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Evaluation of the Size of Sella Tursica in Skeletal Class II Patients In South Indian Population- A Cephalometric Study

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Abstract

Aim: To evaluate the size of sella turcica in skeletal class 1, class II div I and class II div II in Chennai population.

Materials and Methods: 45 lateral cephalograms of skeleltal class I, class II div I and div II were taken for the study. The length, width and depth of sella were measured using the methods of Silveman and Kisling. The data was entered in SPSS software and an independent t test was done to find the correlation between the two skeletal types.

Results: The results showed that there was no significant difference in the length, width and depth of sella turcica among skeletal class II Div I and Div II. There was a significant difference only in the depth of sella turcica between skeletal class I and skeletal class II div I.

Keywords: Sella turcica, skeletal types, lateral cephalogram, pituitary fossa

Introduction

Several landmarks within the cranium have been determined to act as reference points when tracing cephalometric radiographs. These landmarks are used to measure positions of structures (such as the maxilla or mandible) in relation to the cranium, or to themselves. The benefits gained from studying these structures range 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.

One of the most commonly used cranial landmarks for cephalometric tracing is sella point. This point is located in the centre of the sella turcica, with the turcica housing the pituitary gland in the cranial base. Any abnormality or pathology in the gland could manifest from an altered shape of the sella turcica, to a disturbance in the regulation of secretion of glandular hormones; prolactin, growth hormones, thyroid-stimulating hormone, follicular stimulating hormone(1). These disturbances can in turn lead to growth problems such as acromegaly or gigantism, Cushing's disease, hyperthyroidism, amenorrhea and galactorrhea and menstrual disturbances.

Several studies conducted on the shape of sella turcica have concluded that the morphological appearance of the sella turcica is established in the early embryonic structure. Profile radiographs of 16 children born with myelomeningocele revealed an altered shape of sella present during foetal life(2). In children with fragile X and Down syndrome, a change of sella shape was evident pre-natally and continued post-natally(3).

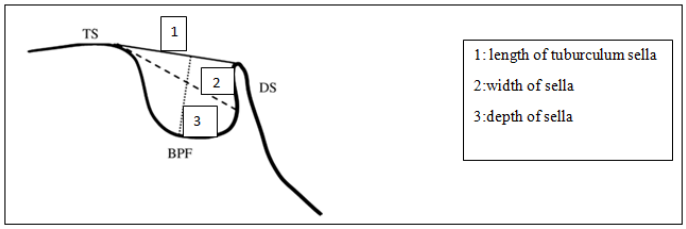
The enlarged sella turcica on a radiograph has been found to be associated with adenomas, meningioma, primary hypothyroidism, prolactinoma, gigantism, acromegaly, empty Sella syndrome, and Nelson syndrome. A small size may lead to decreased pituitary function causing symptoms such as short stature and retarded skeletal growth(4).

Axelsson *et al*.studied the size of Norwegian males and females longitudinally from 6 to 21 years of age with normal facial appearance and normal occlusion. The depth and diameter in males and females were similar but the length was larger in males(5).

Data on the size of the sella turcica have been well-reported in the literature. The size of sella turcica assessed from radiographs can be either linear or by volumetric methods with the help of CT or other 3D radiographic methods. It typically ranges from 4 to 12 mm for the vertical and from 5 to 16 mm for the anteroposterior dimension. The variations between various measurements are probably due to the use of different landmarks, radiographic techniques, and degree of radiographic enlargement(6). Elster *et al*. in a magnetic resonance imaging study of 169 patients aged 1-30 years, found that there was no difference in the size between males and females in childhood and dramatic change occurs at puberty with swelling of the gland. Pituitary gland was 7-10 mm in females while in males it was 7 mm, both being larger than in childhood or young adult hood. They also concluded that young adults had slightly but significantly smaller glands than adolescents of the same gender. The dimensional changes in the sella turcica had a significant positive linear trend to length, depth, and diameter until 25 years of age(7).

Materials And Methods

45 lateral cephalogram of class I and class II division I and class II div II of age in the range of 16-30 years were taken for the study. The sella turcica on each cephalometric radiograph was traced on thin acetate paper under optimal illumination by the author. The linear dimensions of sella turcica were measured using the methods of Silverman (1957) and Kisling (1966). All reference lines used in the current study were located in the midsaggital plane. The length of sella turcica was measured as the distance from the tuberculum sella to the tip of the dorsum sellae. The depth of the sella turcica was measured as a perpendicular from the line above to the deepest point on the floor. A line was also drawn from the tuberculum sella to the furthest point on the posterior inner wall of the fossa. This was considered as the antero-posterior diameter of sella turcica.



Statistical Analysis

Change to Anova

All the data were entered into SPSS software. To study the relationship between skeletal class II div I and div II and sella turcica size, an independent t test was done. Also an independent t test was done to determine the relation between the size of sella and skeletal class 1 and class II.

Results

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Tuberculum Sellae	Equal variances assumed	13.829	.001	-.719	40	.476	-.42857	.59590	-1.63294	.77580
	Equal variances not assumed			-.719	31.261	.477	-.42857	.59590	-1.64352	.78637

Independent t test between length of tuburculum sella and skeletal div I and div ii

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
width	Equal variances assumed	6.296	.016	.628	40	.534	.23810	.37916	-.52822	1.00441
	Equal variances not assumed			.628	30.411	.535	.23810	.37916	-.53582	1.01201

Independent t test for width of tuburculum sella between div 1 and div 2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
depth	Equal variances assumed	7.867	.008	-2.890	40	.006	-.952	.330	-1.618	-.286
	Equal variances not assumed			-2.890	33.396	.007	-.952	.330	-1.623	-.282

Independent t test for the depth of tuburclum sella between div 1 and div 2.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
tuburculum sellae	Equal variances assumed	10.514	.002	-1.558	40	.127	-.95238	.61131	-2.18788	.28312
	Equal variances not assumed			-1.558	33.197	.129	-.95238	.61131	-2.19581	.29105

Independent t test for the length of tuburculum sella between class 1 and class 2 div1

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
width	Equal variances assumed	3.784	.059	-.713	40	.480	-.28571	.40068	-1.09552	.52409
	Equal variances not assumed			-.713	34.523	.481	-.28571	.40068	-1.09954	.52811

Independent t test for the width of sella in class 1 and class 2 div 1

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
depth	Equal variances assumed	.000	.983	-3.364	40	.002	-1.38095	.41046	-2.21053	-.55137
	Equal variances not assumed			-3.364	39.812	.002	-1.38095	.41046	-2.21065	-.55125

Independent t test for the depth of sella in class 1 and class 2 div 1

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
tuburculum sella	Equal variances assumed	.102	.751	-1.215	40	.232	-.52381	.43121	-1.39532	.34770
	Equal variances not assumed			-1.215	39.604	.232	-.52381	.43121	-1.39559	.34797

Independent t test for the length of tuburculum sella in class 1 and class 2 div 2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
width	Equal variances assumed	.173	.680	-1.854	40	.071	-.52381	.28252	-1.09481	.04719
	Equal variances not assumed			-1.854	38.307	.071	-.52381	.28252	-1.09559	.04798

Independent t test for the width of sella in class 1 and class 2 div 2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
depth	Equal variances assumed	5.734	.021	-1.236	40	.224	-.42857	.34667	-1.12922	.27208
	Equal variances not assumed			-1.236	32.048	.225	-.42857	.34667	-1.13468	.27753

Independent t test for the depth of sella in class 1 and class 2 div 2

Discussion

Tetradis and Kantor conducted a study in 1999 with sample of 325 orthodontic patients in which 134 patients were males and 191 were female patients, varying from 6 to 49 years with mean age of 14.8 years. They measured linear dimensions of sella turcica on the lateral cephalogram, the anteroposterior diameter ranged from 6.0 to 17.0 mm, mean value was found to be 10.9 ± 1.8 mm, while the depth varied from 2.5 to 12.5 mm with a mean of 7.6 ± 1.7 mm(8). Among a sample of 325 routine orthodontic patients there were 431 noteworthy incidental radiographic findings, an average of 1.3 findings per patient.

The sella turcica is formed at the most cranial extent of the notochord, and deviations in all cranial fields are believed to be associated with deviations in the sella turcica as well. The pituitary gland begins to develop before the formation of the surrounding sella turcica. This relationship implies the existence of mechanical coordination in the growth of the pituitary gland alongside its enclosing skeletal compartment and may cause variations in the size of the gland, which are reflected in the shape and size of the sella turcica(9). The size of sella turcica was studied by Axelsson et al. in a Norwegian sample longitudinally between the ages of 6 and 21 years. His study results found that the length was almost constant throughout the observation period whereas the depth and diameter increased with age(5). Study done by Axelsson et al. also revealed that there was significant difference in the length of sella turcica in gender which was more in males compared to females, whereas there is no difference in depth and anteroposterior diameter(5).

In the present study, there was no significant difference in all three dimensions in males and females. This result is correlating with studies done by Yassir et al. 2010 in Iraq population, Shah et al. 2011 in Pakistan population, Chavan et al. 2012 in Maharashtra population, Osunwoke et al. 2014 in Nigerian population.

Argyropoulou et al conducted a retrospective MRI study, which revealed that an age-related increase in the size of the sella turcica is probable because its contents (pituitary gland) increase with age(10). Alkofide divided radiographs into 2 groups according to age: 10–14 years and ≥15 years. They found a significant increase in length, depth, and diameter in both non-cleft and cleft subjects(11). This study did not take into account any subjects with developmental defects such as cleft lip and/or palate.

Few studies have compared the skeletal type of individuals with their sella turcica size to determine if a

relationship exists. Preston (12) divided cephalometric radiographs of subjects into three groups according to age 5–9, 10–14, and 15–17 years, and according to their skeletal/facial type: Class I, Class II, and Class III. His findings showed no statistically significant correlation between facial type and the mean sella area of the pituitary fossa. In the present study a significant relation was found in the depth of sella between skeletal class I and skeletal class II div I. An increased depth was seen more common in skeletal class I than skeletal class II div I.

Sathyanarayana(13) concluded that the linear dimensions of the sella turcica in southern Indian populations have a tendency to increase with age in the period of 9–27 years, but only with reference to gender and skeletal type. In the overall assessment, the diameter and depth of the sella turcica constantly increased with age(14). Subhadra Devi also investigated the Indian population between the ages of 11 years and 70 years and detected significant correlation in depth changes, but only with reference to gender(15) which corresponed to the present study.

The linear dimensions obtained from the current study can be used to approximate the size of the pituitary gland, and may aid the clinician when confronted with an abnormally large sella area on lateral cephalograms. The orthodontist should also be familiar with the different shapes of the sella area, in order to help distinguish pathology from normal developmental patterns.

Conclusion

- There is no significant correlation between the various linear dimension measured between skeletal class II div I and class II div II.
- There was a significant difference in the depth of sella turcica between skeletal class 1 and skeletal class II div I

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