with mandibular retrusion.

Miranda et al [14] had found that there was an increase in vertical distance between the condyle and glenoid fossa in patients with short faces as compared to patient with dolichofacial pattern. For accurate measurement of Glenoid fossa position clinically and radiographically, both brachyfacial and dolichofacial patterns must be considered. In another study by Giuntini et al [8] it had been inferred that for evaluation of facial vertical features, vertical measurement of glenoid fossa position had more sensitivity than the sagittal measurements. It is worth mentioning that there is a predisposition of skeletal Class II malocclusion in patient with distally located glenoid fossa. Moreover, the success of dentofacial orthopedics in class II malocclusion can be determined by change in position of glenoid fossa. Dentofacial orthopedics results in the change of structural features of the posterior wall of the fossa, leading to mechanical stimulation of condylar growth and followed by mandibular advancement. [15,16,17,18] Changes produced by these treatments, helps in the rectification of Class II malocclusion with mandibular deficiency. [19,20]

CONCLUSION:

The current study has revealed important relationships of glenoid fossa position with skeletal class II malocclusion.

• In patients of Skeletal Class II malocclusion related to mandibular retrusion, posterior position of the glenoid fossa can be a dependable diagnostic tool.

• Estimation of cephalometric distance between the glenoid fossa to the fronto-maxillary-nasal suture (GF-FMN) is an accurate way to determine glenoid fossa position.

Consent: Written consent was taken from all participants.

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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