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RESEARCH ARTICLE

Sella Turcica: An Important Aid in Diagnosis and Treatment Planning

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ABSTRACT

The purpose of this study was to describe and measure the size of sella turcica in subjects with different skeletal types. Lateral cephalometric radiographs of 120 individuals (60 males and 60 females) with an age range of 11 to 26 years were taken and distributed according to skeletal classification: 40 class I (ANB: 20–40), 40 class II (ANB: >40), and 40 class III (ANB: <20). The sella turcica on each radiograph was analyzed and measured to determine the linear dimensions of length, depth, and diameter. Student's t-test was used to calculate differences in linear dimensions, while a one-way analysis of variance was performed to study the relationship between skeletal type and sella size. No significant differences in linear dimensions between genders could be found. When age was evaluated, significant differences were found between the older (15 years or more) and the younger (11–14 years) age groups at the 0.01 and 0.001 levels for length, depth, and diameter. Sella size of the older age group was larger than in the younger age group. When skeletal type was compared with sella size, a significant difference was found in the diameter of sella between the classes II and III subjects ($p < 0.01$). Larger diameter values were present in the skeletal class III subjects, while smaller diameter sizes were apparent in class II subjects (multiple comparison tests). When gender, age, and skeletal type were all compared with the size of the sella (regression analyses), age was significantly related to a change of length ($p < 0.01$) and diameter ($p < 0.001$).

Keywords: Sella turcica, Skeletal class I, Skeletal class II, Skeletal class III.

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INTRODUCTION

Various markers have been reported as reference points while tracing cephalometric radiographs in the cranium[1] and are used for mapping their relative positions mutually or for mapping these prominent structures with reference to the cranium. These studies provide various insights toward orthodontic diagnosis and result evaluations, and could be considered a tool toward studying an individual's growth via longitudinal superimposition of structures. Sella point is one such commonly used cranial landmark located inside the sella turcica (Latin for Turkish saddle); a saddle-shaped depression on the upper surface of the sphenoid bone that hosts the pituitary gland. Located inside the pituitary fossa, the pituitary gland comprises of the anterior lobe, interior lobe, and the posterior lobe,[2] and its functionality depends highly on the shape of the sella turcica.

Any alterations in the shape of the housing could cause an abnormality in the gland and disturb the secretary regulations of glandular hormones. Levels of prolactin and other hormones responsible for stimulating thyroid, growth, and follicles could be affected that could lead to hyperthyroidism, growth problems like acromegaly/gigantism, menstrual disturbances like amenorrhea, galactorrhea, and Cushing's disease among others. Patients with such conditions may have an abnormal sella region as the root cause that could be determined via cephalometric radiographs. Conversely, patients with an abnormal sella region might have some of the mentioned diseases,[3] although undetected.

A connected study performed on Caucasian patients demonstrated that the sella turcica bridging was twice as common in patients with combined surgical-orthodontic treatment, as compared with those with orthodontic treatment only.[4] In continuation, this study conducted on South Asian patients aims at measuring linear dimensions of sella turcica and determining the effect of varied parameters like gender, age, and skeletal patterns.

MATERIALS AND METHODS

This study was conducted on patients seeking orthodontic treatment at Mahatma Gandhi Mission's Dental College and Hospital, Navi Mumbai. This study involved 120 young patients (60 males and 60 females) aged 11 to 26 years. All individuals in this prospective study were void of serious medical conditions or major illnesses, and the collected diagnostic records included the lower and upper study models and their cephalometric radiographs.

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Table 1: Distribution of classes and genders

	Males		Females		
Skeletal class	*10–14 years*	*15–26 years*	*10–14 years*	*15–26 years*	*Total*
I	10	10	10	10	40
II	10	10	10	10	40
III	10	10	10	10	40

All radiographs were obtained using standardized techniques with the same cephalostat by trained radiographic technicians, and only those with the clearest reproduction of the sella turcica area were selected.

The radiographs were segregated according to skeletal class and further subdivided by gender: 40 class I (ANB: 2°–4°), 40 class II (ANB: >4°), and 40 class III (ANB: <2°) cases with an equal distribution of 20 males and 20 females patients comprised each set. The ANB angle (SNA and SNB) used for classifying the patients into skeletal types of class I, II and III is an angle that specifies the skeletal jaw discrepancy, irrespective of the faulty jaw. To overcome the ANB angle limitations and illustrate jaw severity/inconsistency, the Wits analysis was used in this study.

Alternate grouping of the radiographs was done according to age; two groups were formed for prepubertal (10–14 years) and postpubertal (15+ years) patients respectively (Table 1). The age-based grouping was done in accordance with a previous study that claims that the sella turcica morphology remains fairly consistent after 12 years of age;[5] and that the size of sella turcica in younger adult males and females remains almost the same in most conditions.

Cephalometric Tracing of Sella Turcica

Each cephalometric radiograph was traced by the author for mapping sella turcica under optical illumination on thin acetate paper. This traced sella turcica configuration comprised of the tuberculum sella, dorsum sellae, sella turcica floor, and both the anterior and posterior clinoid processes. Superimposition of this tracing on graph paper with square mm marking was done to measure the sella area within an error bar of 0.1 mm, as described previously.[6]

Size of the Sella Turcica

Linear dimensions of sella turcica were measured using methods described by Silverman[6] and Kisling.[7] This study used midsagittal plane as the location for all reference lines, the distance between the tuberculum sella and the tip of dorsum sella was referred to as length of sella turcica, while measurement of its perpendicular to the deepest point at the floor was referred to as depth of sella turcica. The third parameter: Anterioposterior

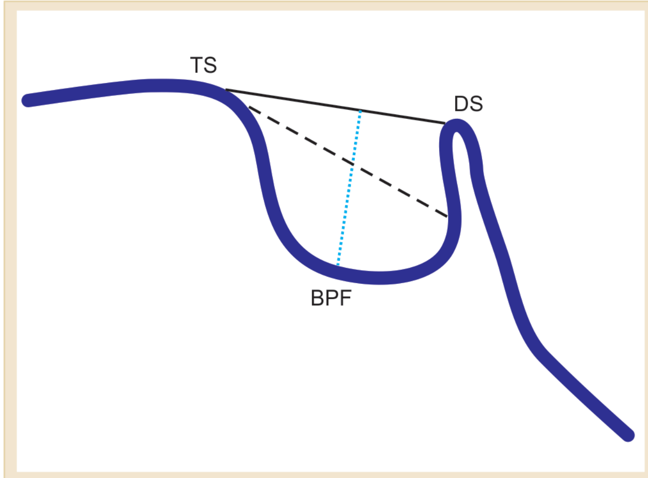

Fig. 1: Morphology and reference lines of normal sella turcica used for sella size measurement: BPF, base of pituitary fossa; DS, dorsum sella; TS, tuberculum sella; black line, length of sella; dashed line, diameter of sella; dotted line, depth of sella

diameter of sella turcica was measured using a line drawn between the tuberculum sella and the furthest point on the posterior inner wall of the fossa. Figure 1 describes these measurements.

Statistical Analysis

Data analysis was done by using Statistical Package for Social Sciences v.13.0 on a Windows machine. The mean difference in the linear dimensions of sella turcica between genders and age-groups was separately calculated using Student's t-test (significance level 0.01). A one-way analysis of variance (ANOVA) test (significance at 0.01 level) was performed to determine to relationship between skeletal type and sella turcica size.

RESULTS

No significant difference in terms of length, depth, or diameter size of was found between male and female patients when comparing linear dimensions of sella turcica between genders (Table 2).

Conversely, significant differences were found between patients of younger and older age-groups at $p < 0.01$ and $p < 0.001$ for all three linear dimensions (Table 3) when compared between age-groups: The sella turcica in the older group was observed to be larger than

Table 2: Sella turcica dimension for females and males (in millimeters)

	Gender	*n*	*Mean*	*Std. dev.*	*Std. error*	*p-value*
Length	Male	60	10.2	2.007	0.21	0.46
	Female	60	11.5	2.628	0.27	
Depth	Male	60	9.1	1.444	0.15	0.78
	Female	60	9.1	1.207	0.12	
Diameter	Male	60	14.5	1.777	0.18	0.84
	Female	60	13.4	2.098	0.22	

Table 3: Sella turcica dimension age (in millimeters)

	Age (years)	*n*	*Mean*	*Std. dev*	*Std. error*	*p-value*
Length	11–14	60	10.3	1.89	0.20	*
	15–26	60	11.3	2.57	0.27	
Depth	11–14	60	8.8	1.25	0.13	*
	15–26	60	9.2	1.36	0.13	
	11–14	60	13.4	1.67	0.18	**
Diameter	15–26	60	14.5	2.00	0.20	

*P < 0.001; **P < 0.001

that in the younger age-group. For further analysis, a one-way ANOVA test was conducted to determine the effect of skeletal pattern on linear dimensions of sella turcica for sample size including all patients irrespective of gender and age; and a significant difference at p < 0.01 was found (Table 4). The diameter of sella turcica showed the mean difference, which appeared larger in class III patients as compared with class II patients.

DISCUSSION

There have been studies comparing the skeletal types with respective size of sella turcica, aimed at identifying a mutual relationship between the two. Also, studies have aimed at establishing relationship between age-group and sella turcica size. One such combined study[8] reports distribution of cephalometric radiographsby age-group (5–9, 10–14, and 15–17 years) and by skeletal type (classes I, II, and III) for observing correlation with sella size. While the present work measures linear dimensions, this reported study used mean sella area as the correlation parameter: With no significant correlation observed between skeletal type and their respective mean sella area. The present work however observed a significant difference in the measured diameter of sella turcica between classes II and III skeletal type individuals: Class III patients were observed to have a diametrically enhanced sella, while a reduction in diameter size was seen in class II individuals.

In line with a previous work[9] reporting no significant correlation between sella shape and gender, this study also found no significant gender difference while establishing a relationship between size of sella turcica and gender of the patients.

CONCLUSION

Age-group was demonstrated to be an important parameter, since a significant difference in the sella size was found between younger (11–14 years) and older (15 years

Table 4: One-way analysis of variance testing the effects of skeletal class on Sella linear dimension (in millimeters)

	Classes	*n*	*Mean*	*SD*	*SE*	*p-value*
Length	I	40	10.7	2.03	0.26	0.09
	II	40	10.4	1.95	0.25	
	III	40	11.4	2.8	0.36	
Depth	I	40	8.9	1.2	0.16	0.2
	II	40	9.0	1.3	0.17	
	III	40	9.3	1.3	0.17	
Diameter	I	40	13.9	1.8	0.23	*
	II	40	13.4	1.6	0.21	
	III	40	14.6	2.0	0.26	

*p < 0.01

above) age-groups for all linear dimensions (length, depth, and diameter); older age-groups had larger sella sizes as compared with younger ones. Age was correlated in a significant manner with the linear and diametric dimensions of sella. When being compared for skeletal type, class II and III types demonstrated a significant difference; with larger diameter values observed for class III and smaller for class II patients. While establishing a relationship between sizes of sella turcica with gender of the patients, no significant gender difference was found.

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