Variations in the size of sella turcica in class I and class II skeletal patterns: A lateral cephalometric study

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Abstract

Aim and Objective: The purpose of this study was to measure and establish normative reference standards of the sella turcica size in subjects with skeletal class I and class II patterns.

Materials and Method: The material comprised of lateral cephalograms of 80 patients from 19 to 27 years of age divided equally into skeletal Class I and Class II groups. Length, depth and diameter of the sella turcica were measured. Student t test was done to study the relationship between sella size and skeletal types.

Results: A statistically significant difference was noted among skeletal class and depth of the sella turcica. ($p =.006$). Mean Depth was found to be 9.97mm in Class I patients as compared to 9.02 mm in Class II patients.

Conclusion: The results of this study constitute quantitative reference data that could be used for objective evaluation of sella turcica size.

Introduction

The sella turcica is an important anatomical structure for cephalometric assessment because of its central landmark known as *sella*. It is a saddle-shaped area of bone located in the middle cranial fossa. The sella turcica lies on the intracranial surface of the body of the sphenoid and consists of a central pituitary fossa bounded anteriorly by the tuberculum sellae and posteriorly by the dorsum sellae. Two anterior and two posterior clinoid processes project over the pituitary fossa.[1] The anterior clinoid processes are formed by the medial and anterior prolongations of the lesser wing of the sphenoid bone, and the posterior clinoid processes represent terminations of the dorsum sellae. The anterior wall of the sella turcica reaches stability at about 5 years of age .The tuberculum sella and the posterior wall of the sella turcica stop growing at ages of 18 years in males and 16 years in females.[1-3]

The sella turcica is readily recognized on lateral cephalometric radiographs and routinely traced for cephalometric analysis. This makes it a good source of additional diagnostic information related to pathology of the hypophysis, or to various syndromes that affect the craniofacial region.[4] Sella turcica is an important structure in radiographic analysis of the neurocranial and craniofacial complex. Sella point, which is located at the center of sella turcica is one of the most commonly used landmarks in cephalometric analysis. This landmark is located within the craniofacial region and is used to measure the length of anterior cranial base and assessment of the anteroposterior positions of maxilla and mandible in relation to the cranium. The benefits gained from studying this structure ranges from assisting the orthodontist during diagnosis, as a tool to study growth in an individual through superimposition of structures on a longitudinal basis and during evaluation of orthodontic treatment results. Since sella area is an important region, and its size may vary from individual to individual, establishing normal standards will aid in the process of eliminating any abnormality in the size or shape of sella turcica. Clinicians should be familiar with the normal radiographic anatomy and morphologic variability of this area, in order to recognize and investigate deviations that may reflect pathological situations, even before these become clinically apparent. Normative data on the size of the sella turcica have been reported in the literature by various studies and typically range from 4 to 12 mm for the vertical and 5 to 16 mm for the antero-posterior dimensions. Changes in size of the sella turcica are frequently related to pathology; enlargement being the most frequent finding.[5-10]

Since there is an increasing interest in the study of human craniofacial dysmorphology, it is essential to establish the cephalometric norms for normal growth and development of sella.

Normal standards are essential for describing the abnormal morphology in several craniofacial aberrations and syndromes.[11-12] The purpose of this study was to measure the size of the sella turcica and to establish normative reference standards of sella size in subjects with class I and class II skeletal pattern.

Material And Methods

Standardized Lateral cephalometric radiographs of 80 patients aged 19 to 27 years were used in the study. Individuals with major illness were excluded from the study.

Only radiographs of good quality, depicting a reference ruler on the cephalostat for exact measurement of the

magnification factors, were included. All the radiographs were taken with the same cephalostat by a single operator.. Based on ANB angle, subjects were classified equally into skeletal Class I and Class II . Subjects with ANB angle of $\pm 2^0$ belonged to Class I skeletal base while those with Angle $\geq 4^0$ belonged to Class II skeletal base. In addition to overcome the limitations of ANB angle, wits analysis was used. Cephalometric tracing of Sella Turcica*:* Each lateral cephalogram was traced using an acetate paper under optical illumination. The outline of the sella turcica which consisted of the tuberculum sella, floor , dorsum sella , anterior and posterior clinoid processes was drawn. The linear dimensions were measured according to method given by Silverman and Kisling.[9] All the reference points used in this study were in the midsagittal plane and measurements were made with digital sliding callipers. The length was measured as a linear distance from tuberculum sella (TS) to the tip of the dorsum sella (DS) . The depth was measured as a perpendicular distance from the line above(DS-TS) to the deepest point on the floor. The anteroposterior diameter of sella is measured as a line drawn from the tuberculum sella to the furthest point on the posterior inner wall of the fossa. (Fig.1)
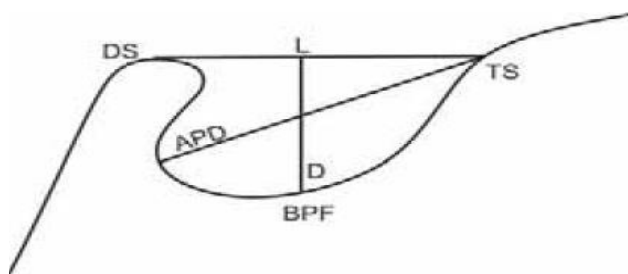

Fig.: Length (L), depth (D), and anteroposterior diameter (APD) of sella turcica

To calculate the error of the method, 20 radiographs were randomly selected and re-evauated. Paired t -tests were employed to evaluate the systematic error. Random error was calculated using the method of Houston (1983).

Statistical Analysis: A student t test was used to calculate the mean differences in linear dimensions of sella turcica and to find out the relationship between skeletal type and size of the sella turcica at a significance level of 0.05. (Table 1)

Results

 No systematic error was detected between duplicate measurements of the conventional variables. Differences between duplicate measurements (in absolute values) ranged from 0 to 0.7 mm for the linear measurements .The coefficient of reliability ranged from 95.8 to 98.5 per cent. The random error (Houston, 1983) ; the square root of half of the variance of the difference between duplicate measurements), ranged from 0.17 to 0.24 mm. Student t test was done to determine if there was any difference in linear dimensions among Class I and Class II skeletal pattern, irrespective of age and gender. Mean length of sella turcica in Class I and Class II patients was 7.60mm and 7.80mm respectively. Mean diameter was found to be 6.95 mm in class I patients and 7.2mm in class II patients. Both the length and diameter showed no significant differences in the two groups. A statistically significant difference was noted among skeletal class and depth of the sella turcica.(p=.006). Mean Depth was found to be 9.97mm in Class I patients as compared to 9.02 mm in Class II patients. (Table.1)

Length	Class 1	40	7.6000 mm	.592
	Class 2	40	7.8000 mm	(non significant)
Diameter	Class 1	40	6.9500 mm	.519
	Class 2	40	7.2000 mm	(non significant)
Depth	Class 1	40	9.9750 mm	.006
	Class 2	40	9.0250 mm	(significant)

Table 1: T- test Comparing the size of Sella Turcica in Different Skeletal types.

Discussion

Various studies have already been reported in the literature regarding the size of sella turcica . When the linear dimension of length, depth and diameter of the sella turcica in the present study were compared to the previous studies a difference between the measurement was noted. This can be attributed to various factors like the cephalometric techniques, magnification errors, measurement methods , race or ethnicity of the subjects etc.

Camp[13] in 1924 conducted a study on adults. He found that average width of sella turtica (termed as length "l" in our study) was being 10.6mm as compared to 7.6mm in our study while average height (depth"d" in our study) was 8.1 mm compared to 6.9 mm in our study.

Quakinine and Hardy[14] studied upon 250 sphenoidal block obtained from the cadavers of different ages. They found that average transverse width (L) of the sella turcica was 12mm, average length (APD) 8mm, and the average height (D) 6mm. When compared to the current study, the average length was about 5mm smaller while the average depth was 4mm smaller in our study. Quakinine and Hardy added that when measuring the size of sella turcica the height of the gland was usually 2mm shorter than the depth of sella turcica.(i.e. the gland does not fill the whole volume of the sella turcica).

Axelsson et al[15,16] studied the size of sella turcica in a Norwegian sample longitudinally between the ages of 6 to 21 years. His findings showed that the length was constant throughout the observation period whereas the depth and diameter increased with age. He also found that there was no significant difference in depth and diameter between males and females while the length was larger in males. On comparing our result with norwegian sample, the difference in linear dimensions

was between 0.3 and 1.1 mm. Comparison of the study done by Alkofide[1] in Saudi subjects shows that the linear dimensions in the Indian population sample were on average 1.2 to 2.9 mm smaller than those of Saudi subjects. Shah et al[17] studied the size and shape of sella turcica among patient above 15 years of age from Islamabad and reported that mean length and anteroposterior diameter in females was 11.3 and 14mm and in males it was 11.4 mm and 13.8 mm respectively. The mean depth in both the genders was 9.9 mm. The authors concluded that there was no statistically significant difference among all linear measurement in both genders and in different skeletal patterns . Filipovic et al[18] analyzed the size of sella turcica in 90 Nigerian subjects with various skeletal malocclusions between the age group 18 to 22 and found that the length ,width and anteroposterior diameter was 9.2,8.3,10.9 mm repectively. The author also concluded that the size was smaller in class II malocclusion and larger in class III malocclusions and there was no difference between two sexes. Comparison of the size with our study population showed that the lengths were similar and diameter was larger in Nigerian subjects. The probable reason for these differences in the values can be attributed to ethnicity or in the method of measurement.

Alkofide found that the sella size was smaller in skeletal class II subjects and larger in skeletal class III subjects

In the present study both the length and diameter showed no significant differences in the two groups. However, a statistically significant difference was noted among the skeletal class and depth of the sella turcica. Depth was found to be more in Class I patients as compared Class II patients. Further research is required to explore the factors responsible for differences in the depth of sella turcica found in the two groups.

Further, the linear dimension obtained from this study can be used to estimate the size of pituitary gland. It can also help the clinician when confronted with an abnormally large sella area on lateral cephalogram. The orthodontist should also be familiar with the different shapes of sella turcica, to help in differentiation and distinguishing pathology from the normal development patterns.

Conclusion

There was no significant difference in the length and diameter of sella turcica in Class I and Class II subjects. The mean depth of sella turcica in Class I and Class II subjects showed statistically significant difference.

Results of the study can be used as a reference standards for studying sella turcica size in North Indian subjects.

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