

SELLA TURCICA BRIDGING AND DIMENSIONS IN DIFFERENT SKELETAL PATTERNS I.E CLASS I, CLASS II, NORMODIVERGENT, HYPODIVERGENT AND HYPERDIVERGENT -A COMPARATIVE STUDY.

Dental Science

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ABSTRACT

This retrospective study was carried out to investigate differences in sella turcica morphology i.e length, depth and diameter of sella, sella turcica bridging amongst Class I and Class II skeletal patterns. The above parameters were also compared between normodivergent, hypodivergent and hyperdivergent growth patterns. So the aim of the study was to check the frequency of sella turcica bridging in various skeletal patterns and also to explore variations in sella morphology in these participants. **Material and Methods:** Determination of the extent of sella turcica bridging was carried out using lateral cephalometric radiographs from 160 patients which were divided into Class I and Class II group based on ANB angle values. These participants were also divided into 3 groups based on the vertical growth pattern i.e normodivergent (n=53), hypodivergent (n=63) and hyperdivergent (n=44) groups. The extent of the sella turcica bridging on each lateral cephalogram was divided into Type A (no bridging), Type B1 (a ribbon like fusion), Type B2 (extension of the anterior and/or posterior clinoid process, where these two meet either anteriorly, posteriorly, or in the middle, with a thinner fusion) and Type C (partial sella bridging). **Results and conclusion :** The mean length, diameter and depth of sella turcica were 7.063 ± 1.2 mm, 9.55 ± 1.25 mm and 7.04 ± 1.12 mm respectively. The frequency of sella turcica bridging in 160 patients was type A (69.4%), type B1 (5.6%), type B2 (1.3%) and type C (23.8%) and there was no statistically significant ($P < 0.05$) difference in the bridging pattern amongst class I and II groups. Also amongst the various skeletal patterns the incidence type A bridging was highest and that of type B2 was lowest in all the groups. There was no statistically significant difference in diameter, depth and length of sella between males and females with a class I skeletal pattern. The depth and diameter of sella were slightly increased in class II males and females as compared to class I group as determined by ANOVA and post hoc tests, but the difference was not statistically significant. It was found that the diameter of sella was slightly increased in males and depth of sella was increased in females. There was no statistically significant difference between males and females with reference to type of bridging pattern.

KEYWORDS

sella turcica bridging, sella turcica morphology, sella dimensions.

INTRODUCTION

The sella turcica due to its central location in lateral cephalogram is an important anatomic structure in cephalometric assessment. In orthodontics sella has its due importance since midpoint of sella turcica i.e sella point is widely used in various orthodontic cephalometric analyses.¹ The anterior contour of sella turcica is useful in predicting patient growth and in assessing the craniofacial morphology and superimposing serial cephalograms.²

Fusion of the anterior and posterior clinoid processes is yet another reported anatomic abnormality of the sella turcica. This bony formation is referred to as sella bridge³, interclinoid osseous bridge⁴, or interclinoid taeina⁵.

In a previous study conducted by Marcotty et al. 400 pre-treatment lateral cephalograms of adult patients with skeletal class III or I malocclusion were evaluated. It was concluded that skeletal Class III patients presented a significantly higher rate of sella turcica bridging, 16.8 per cent ($P = 0.031$), in comparison with skeletal Class I patients 9.4 per cent⁶. However, there has been no comparative study of sella bridging with skeletal Class I and Class II malocclusion and also between normodivergent, hypodivergent and hyperdivergent individuals. So the aim of our study was to evaluate the difference in sellabridging, dimensions amongst skeletal class I, II and various skeletal growth patterns.

MATERIALS AND METHODS

This retrospective study was performed with 160 (80 females and 80 males) pretreatment lateral cephalometric radiographs divided into two groups Class I (n=81) and Class II (n=80). This division was based upon the skeletal pattern of individuals as given by ANB angle. The sample was also divided into 3 groups i.e normodivergent (n=50), hypodivergent (n=62), hyperdivergent (n=42) depending upon the vertical growth pattern as determined by FMA angle and basal plane angle. Sella length, depth and diameter of sella and sella turcica bridging were compared amongst class I and Class II groups. All the above mentioned parameters were also compared between various groups based on vertical growth pattern.

INCLUSION CRITERIA

1. age group-17-26 years
2. No previous orthodontic treatment.

EXCLUSION CRITERIA

1. patients in growth phase or patients younger than 17 years.

Determination of the extent of sella turcica bridging

The length, diameter and depth of the sella turcica were measured to quantify the extent of sella turcica bridging. The tip of the dorsum sella (DS) to the tuberculum sella (TS) was traced which formed the contour of the pituitary fossa. The length of the sella turcica (distance from the tip of the DS to the TS) and anteroposterior greatest diameter (distance from TS to the most posterior point on the inner wall of the pituitary fossa) will be measured [Figure 1].

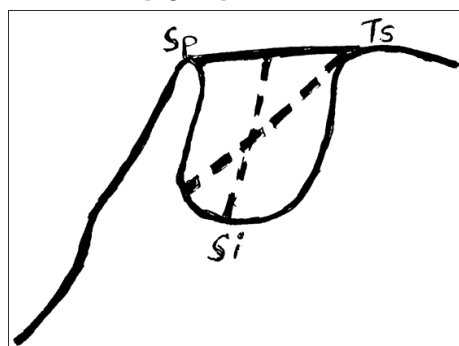


Fig 1 Normal morphology of sella turcica with reference lines for its measurements.

TS (tuberculum sella), Sp (Dorsum sella), Si (floor of sella). Reference lines black line=length of sella, straight dotted line=depth of sella, oblique dotted line=diameter of sella.

The extent of the sella turcica bridging on each lateral cephalogram will be assessed based on a standardized scoring scale (Bector *et al.*).⁷

Type A (no bridging), Type B1 (a ribbon like fusion), Type B2 (extension of the anterior and/or posterior clinoid process, where these two meet either anteriorly, posteriorly, or in the middle, with a thinner fusion) and Type C (partial sella bridging).¹³

RESULTS

There was no statistically significant difference in diameter, depth and length of sella between males and females with a class I skeletal pattern. The mean length, diameter and depth of sella turcica were 7.063 ± 1.2 mm, 9.55 ± 1.25 mm and 7.04 ± 1.12 mm respectively. The mean length of sella turcica was 7.0063 ± 1.22 mm in Class I males and 7.0188 ± 1.09 mm in Class I females. The mean length of sella turcica

was 7.14 ± 1.28 mm in Class II males and 7.08 ± 1.23 mm in Class II females. The mean diameter of sella turcica was 9.33 ± 1.00 mm in Class I males and 9.33 ± 1.47 mm in Class I females. The mean diameter of sella turcica was 9.80 ± 1.23 mm in Class II males and 9.74 ± 1.21 mm in Class II females. The mean depth of sella turcica was 6.8 ± 0.88 mm in Class I males and 6.9 ± 1.29 mm in Class I females. The mean depth of sella turcica was 7.16 ± 1.04 mm in Class II males and 7.24 ± 1.22 mm in Class II females. The depth and diameter of sella were slightly increased in class II males and females as compared to class I group as determined by T test, ANOVA and multiple Bonferroni tests (table 1). Amongst the 160

samples they were divided into 80 males and 80 females and standard T test was applied. It was found that the diameter of sella was slightly increased in males and depth of sella was increased in females. Type A sella turcica bridging was the most common type and type B2 was the least common amongst all the classes and skeletal patterns. The frequency of bridging was as follows: type A (69.4%), type B1 (5.6%), type B2 (1.3%) and type C (23.8%) (table 2). The frequency of bridging in various vertical growth patterns is shown in table 3. There was no statistically significant difference between these groups and also between males and females with reference to type of bridging pattern.

Table 1: Multiple comparisons

Multiple Comparisons Bonferroni							
Dependent Variable	(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
LENGTH OF SELLA	CLASS I MALE	CLASS I FEMALE	-.01250	.27106	1.000	-.7369	.7119
		CLASS II MALE	-.14200	.27106	1.000	-.8664	.5824
		CLASS II FEMALE	-.07500	.27106	1.000	-.7994	.6494
	CLASS I FEMALE	CLASS I MALE	.01250	.27106	1.000	-.7119	.7369
		CLASS II MALE	-.12950	.27106	1.000	-.8539	.5949
		CLASS II FEMALE	-.06250	.27106	1.000	-.7869	.6619
	CLASS II MALE	CLASS I MALE	.14200	.27106	1.000	-.5824	.8664
		CLASS I FEMALE	.12950	.27106	1.000	-.5949	.8539
		CLASS II FEMALE	.06700	.27106	1.000	-.6574	.7914
	CLASS II FEMALE	CLASS I MALE	.07500	.27106	1.000	-.6494	.7994
		CLASS I FEMALE	.06250	.27106	1.000	-.6619	.7869
		CLASS II MALE	-.06700	.27106	1.000	-.7914	.6574
DEPTH OF SELLA	CLASS I MALE	CLASS I FEMALE	-.15625	.25113	1.000	-.8274	.5149
		CLASS II MALE	-.36275	.25113	.904	-1.0339	.3084
		CLASS II FEMALE	-.43750	.25113	.501	-1.1086	.2336
	CLASS I FEMALE	CLASS I MALE	.15625	.25113	1.000	-.5149	.8274
		CLASS II MALE	-.20650	.25113	1.000	-.8776	.4646
		CLASS II FEMALE	-.28125	.25113	1.000	-.9524	.3899
	CLASS II MALE	CLASS I MALE	.36275	.25113	.904	-.3084	1.0339
		CLASS I FEMALE	.20650	.25113	1.000	-.4646	.8776
		CLASS II FEMALE	-.07475	.25113	1.000	-.7459	.5964
	CLASS II FEMALE	CLASS I MALE	.43750	.25113	.501	-.2336	1.1086
		CLASS I FEMALE	.28125	.25113	1.000	-.3899	.9524
		CLASS II MALE	.07475	.25113	1.000	-.5964	.7459
DIAMETER OF SELLA	CLASS I MALE	CLASS I FEMALE	.00000	.27781	1.000	-.7425	.7425
		CLASS II MALE	-.46942	.27958	.571	-1.2166	.2778
		CLASS II FEMALE	-.41000	.27781	.852	-1.1525	.3325
	CLASS I FEMALE	CLASS I MALE	.00000	.27781	1.000	-.7425	.7425
		CLASS II MALE	-.46942	.27958	.571	-1.2166	.2778
		CLASS II FEMALE	-.41000	.27781	.852	-1.1525	.3325
	CLASS II MALE	CLASS I MALE	.46942	.27958	.571	-.2778	1.2166
		CLASS I FEMALE	.46942	.27958	.571	-.2778	1.2166
		CLASS II FEMALE	.05942	.27958	1.000	-.6878	.8066
	CLASS II FEMALE	CLASS I MALE	.41000	.27781	.852	-.3325	1.1525
		CLASS I FEMALE	.41000	.27781	.852	-.3325	1.1525
		CLASS II MALE	-.05942	.27958	1.000	-.8066	.6878

Table 2: TYPE OF SELLA BRIDGING * group

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.172(a)	3	.017*
Likelihood Ratio	10.364	3	.016
N of Valid Cases	160		
a 2 cells (25.0%) have expected count less than 5. The minimum expected count is 1.00.			

Crosstab							
			group				Total
			CLASS I MALE	CLASS I FEMALE	CLASS II MALE	CLASS II FEMALE	
TYPE OF SELLA BRIDGING	A	Count	25	30	30	26	111
		% within TYPE OF SELLA BRIDGING	22.5%	27.0%	27.0%	23.4%	100.0%
		% within group	62.5%	75.0%	75.0%	65.0%	69.4%
	B 2	Count	2	0	0	0	2
		% within TYPE OF SELLA BRIDGING	100.0%	.0%	.0%	.0%	100.0%

		% within group	5.0%	.0%	.0%	.0%	1.3%
	B1	Count	2	3	2	2	9
		% within TYPE OF SELLA BRIDGING	22.2%	33.3%	22.2%	22.2%	100.0%
		% within group	5.0%	7.5%	5.0%	5.0%	5.6%
	C	Count	11	7	8	12	38
		% within TYPE OF SELLA BRIDGING	28.9%	18.4%	21.1%	31.6%	100.0%
		% within group	27.5%	17.5%	20.0%	30.0%	23.8%
Total		Count	40	40	40	40	160
		% within TYPE OF SELLA BRIDGING	25.0%	25.0%	25.0%	25.0%	100.0%
		% within group		100.0%	100.0%	100.0%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.871(a)	9	.449
Likelihood Ratio	8.415	9	.493
N of Valid Cases	160		

a 8 cells (50.0%) have expected count less than 5. The minimum expected count is .50.

Table 3: showing frequency of sella bridging in various skeletal patterns

Growth pattern	Type of bridging			
	A(%)	B1(%)	B2(%)	C(%)
Hyperdivergent	71.42	26.19	0	2.38
Hypodivergent	64.51	3.22	3.22	29.3
Normodivergent	76	12	0	12

DISCUSSION

Radiographic evidence of sella bridging/calification of ICL on lateral cephalometric radiographs is typically recorded as a supplemental finding, unless there is a warranting clinical or historical condition.⁸

Till now, researchers focused their attention mainly on sella bridging in malposed maxillary canines be it palatally displaced or impacted canines, highly placed canines, combination of buccal and palatal canine impactions.⁹⁻¹² Marcotty et al. carried out a study on 400 pre-treatment lateral cephalograms of adult patients with skeletal class III or I malocclusion and concluded that skeletal Class III patients presented a significantly higher rate of sella turcica bridging, 16.8 per cent (P = 0.031), in comparison with skeletal Class I patients 9.4 per cent⁶. Shobha Sundareswaran et al carried out a study to analyze the prevalence of sella turcica bridging and to measure the size of the sella turcica on profile cephalograms in a homogenous group of surgically repaired unilateral cleft lip and palate (UCLP) patients. They concluded that the UCLP patients apparently had higher predilection for sella turcica bridging. The dimensions of sella turcica were also seen to be significantly smaller than the control group.¹³ S. Divya et al conducted a retrospective study to investigate whether impacted canines or the presence of hyperdontia (supernumerary teeth) is associated with sellar bridging and concluded that the frequency of sella turcica bridging is positively associated and increased in patients with impacted canines and hyperdontia when compared to a control group.¹⁴ P. Dasgupta et al carried out a study to analyse the prevalence of sella turcica bridging in subjects with class I and class II skeletal types and to check whether sella can be considered as diagnostic marker for skeletal class II malocclusion. They concluded that there is a significant prevalence of sella turcica bridging (partial/complete) among subjects with skeletal class II malocclusion.¹⁵ R. M. Jones et al compared the incidence of sella turcica bridging and sella turcica dimensions in 150 Caucasian subjects who had combined surgical-orthodontic correction of their malocclusion with a randomly selected group of 150 Caucasian subjects who were treated contemporaneously by orthodontic means only and concluded that there is a greater likelihood likelihood of sella turcica bridging and abnormal sella turcica dimensions in subjects treated by combined surgical-orthodontic means rather than by orthodontics only.¹⁶ Pamela M. Ortiz et al investigated the association between unilateral/bilateral maxillary canine impaction and sella-turcica bridging using CBCT imaging and concluded that there is no statistically significant association between unilateral/bilateral palatal canine impaction and sella-turcica bridging when using 3D CBCT.¹⁷

Nehir Canigur Baybek et al evaluated the size and morphology of sella turcica in patients with type 1 diabetes compared with a healthy control group and stated that the measurements concerning sella were similar in the type 1 diabetic and control subjects, but dysmorphic types were more common in diabetic patients.¹⁸ Rosalia Leonardi et al

carried out a study to determine any association between tooth transposition and bridging of the sella turcica. They found that Sella turcica bridging was more frequent in subjects diagnosed with dental transposition than in the controls, with the difference being statistically significant [chi-square = 7.4; degrees of freedom (df) = 2; P = 0.025; Fisher's exact test; P = 0.042]. The increased frequency of complete and partial bridging of the sella turcica in subjects with dental transposition provides further evidence of a genetic basis to this condition.¹⁹

However, there has been no comparative study of sella turcica dimensions and bridging between class I and II groups and also between various vertical growth patterns.

It has been demonstrated that the incidence of Type A bridging was highest and lowest of type B2 bridging. There is no statistically significant difference in bridging pattern and sella dimensions between class I and class II groups and also between males and females. (chi square tests)

This study had a few limitations like lateral cephalogram used in the study is a two-dimensional representation of a three-dimensional structure and has its own flaws such as landmarks identification and tracings errors. Therefore a more precise cone-beam computed tomography or a three-dimensional imaging, could yield more accurate results. However, due to the higher exposure to radiation such imaging techniques in orthodontic patients are not routinely indicated. A higher sample size inclusion with different skeletal and dental patterns would yield more significant results.

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