

ASSESSMENT AND COMPARISON OF DIMENSIONS OF SELLA TURCICA IN SKELETAL CLASS I & SKELETAL CLASS II CASES

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ABSTRACT

The aim of this study was to assess and compare the dimensions of Sella Turcica in 90 subjects grouped as Group A (Skeletal Class I: ANB 0-4°, Wits value -1 to 0.5 mm)^{1,4} and Group B (Skeletal Class II: ANB >4°, Wits value >0.5 mm) aged 14-30 years each having 45 subjects. For Group A Width (W) of Sella Turcica¹⁰ is found to be 15.33 mm + 2.77 S.D, Depth (D) 6.43 mm + 1.45 S.D, Area (A) 66.05 mm² + 9.2 S.D, Specific Dimension (SDim) 99.5 mm² + 27.7 S.D and Interclinoid Distance (I) as 5.55 + 2.12 S.D while for Group B Width (W) of Sella Turcica is found to be 14.55 mm + 2.16 S.D, Depth (D) 6.45 mm + 0.9 S.D, Area (A) 60.35 mm² + 7.96 S.D, Specific Dimension (SDim) 94.4 mm² + 21.56 S.D and Interclinoid Distance (I) as 4.85 mm + 0.93 S.D. When two groups were compared for Sellar Dimensions, Width, Area and Interclinoid Distance showed statistically significant difference between the Skeletal Class II and Skeletal Class I subjects (P < 0.05) while Vertical Depth & Specific Dimension showed statistically insignificant difference (P > 0.05). Moreover these findings appear to indicate the greater likelihood of Sella Turcica bridging in Skeletal Class II patients.

Key words: Sella Turcica, Sellar Dimensions, ANB Angle, Wit's Value

INTRODUCTION

The Sella Turcica is an important anatomical structure for cephalometric assessment as it is used with Nasion as a reference plane (SN Plane) in various cephalometric analyses¹⁻⁵. The anterior wall of Sella Turcica and the cribriform plate (laminar cribrosa) remain unchanged after age 5 years which means that no further growth or remodeling will affect these areas of the cranial base by the time the first permanent tooth erupts^{6,7}. SN Plane is thus considered to be a fixed horizontal reference plane though it is being criticized for its orientation and there can be change in the spatial position of the nasion either in the vertical or anteroposterior direction or both⁸⁻⁹. Position, shape and size of Sella Turcica might effect the cephalometric assessment as well but needs to be worked upon extensively¹⁰

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 ante-

rior and two posterior clinoid processes project over the pituitary fossa. 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 sellae¹¹. Sella turcica size varies from 5 to 16 mm in anteroposterior diameter and from 4 to 16 mm in vertical depth^{12,13}, with accepted normal maximum dimensions of 16 mm in anteroposterior dimension and 12 mm in depth¹⁴. Normal sella turcica volume has been stated to be 133 mm³.

According to some authors, the area of the sella turcica can be determined simply by multiplying the length by the depth. Normal sellar area has been stated to be 130 mm² at a 28-inch anode-to-film distance¹⁵. It has been stated that sellar volume is a more reliable indicator of sellar size than merely measuring the height and width¹⁶.

Anatomically Sella Turcica has been classified into three types - round, oval or flat¹⁷. An important structure to evaluate when inspecting the sella is the floor.

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The floor of the sella is usually visible as a single cortical line. On occasion, however, a so-called double floor may be seen. Such an appearance may be a variation of normal, the appearance being brought about by a depression of the central part of the sella, by asymmetrical development of the floor or by asymmetrical sphenoid sinuses." The sphenoid sinuses may pneumatize dorsum sellae, creating a variation of normal in which the posterior clinoids are typically small.¹⁸ The carotid groove, produced by the internal carotid artery, where it lies adjacent to the medial wall of the cavernous sinus, may also be the cause of a false or pseudo double floor. On the other hand, a double floor, thinning or ballooning of the floor, or erosion of the lamina dura or dorsum sellae may indicate pathologic lesion, particularly in patients with significant signs or symptoms.¹⁸⁻²² Variations in the size and shape of the clinoid processes are also common. The anterior clinoid processes are larger and more variable. They may be short blunt structures or may project over the pituitary fossa, occasionally uniting (Bridging). Bridging can be of two types; Type A & Type B. Type A features ribbonlike fusion, and type B is represented by bony extension of the anterior or posterior clinoid process such that they meet or superimpose across the pituitary fossa²³. So variations do exist and need to be explored^{17,24}. Variation in the shape, size and form may be associated with different Cranio-facial syndromes^{25,28} however variations have also been associated with different Skeletal Patterns.

Aim of this study was to assess the dimensions of Sella Turcica in Skeletal Class I cases and to compare it with Skeletal Class II patients. This will identify any correlation between the Sellar dimensions and Skeletal Class II patterns there by helping in identifying etiology and thus proper diagnosis & treatment planning.

Purpose of this study was:

- To establish norms for the dimensions of Sella Turcica for a Pakistani sample
- Compare Sellar dimensions of Skeletal Class I individuals with the Sellar dimension found in Skeletal Class II patients

MATERIALS AND METHODS

A cross sectional descriptive study was conducted on 90 patients (**54 females & 36 males**) aged 14-30 years. Two groups were made. Group A consists of 45 Skeletal Class I subjects (ANB = 0-4° while Wits value is -1 to 0.5 mm) while Group B consists of 45 Skeletal

Class II patients (ANB > 4° and Wits Value > 0.5).

Patients were excluded based on following criteria:

- 1 Skeletal Class III patients
- 2 Patients with cranio-facial syndrome (clefts, Apert's syndrome, Cleido-cranial dysplasia, Pier Robbins syndrome e.t.c)
- 3 Patients with facial asymmetry
- 4 Patients with CO-CR shift
- 5 Patients with High or Low angle vertical patterns
- 6 Patient who are already undergoing with orthodontic treatment

Sample was collected using the non-probability convenience sampling technique.

Lateral Cephalograms were taken in natural head position for each patient and were traced and analyzed. To assess ANB angle, SNA angle & SNB angle were determined while to assess Wits value difference between AO and BO was assessed. Vertical Pattern of the patient was assessed by <SNM (Table 1, Fig 1). Selected patients were then grouped as Group A and Group B based on the criteria already laid down.

The dimensions of the sella turcica were then measured. The area (A), Specific Dimension (Width X Depth), width (W), vertical depth (D), and interclinoid distance (I) were measured (Table 2, Fig 2). Group A was then compared with Group B for each Sellar assessment (Table 3). Milimetric paper was used to assess the Area of Sella Turcica which is the pituitary fossa enclosed by line W. Width of Sella is determined from superior aspect of dorsum sellae to superior aspect of tuberculum sellae. Depth is determined as greatest measurement perpendicular from line W to base of pituitary fossa. Interclinoid distance is the shortest distance between the clinoid processes.

STATISTICAL METHOD

SPSS 10.0 was used for statistical evaluation.

- 1 Mean, Standard Deviation, Minimum & Maximum value and Range were calculated for each subject.
- 2 Two sample t-tests was used to compare mean sella turcica dimensions between the two groups.
- 3 Paired t test was used to assess method error by retracing 20 Cephalograms and comparing original values with retraced values.

TABLE 1
GROUP A

	N	Range	Minimum	Maximum	Mean		Std
	Statistic	Statistic	Statistic	Statistic	Statistic	Std Error	Statistic
SNA	45	12.00	77.00	89.00	82.0000	.4132	2.7716
SNB	45	12.50	74.50	87.00	79.2667	.4025	2.7002
ANB	45	4.00	00	4.00	2.7333	.1781	1.1947
WIT	45	1.50	-1.00	0.50	1556	.1270	8516
SNM	45	1.00	26.00	36.00	29.4222	.3950	2.6499

GROUP B

	N	Range	Minimum	Maximum	Mean		Std
	Statistic	Statistic	Statistic	Statistic	Statistic	Std Error	Statistic
SNA1	45	16.50	73.50	90.00	83.0000	.5547	3.7209
SNB1	45	17.00	66.00	83.00	76.8889	.5849	3.9238
ANB1	45	5.50	4.50	10.00	6.5556	.2364	1.5855
WIT1	45	6.00	2.00	8.00	3.8222	.2918	1.9574
SNM1	45	8.00	28.00	36.00	32.6000	.3559	2.3875

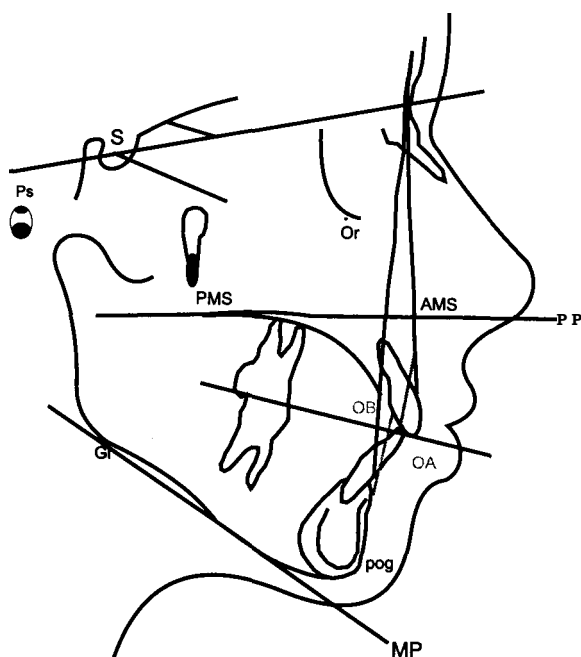


Fig 1

RESULTS

The chronological age range of the sample was 14-30 years, with a mean age of 22.28 years. The sex distribution was 36 males (40%) and 54 females (60%). The mean age of male patients was 22.25 years and mean age of female patients was 22.33 years. Sample

was defined as Group A (Skeletal Class I: ANB 0-4°, Wits Value -1 to 0.5 mm) and Group B (Skeletal Class II: ANB >4°, Wits Value >0.5 mm) each comprising of 45 subjects. Group A consists of 20 males (44%) and 25 (56%) females while Group B includes 16 males (35.5%) and 29 females 64.5%).

Width of Sella Turcica

Mean width of Sella Turcica for Group A was 15.33 mm + 2.77 S.D while the mean width of Sella Turcica for Group B was 14.55 mm + 2.16 S.D. Mean difference between the two groups was 0.833 mm + 2.59 S.D. (P-value 0.049). (Tables 2 & 3, Graph I & II).

Depth of Sella Turcica

Mean depth of Sella Turcica for Group A was 6.43 mm + 1.45 S.D while the mean depth of Sella Turcica for Group B was 6.45 mm + 0.9 S.D. Mean difference between the two groups was insignificant (P-value 0.935). (Tables 2 & 3, Graph I & II).

Inter clinoid Distance

Mean Interclinoid Distance for Group A was 5.55 + 2.12 S.D while the mean Interclinoid Distance for Group B was 4.85 mm + 0.93 S.D. Mean difference between the two groups was 0.7 mm + 2.23 S.D. (P-value 0.048). (Table 2 & 3, Graph I & II).

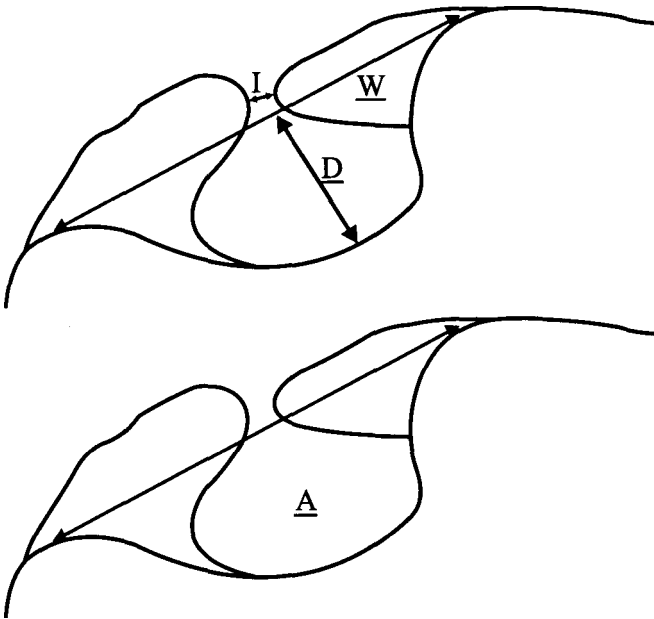
TABLE 2
GROUP A

	N	Range	Minimum	Maximum	Mean		Std
	Statistic	Statistic	Statistic	Statistic	Statistic	Std Error	Statistic
W	45	10.00	10.00	20.00	15.3889	.3093	2.0750
D	45	5.00	4.00	9.00	6.4333	.2159	1.4484
I	45	8.00	1.00	9.00	5.5556	.3175	2.1299
A	45	36.10	53.10	89.20	66.0513	1.3713	9.1988
SDIM	45	94.50	58.50	153.00	99.5000	3.9882	26.7539

GROUP B

	N	Range	Minimum	Maximum	Mean		Std
	Statistic	Statistic	Statistic	Statistic	Statistic	Std Error	Statistic
W1	45	7.00	10.00	17.00	14.5556	.3219	2.1591
D1	45	4.00	5.00	9.00	6.4556	.1337	.8971
I1	45	3.50	3.00	6.50	4.8556	.1382	.9270
SDIM1	45	103.00	50.00	153.00	94.4222	3.2135	21.5567
A1	45	26.90	49.90	76.80	60.3489	1.1870	7.9625

Sellar Dimensions



- W - Width, superior aspect dorsum sellae to superior aspect tuberculum sellae
- D - Depth, greatest measurement perpendicular from line W to base of pituitary fossa
- I - Interclinoid, shortest distance between clinoid processes
- A - Area, pituitary fossa enclosed by line W

Fig 2

Area of Sella Turcica

Mean area of Sella Turcica for group A was 66.05 mm² + 9.2 S.D while the mean area for Group B was 60.35 mm² + 7.96 S.D. Mean difference between the two groups was 5.7 mm² + 12.01 S.D (P-value 0.003). (Tables 2 & 3, Graph I & II).

Specific Dimension of Sella Turcica

Mean Specific Dimension of Sella Turcica for group A was 99.5 mm² + 27.7 S.D while the mean Specific Dimension for Group B was 94.4 mm² + 21.56 S.D. Mean difference between the two groups was 5.07 mm² + 5.37 S.D (P-value 0.3). (Tables 2 & 3, Graph I & II).

Method Error

For each subject, there were no significant differences between the means of the original sella turcica dimensions and the repeated dimensions (P = .069) or between the means of the original and the repeated cephalometric analyses (P = .071).

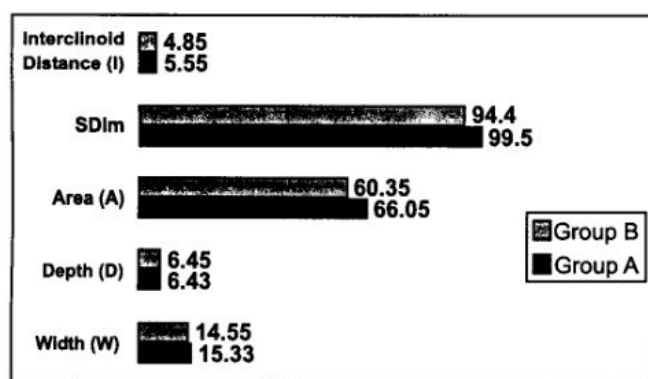
DISCUSSION

This study assessed the dimensions of Sella Turcica in a Pakistani Skeletal Class I sample and compared them with those of the Skeletal Class II patients. The parameters assessed in this study do not appear to have been compared previously for selected groups however attempts have been made to assess the Sellar dimensions individually for different population samples.

TABLE 3

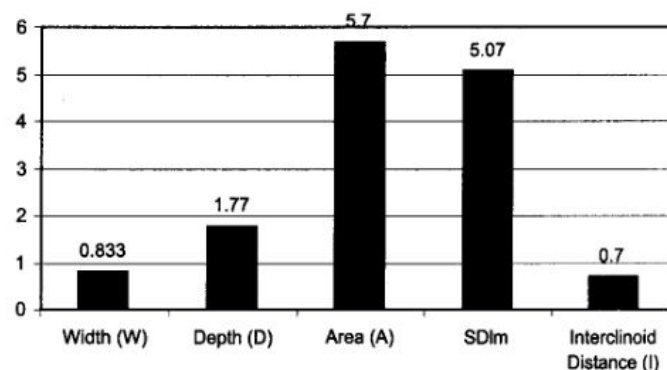
Sella Turcica Dimensions (mm or mm ²)	Group A	Group B	Mean Difference	P-Value	95% Confidence Interval for Mean Difference
Width(W)	15.33+2.77	14.55+2.16	.8333+2.5	0.049	-3.7E-02, 1.7
Depth(D)	6.43+1.45	6.45+0.9	-2.2222E-02+1.8	0.935	-0.57, 0.52
Area(A)	66.05+9.2	60.35+7.96	5.7+12.01	0.003	2.07, 9.3
Specific Dimension (SDim)	99.5+27.7	94.4+21.56	5.07+5.37	0.35	-5.7, 15.9
Interclinoid Distance (I)	5.55 + 2.12	4.85+0.93	.7000+2.23	0.048	6.8E-03, 1.4

Mean Dimensions of Sella Turcica for Group A & Group B



Graph I

Mean Difference of Sella Dimensions between Group A & Group B



Graph II

Teal JS & Weisberg LA in separate studies found that the size of Sella Turcica varies from 5 to 16 mm in anteroposterior diameter and from 4 to 16 mm in vertical depth^{12,13}, with accepted normal maximum dimensions of 16 mm in anteroposterior dimension and 12 mm in depth". Jones R. M et al²⁹ in his study found width of Sella as 10.2+2.3, depth as 8.6+1.4 and area of Sella Turcica as 69.1+16.7. Our study showed that the width of Sella Turcica for a Pakistani sample is 15.33 mm + 2.77 S.D, the vertical depth is 6.43 mm + 1.45 S.D while the area is 66.05 mm²+ 9.2 S.D which are similar to those found in the previous studies.

Jones R. M et al²⁹ in their study also calculated the interclinoid distance and found it to be 3.5+ 2.3 for combined surgical -orthodontic group while 4.1+ 2.4 for group requiring Orthodontics alone. Our study showed that interclinoid distance for Skeletal Class I patients is 5.55 + 2.12 S.D while the mean Interclinoid Distance for Skeletal Class II patients is 4.85 mm + 0.93 S.D. Though different groups were studied in the two studies but statistically the results were comparable

though interclinoid distance is comparatively more in our sample.

Our study was also aimed to compare the dimensions of sella Turcica in the two groups under study. Area (A), Specific Dimension (SDim), Width (W), Depth (D) and Interclinoid distance(I) was calculated for the two groups in an attempt to find whether any statistically significant difference exists between the two groups or not.

Our study demonstrated a statistically significant difference between the interclinoid distance (P<0.05) for the two groups. Interclinoid distance on average was 0.7 mm + 2.23 S.D less in Skeletal Class II patients when compared with those of Skeletal Class I subjects. This also showed that in Skeletal Class II patients the incidence of bridging is comparatively more than in Skeletal Class I patients.

The mean width and depth of Sella Turcica for the two groups was calculated and the study demonstrated statistically significant difference in the mean width

($P < 0.05$) of Sella while mean depth ($P > 0.05$) showed no statistically significant difference between the two groups. Specific dimension was calculated by simply multiplying width with the depth and the results showed a mean difference of $5.0 \text{ mm}^2 + 5.37 \text{ S.D}$ (P -value 0.3) between the groups which is statistically insignificant.

Area of Sella Turcica was also calculated with the mean difference of $5.7 \text{ mm}^2 + 12.01 \text{ S.D}$. (P -value 0.003). Results showed that mean area of Sella is less for Skeletal class II patients when compared with Skeletal I subjects.

Further work based on our study is needed to find any co-relation between the Skeletal class II and the Sellar dimensions.

CONCLUSION

- For Pakistani Population Sample Width (W) of Sella Turcica is $15.33 \text{ mm} + 2.77 \text{ S.D}$, Depth (D) is $6.43 \text{ mm} + 1.45 \text{ S.D}$, Area (A) is $66.05 \text{ mm}^2 + 9.2 \text{ S.D}$, Specific Dimension (SDim) is $99.5 \text{ mm}^2 + 27.7 \text{ S.D}$ and Interclinoid Distance (I) $5.55 + 2.12 \text{ S.D}$
- When two groups were compared for Sellar Dimensions, Width (W) & Area (A) & showed statistically significant difference between the Skeletal Class II and Skeletal Class I subjects while statistically insignificant difference is seen for Depth (D) & Specific Dimension (SDim).
- Statistically significant difference for the interclinoid distance ($P < 0.05$) between the two groups was also noted. Interclinoid distance on average was $0.7 \text{ mm} + 2.23 \text{ S.D}$ less in Skeletal Class II patients when compared with those of Skeletal Class I subjects. This also showed greater incidence of Bridging in Skeletal Class II patients.

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