A Cephalometric Study of Sella Turcica: Correlation of Its Size with Different Skeletal Malocclusions

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Abstract

Introduction: The present study was done to determine the size of the sella turcica in different skeletal type subjects and to evaluate if any significant difference exists between them, which could be the basis for early diagnosis.

Materials and methods: A total of 60 lateral cephalograms of patients above 15 years of age were selected and distributed according to skeletal malocclusion into class I ($n = 20$), class II ($n = 20$), and 20 class III ($n = 20$). Syndromic patients (physically/mentally/both) or patients with major illnesses were not included. Two linear measurements of the sella turcica, that is, length and depth in mid-sagittal plane, were obtained in accordance with Silverman and Kisling method. Unpaired t-test and one-way analysis of variance (ANOVA) were performed.

Results: The mean length of sella turcica in class I, class II, and class III subjects was 3.81, 3.37, and 3.9, respectively. Similarly, the mean depth of sella turcica in class I, class II, and class III subjects was 7.6, 6.83, and 9.075, respectively.

Conclusion: No significant difference in length of the sella turcica could be found between different skeletal types. Maximum depth of sella turcica was found to be in subjects with class III and minimum with class II skeletal types.

Clinical significance: The linear dimensions of sella turcica can be used to approximate the pituitary gland size. The pedodontist should be familiar with different morphologies of the sella turcica to differentiate normal from abnormal appearance so that treatment can be diagnosed and treated early.

Keywords: Cephalometrics, Orthopantomogram, Pediatric dentistry, Sella turcica, skeletal malocclusion.

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Introduction

Sella turcica and nasomaxillary complex are related to the fetal neural crest cells. Most commonly and easily recognized well-known anatomical landmark on a lateral cephalogram is sella turcica, which, in turn, is used for diagnosing any pathology related to cranial base. Due to its position, it is used as an additional diagnostic information associated with hypophysis or various affected syndromes associated with cranial base.[1]

A saddle shape depression of sella turcica enclosing pituitary gland is often used as cephalometric key point for evaluation of jaw position as well as their relation to cranial base.[2] Normally, in lateral cephalogram, the shape of sella turcica is U-shaped. Any deviation from the normal may indicate a pathological condition. Large size of pituitary gland may indicate tumor with overproduction of hormones such as adrenocorticotropic hormone (ACTH), thyroid-stimulating hormone (TSH), prolactin, and vasopressin leading to acromegaly or amenorrhea. On the other hand, reduced size may cause decrease in size of pituitary function leading to retarded bone maturation and reduced growth.[3]

Noticing any pathologic condition on a lateral cephalogram is a reminder of the important role that the dentist may play in identifying craniofacial lesions. Therefore, dentist must be acquainted with the common anatomical structures as well as the morphologic diversity in order to recognize any pathological changes indicating a medical condition, even before they become clinically evident.[3,4]

Although many features related to cephalometric radiography have been investigated and discussed but dimension of sella turcica has received little attention. Hence, this study aims to assess and determine the size of the sella turcica in skeletal malocclusion and

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to evaluate if any significant difference exists between them, which could be the basis for early diagnosis.

Materials and Methods

This study was done over 15-year-old patients seeking orthodontic treatment, depicting clear presentation of sella turcica on the lateral cephalogram. Patients with any major illness or syndromic patients (physically/mentally/both) were excluded from the study. A total of 60 lateral cephalograms were selected, and based on

their pattern of malocclusion, they were distributed in groups of 20 subjects each.

Distribution into Skeletal Classes

The skeletal malocclusion was assessed by measuring ANB angle, Wit's appraisal, and β angle. Two out of the three abovementioned parameters confirm the classification of skeletal type for each subject.

Determination of Length and Width of Sella Turcica

Depth and length of sella turcica in mid-sagittal plane were obtained using Silverman and Kisling methods (Fig. 1).[5,6] Depth is measured by drawing a perpendicular line till a point above the deepest point on the floor, whereas length is measured as the distance between the tuberculum sella to the tip of dorsum sella.

Statistical Analysis

Data collected was statistically analyzed using Statistical Package for the Social Sciences (SPSS) software Version 10 (Chicago, Illinois). The quantitative measurements, that is, size (length and depth), mean, and standard deviation were presented. Between skeletal patterns, one-way analysis of variance (ANOVA) and unpaired t-test were performed.

Results

Average mean length of sella turcica in class I (3.81), class II (3.37), and class III (3.9). Similarly, the mean depth of sella turcica in class I (7.6), class II (6.83), and class III (9.075) (Tables 1 and 2).

Taking in consideration the length in all three malocclusions, there was no significant statistical variation ($p = 0.538$) (Tables 3 to 5), while in case of depth, increased and statistically significant results
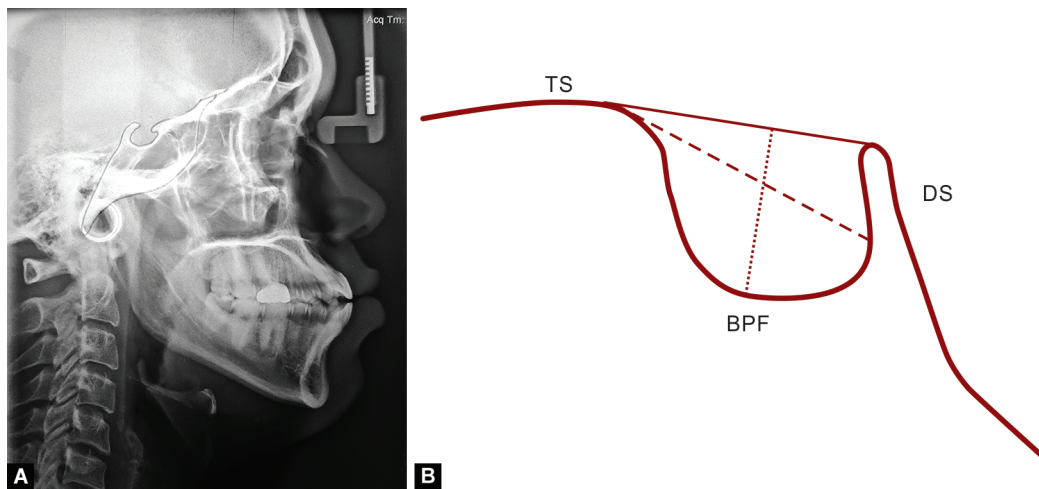
Figs 1A and B: Reference lines used for measuring sella turcica size; black line, length of sella; BPF, Base of pituitary fosssa; dotted line, depth of sella; DS, dorsum sella; TS, tuberculum sellae

Table 1: Linear measurements of sella turcica length

Length	N	Mean	Standard deviation	Minimum	Maximum
Class I	20	3.81	1.894	0.5	7.7
Class II	20	3.37	1.512	1	6.5
Class III	20	3.9	1.353	1.5	6

Table 2: Linear measurements of sella turcica depth

Depth	N	Mean	Standard deviation	Minimum	Maximum
Class I	20	7.6	1.483	5.5	11
Class II	20	6.83	1.588	3.5	9
Class III	20	9.075	2.040	2.5	12

Table 3: Unpaired t-test between skeletal patterns for sella turcica length

	Mean	Standard error of difference	95% confidence interval	T	Degrees of freedom	p-value
Class I and class II	0.363	0.552	−0.755–1.480	0.6575	37	0.5149 (not significant)
Class I and class III	−0.032	0.531	−1.109–1.044	0.0604	37	0.9521 (not significant)
Class II and class III	−0.467	0.462	−1.403–0.469	1.0110	37	0.3186 (not significant)

Table 4: Unpaired *t*-test between skeletal patterns for sella turcica depth

	Mean	Standard error of difference	95% confidence interval	T	Degrees of freedom	p-value
Class I and class II	−0.823	0.495	−1.827–0.181	1.6611	37	0.1051 (not significant)
Class I and class III	−1.658	0.564	−2.802 to −0.514	2.9399	37	0.0057**
Class II and class III	2.413	0.585	0.957–3.330	3.6616	37	0.0008***

**very significant; ***extremely significant

Table 5: One-way ANOVA between skeletal patterns for sella turcica length and depth

		Sum of squares	Degrees of freedom	Mean square	F	p-value
Length	Between skeletal patterns	3.217	2	1.609	0.626	0.538 (not significant)
Depth	Between skeletal patterns	52.057	2	26.028	8.791	0.000***

***extremely significant

were observed for class III patients compared to class I and class II patterns (Tables 4 and 5).

DISCUSSION

Over the past, studies have shown the sella bridging prevalence in different groups of population and correlated with dental malocclusions. As stated by Dasgupta et al., there was a significant result in the occurrence of sella turcica bridging (partial/complete) between subjects with skeletal class II malocclusion.[5] Meyer-Marcotty et al. investigated the morphology and size of the sella turcica and found that skeletal class III subjects exhibited the higher rate of sella turcica bridging in comparison to class I patients. They concluded that sella turcica bridging could be appreciated in skeletal class III subjects.[6]

Very scanty literature is present comparing the skeletal type of malocclusion and size of sella turcica and has evaluated a correlation between them.

A study by Motwani et al.[7] determined whether gender dimorphism was seen in the size and found a significant difference between genders in terms of length of this landmark. This was not in accordance with the study reported by Shah et al.,[8] and Meyer-Marcotty et al.,[6] who found no difference between females and males in terms of sella height, depth, and width of sella turcica. Alkofide[9] concluded that the size of young males and females were almost identical, and no significant difference was found. Therefore, in the present study, we have not considered gender as a parameter. On the other side, Preston, in 1979, classified radiographs of subjects into three different age groups and also according to malocclusion pattern. They concluded that there was no correlation between the two.[10] However, against Preston's theory, Alkofide evaluated three measurements, wherein he stated that there is a correlation in class III subjects with the width of sella turcica.[9]

As stated by Filipović et al., subjects with class II malocclusion had the minimum value, while class III malocclusion had the maximum values of the measurements of sella, which was in accordance with our present study in terms of depth of sella turcica. Though in terms of length, not much variability was seen among different skeletal types.[11]

Sheikhi et al. reported no significant differences in size between the three skeletal malocclusions (*p*-values of length and depth were 0.577 and 0.881, respectively),[12] which was in contrast to our findings where depth was found to be statistically significant for all malocclusion patterns (*p*-values of length and depth were 0.538 and 0.000, respectively). Kumar et al. concluded in a study that skeletal class II and class III values for size of sella turcica were inconclusive, though smaller values were reported for class I subjects in contrast to our study, where smaller values were reported for class II subjects.[13]

The measurements found in our study can be further used for assessment of the size of pituitary gland. Also, it can help the dentist to get familiar with the different types of sella turcica in differentiating and distinguishing pathology from normal development patterns.[2]

More researchers are needed to find the specificity and sensitivity of lateral cephalograms. Various methods of measurements are used to study the width and height; differences in measurements in our study should be compared with other studies with caution.

CONCLUSION

Considering the length of the sella turcica among various types of malocclusion, no significant result was noted. On the other hand, maximum depth of sella turcica was found to be in subjects with class III followed by class I and minimum with class II skeletal types.

Clinical Significance

Since this anatomical landmark is a U-shaped depression enclosing a pituitary gland, any variation in the size of this landmark can be used to assess the anomalies associated with pituitary gland, leading to favorable treatment.

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