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The Comparative Study of Size of Sella Turcica in Different Skeletal Types In Local Population – An *in Vitro* Study

KEYWORDS: sella turcica, neural crestal cells, lateral cephalogram, pituitary gland

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ABSTRACT *One of the most commonly used landmarks of cephalometric tracing is sella point. Any abnormality or pathology of gland could manifest from altered shape of sella turcica, to disturbance in regulation of secretion of glandular hormones. Therefore, the purpose of this study is to analyze the morphological shape and to measure the linear dimensions of sella turcica to determine if differences exist with different skeletal patterns. The radiographs are distributed according to skeletal class and gender; 30 cases of each class-1, class-2 and class-3 were collected with an equal distribution between males and females in each class (15- males and 15- females). The sella turcica on each cephalometric radiograph was traced on thin acetate paper under optimal illumination to find out length, depth and diameter of sella turcica. We observed that there is no significant difference between the three skeletal types with respect to the length and the depth. We noticed that there is a significant difference in diameter between Class I and Class III; an increase in diameter size appears to be more common in Class III subjects, while a reduced diameter size is more prevalent in Class I individuals.*

INTRODUCTION:
Several landmarks in the cranium have been determined to act as reference points when tracing cephalometric radiographs. These landmarks used to measure position of structures such as maxilla or mandible in relation to cranium or to themselves.

One of the most commonly used landmarks of cephalometric tracing is sella point. This point is located in the center of sella turcica, with the turcica housing pituitary gland in cranial base. This gland lies within pituitary fossa. Any abnormality or pathology of gland could manifest from altered shape of sella turcica, to disturbance in regulation of secretion of glandular hormones. Abnormal sella turcica may in fact have an undetected underlying disease.[1]

Therefore, the purpose of this study is to analyze the morphological shape and to measure the linear dimensions of sella turcica to determine if differences exist with different skeletal patterns. The linear dimensions obtained from study can be used to approximate the size of pituitary gland, and may aid clinician when confronted with abnormally large sella area on lateral cephalogram. The orthodontist should also be familiar with the sella area, in order to help distinguish pathology from normal developmental pattern.

OBJECTIVES:
1. To measure linear dimensions of sella turcica in local population to determine if differences exist due to different skeletal patterns

MATERIALS AND METHOD:
Source of data:
The cephalometric radiographs of 90 patients of local population in Maharashtra (45 males and 45 females) aged 10-30 years used in this study and distributed according to 30 class-1, 30 class-2 and 30 class-3.

Method of collection of data:
Armamentarium:
1. High quality radiographs which are taken by trained radiographic technician in a standardized manner with clearest reproduction of sella turcica area
2. Acetate paper
3. Graph paper marked in square millimeters
4. Boley guage by GAC international
5. 0.3 mm lead pencil (staedtler)

Inclusion criteria:
1. Indigenous subjects of Maharashtra origin aged 10-30 years
2. High quality radiographs taken by trained radiographic technicians in a standardized manner with clearest reproduction of sella turcica area

Exclusion criteria:
1. Individuals with major illness or medical conditions
2. Low quality radiographs with blurred sella turcica area

The radiographs are distributed according to skeletal class and gender; 30-class-1, 30-class-2, 30-class-3 cases are collected with an equal distribution between males and females in each class (15- males and 15- females). The sella turcica on each cephalometric radiograph was traced on thin acetate paper under optimal illumination. This tracing was superimposed on graph paper marked in square millimeters to calculate the sella area and measurements are made to the nearest point 1mm. The configuration of the sella turcica, which consisted of the tuberculum sella, the sella turcica floor, the dorsum sellae and both anterior and posterior clinoid processes was drawn. The linear dimensions of sella turcica were measured using the methods of Silverman (1957)[2] and Kisling (1966)[3] . 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

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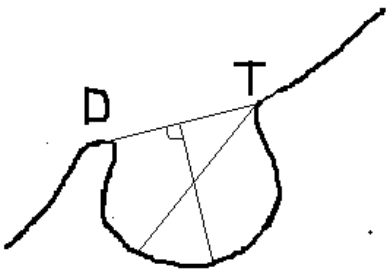
to the furthest point on the posterior inner wall of the fossa. This was considered as the antero-posterior diameter of sella turcica

(Figure 1) (T- Tuberculum sella, D- dorsum sella)



The linear dimensions of sella turcica are measured using all reference lines located in mid saggital plane, in order to reduce error due to inter operator variability, 20 lateral cephalometric radiographs chosen at random and retraced after interval of three weeks under identical conditions by both orthodontist and radiologist. The one way random effect analysis of variance (ANOVA) model is used to extract estimate of variance component. The ICC (intra class correlation coefficient) is used in this study to evaluate reproducibility of readings.

RESULTS:

Comparison of length in Class 1, Class 2 and Class 3 Skeletal types: (Table:1)

We used ANOVA to compare the length recorded in the three skeletal types. We observed that there is no significant difference between the three skeletal types with respect to the length (P>0.05).

Comparison of depth in Class 1, Class 2 and Class 3 Skeletal types: (Table:2)

We observed that there is no significant difference between the three skeletal types with respect to the depth (P>0.05).

Comparison of diameter in Class 1, Class 2 and Class 3 Skeletal types: (Table:3)

We observed that there is a significant difference between the three skeletal types with respect to the diameter (P<0.05). In order to find out among which pair of skeletal types there exists a significant difference; we carried-out multiple comparisons (post-hoc) test using Bonferroni method. (Table: 4)

We noticed that there is a significant difference in diameter between Class 1 and Class 3 (P<0.05). But no significant difference is noticed between Class 1 and Class 2 as well as Class 2 and Class 3 (P>0.05).

STATISTICAL ANALYSIS [4,5]

Table: 1 Comparison of length in Class 1, Class 2 and Class 3 Skeletal types:

We use ANOVA to compare the length recorded in the three skeletal types. The results are given below:

Length (mm)	N	Mean	Std Dev	Min	Max	F	P-value
Class 1	8	8.27	2.53	4.90	11.80	0.931	0.410
Class 2	8	9.46	2.03	6.10	13.00		
Class 3	8	10.04	3.26	7.00	15.90		

We observe that there is no significant difference between the three skeletal types with respect to the length (P>0.05).

Table: 2 Comparison of depth in Class 1, Class 2 and Class 3 Skeletal types:

Depth (mm)	N	Mean	Std Dev	Min	Max	F	P-value
Class 1	8	7.98	1.30	6.00	10.35	0.237	0.791
Class 2	8	7.75	1.18	5.80	9.35		
Class 3	8	8.34	2.45	5.70	13.55		

We observed that there is no significant difference between the three skeletal types with respect to the depth (P>0.05).

Table: 3 Comparison of diameter in Class 1, Class 2 and Class 3 Skeletal types:

Diameter (mm)	N	Mean	Std Dev	Min	Max	F	P-value
Class 1	8	11.18	1.34	9.75	13.50	5.366	0.013*
Class 2	8	11.83	1.32	10.30	13.90		
Class 3	8	14.24	2.84	11.55	20.20		

*** denotes a significant difference**

Table: 4

Multiple Comparisons

Dependent Variable: Diameter (mm)
Bonferroni

(I) Skeletal type	(J) Skeletal type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Class 1	Class 2	-.65000	.98291	1.000	-3.2069	1.9069
	Class 3	-3.05625*	.98291	.016	-5.6131	-.4994
Class 2	Class 1	.65000	.98291	1.000	-1.9069	3.2069
	Class 3	-2.40625	.98291	.070	-4.9631	.1506
Class 3	Class 1	3.05625*	.98291	.016	.4994	5.6131
	Class 2	2.40625	.98291	.070	-.1506	4.9631

*. The mean difference is significant at the .05 level.

We noticed that there is a significant difference in diameter between Class 1 and Class 3 (P<0.05). But no significant difference is notice between Class 1 and Class 2 as well as Class 2 and Class 3 (P>0.05).

DISCUSSION:

The prenatal formation and postnatal development of the sella turcica and the pituitary gland are complex processes. The two structures are located in a boundary region, separating tissues of different origin and development. The anterior part believed to develop mainly from neural crest cells that are not directly dependent upon the notochord, while the posterior part develop from paraxial mesoderm, which is closely related to notochordal induction.[6,7,8,9,10]

The measurement of sella turcica and appraisal of its morphology are valuable in assessment of pathology in the pituitary gland. Studies of sella turcica size on radiographs have been based either on linear , various methods of area and volume measurements.[11,12,13,14,15,16]

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This prospective study describes linear dimensions of the sella turcica in local population

with different skeletal types.Few studies have compared the skeletal type of individuals with their sella turcica size to determine if a relationship exists. Preston (1979) 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. However, contrary to the current study in which linear dimensions were used, the mean sella area was measured by Preston (1979) [17]. In the study done byEman A. Alkofide when skeletal type and linear dimensions of sella turcica were evaluated in saudi subjects; a significant difference was found. When comparing skeletal Class II and Class III subjects, a significant difference was observed between the diameter of the sella turcica in both Classes. An increase in diameter size appears to be more common in Class III subjects, while a reduced diameter size is more prevalent in Class II individuals[1]. While in current study we observed that that there is no significant difference between the three skeletal types with respect to the length and the depth; but there is a significant difference in diameter between Class I and Class III . An increase in diameter size appears to be more common in Class III subjects, while a reduced diameter size is more prevalent in Class I individuals.

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:

We observed that there is no significant difference between the three skeletal types with respect to the length and the depth. We noticed that there is a significant difference in diameter between Class I and Class III; but no significant difference is noticed between Class I and Class II as well as Class II and Class III. An increase in diameter size appears to be more common in Class III subjects, while a reduced diameter size is more prevalent in Class I individuals.

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