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Association between sella turcica bridging, third molar agenesis and impaction

Usman Zaheer[a], Junaid Israr[b], Asim Riaz[c], Naauman Zaheer[d], Maliha Shahbaz[e], Aneeqa Yaqub[f]

Abstract

Introduction: To establish whether sella turcica bridging could be used as a diagnostic indicator of third molar agenesis and determine its correlation with third molar impaction, age, gender, anomalies, and skeletal class.

Material and Methods: This cross-sectional analytical study included 99 pretreatment orthopantomograms (OPG) and lateral cephalograms. 30 patients were included as cases with third molars agenesis and 69 patients were included in control with no agenesis. Radiographs were assessed for sella turcica bridging pattern, third molar agenesis, anomalies, third molar impaction, skeletal pattern, age, and gender predilection.

Results: The association between third molar agenesis and sella turcica bridging was found insignificant with p value 0.499. Upper and lower third molar impaction was significantly associated with agenesis cases (p-value 0.005) while insignificantly associated with sella turcica bridging cases. Skeletal class I and II showed more prevalence but relationship was found to be insignificant (p-value 0.346). Third molar agenesis was found common in male patients but had insignificant p value of 0.413. Cases with bridging of sella turcica complete or partial was found significantly associated with age (p value 0.047). Anomalies had inconsequential association with either sella turcica bridging or third molar agenesis cases (p value 0.239).

Conclusions: An insignificant correlation was found between third molar agenesis and sella turcica bridging. Increased incidence of third molar impaction was associated with third molar agenesis. All skeletal classes were found to be ubiquitous in partial bridging category. Chances of sella turcica bridging increases with age.

Keywords: Agenesis; sella turcica bridging; third molar

Introduction

Sella turcica is an important landmark in cephalometric diagnosis of Orthodontic patients. Anatomically it consists of hypophyseal fossa, anterior and posterior clinoidal processes.[1,2] The bridging of sella occurs as a variation of normal development and is classified widely as type I (no bridging), type II (partial bridging) and type III (complete bridging). This classification is based on degree of calcification as the difference between length and diameter of sella turcica varies.[3–6]

A strong correlation exist between palatally displaced canines (PDC) and hyperdontia with sella turcica bridging in literature [3,7,8]. The frequency of bridging is quite high with PDC than control with complete (25.8%) and partial calcification (54.8%) [8]. Although a weak correlation was found between PDC and sella turcica bridging when cone beam

[a] Corresponding Author. BDS, FCPS; Assistant Professor, Department of Orthodontics, Lahore Medical & Dental College. Lahore, Pakistan. Email: usman.zaheer@lmdc.edu.pk
[b] BDS, DDCS, MFDS RCS, FCPS; Associate Professor, Department of Orthodontics, Lahore Medical & Dental College. Lahore, Pakistan.
[c] BDS, FCPS; Assistant Professor, Department of Orthodontics. FMH College of Medicine & Dentistry, Lahore, Pakistan.
[d] BDS, MPhil; Associate Professor, CMH Lahore Medical College, Institute of Dentistry, Lahore, Pakistan.
[e] BDS, MPhil; Assistant Professor, Oral Biology Department, Rashid Latif Dental College, Lahore, Pakistan.
[f] BDS; Resident, Department of Orthodontics, University College of Medicine & Dentistry, Lahore, Pakistan.

computed tomography was used as the investigating tool [9]. Boddeti et al suggested that sella turcica bridging can be used for association with skeletal classes with males having larger dimensions of sella turcica. Class III individuals showed oblique morphology of sella turcica.[10] Sella turcica bridging is also found to be associated with different skeletal classes. The skeletal class III malocclusion being the more prevalent than class I.[11] Transposition which is a positional substitution of teeth is highly correlated with sella turcica bridging.[12] The incidence of sella turcica bridging and associated anomalies were also found increased for patients being treated for Orthognathic surgery rather than Orthodontics alone.[13,14]

Alam et al. reported positive association between third molar agenesis and skeletal class II and III in Malaysian and Chinese population with maxillary jaw being more affected.[15] The timing of eruption of third molar and its location in an arch has strong implication on future outcome of Orthodontic treatment and must be planned before start of treatment. Agenesis of third molar and second premolars is strongly associated with palatally impacted canines.[16] Elham et al. suggested a positive correlation of PDC with third molar agenesis and upper molar impaction, (vertical and disto-angular).[17] Female patients are significantly associated with third molar impaction with maxilla being the dominant jaw.[18]

The aim of the present study was to investigate the association between sella turcica bridging with third molar impaction / agenesis and possibility of it being used as a diagnostic indicator in clinical practice.

Material and Methods

The study was a cross-sectional analytical study, constituting of 30 cases with agenesis of third molars and a comparative group of 69 cases without agenesis. Ethical approval was taken from Ethical review committee of the institute (XXXX/FD/1216/20). The duration of the study was six months. Adult patients, with ages not less than 19 years of either sex were included in this study. Pre-treatment cephalometric radiographs and orthopantomograms (OPG) of the patients visiting the orthodontic outdoor for treatment in last 10 years were retrospectively collected. Only clearly readable radiographs were included in this study which had sella turcica bridging, partial bridging or no bridging. The study group consisted of patients with agenesis of at least one or more third molar teeth. Third molar impaction was classified according to Winters classification.[17] Patients with extracted third molars, cleft lip and palate, craniofacial anomalies, syndromes, trauma or previous treatment were excluded. However, the control group was randomly selected including adult patients with all third molars present coming to Orthodontic clinic in the last 10 years. Cephalometric tracing was done with lead pencils on acetate paper under x-ray illumination. All the radiographs were randomly traced by the investigators to reduce the bias and reconfirmed latter by the principal investigator after 1 week.

The sella turcica bridging was classified as Type I (no calcification); inter-clinoidal length greater than or equal to three-fourth of the diameter, Type II (partial calcification); length lesser than or equal to three quarters of the diameter and Type III (complete); diaphragm sella visible radiographically. [8] (Fig.1)

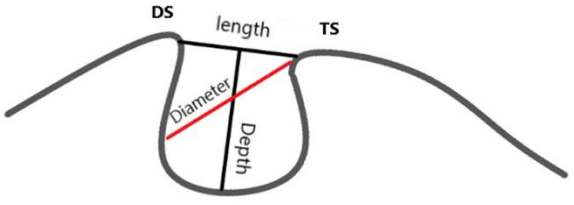

Figure 1: Sella turcica dimension
TS=Tuberculum Sella, Ds=Dorsum sella

Third molar impaction was classified as based on inclination between third molar and

second molar longitudinal axis respectively. Vertical labelled when the angle was 10 to -10 degree, Mesio-angular when the angle was 11 to 80 degree and Disto-angular when the angle was -11 to -80 degree [17] (Fig.2).

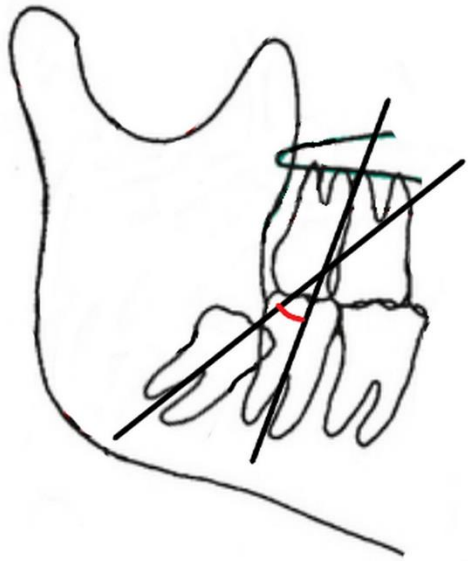

Figure 2: Winters classification (angle between long axis of second and third molar)

Skeletal classes were classified as class I, II, III on the basis of ANB which was deduced after subtracting SNB from SNA.[5] Ranges eree as follows:

Class I - ANB (3±2) degree, Class II-ANB (>5) degree and Class III –ANB (<1) degree (Fig.3).

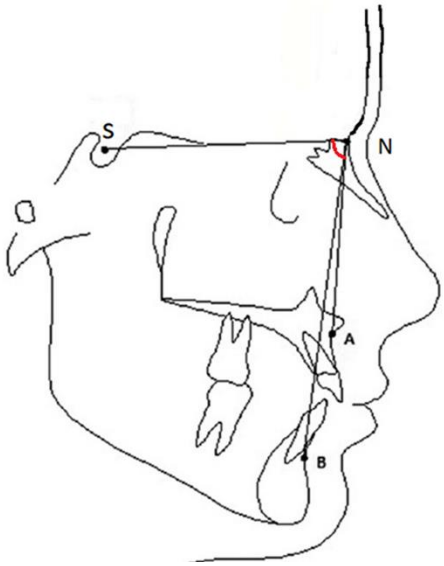

Figure.3 Cephalometric sagittal analysis (<ANB)

SPSS version 20 was used to analyze the data and MS-excel was used to produce the graphs. The results for Sella turcica bridging status, age, gender, skeletal class, impaction, anomalies (palatal displaced canines, missing lateral incisors, second premolars and transpositions) were described by using frequency and percentages in two comparative groups and likelihood ratio test and Chi-square with continuity correction were used to see association of these variables with agenesis. Then same were reported for three groups based on Sella turcica status and comparison between the groups was also made by using likelihood ratio test. The multinomial logistic regression was applied by taking no bridging as reference category for dependent variable (Sella Turcica) and taking agenesis, impaction, age, gender anomalies and skeletal class as independent variables. The last category for each independent variable was taken as the reference category. Results were presented by adjusted odds ratio with 95% confidence interval, also the simple odds ratios were also calculated with 95% confidence interval and added in the results for comparison. P-value ≤ 0.05 was considered significant and 0.10 as worth full for discussion.

Results

There were 30 cases with agenesis and 69 without agenesis. The study had significantly different distribution of gender among cases with presence and absence of agenesis in third molar with more males having agenesis. The Skeletal class and Sella Turcica had similar distribution among two groups with p-values 0.531 and 0.449, while the impaction had a highly significant difference for distribution among two groups with p-value 0.005. Those with agenesis had significantly higher proportion of cases with upper and lower impaction while those without agenesis had significantly higher proportion for cases with no impaction. The presence of anomalies and age did not differ between two groups (Table I).

Table I: Status and comparison of various conditions in two groups as per genesis status

		THIRD MOLAR AGENESIS				*p*-value
		Present		Absent		
		n	%	n	%	
GENDER	Male	16	53.3	20	29.0	0.037*
	Female	14	46.7	49	71.0	
SKELETAL	Class-I	13	43.3	33	47.8	0.531
	Class-II	12	40.0	30	43.5	
	Class-III	5	16.7	6	8.7	
SELLA TURCICA	Partial	25	83.3	52	75.4	0.449
	Complete	4	13.3	10	14.5	
	No Bridging	1	3.3	7	10.1	
IMPACTION	Upper	6	20.0	2	2.9	0.005*
	Lower	12	40.0	19	27.5	
	Both	4	13.3	26	37.7	
	None	8	26.7	22	31.9	
Anomaly	Present	4	13.3	3	4.3	0.239
	Absent	26	86.7	66	95.7	
Age	≤ 22	14	46.7	40	58.0	0.413
	> 22	16	53.3	29	42.0	

p ≤ 0.05:* level of *significance*

There were 77 cases with partial bridging, 14 with complete and 8 without bridging. The gender, skeletal class, agenesis, and anomalies had no significant association with Sella Turcica and p-values recorded were 0.767, 0.346, 0.449 and 0.854, respectively. The impaction showed insignificant association with Sella turcica bridging with p-value of 0.099. All 8 cases with upper impaction had only partial bridging and the proportion of those with lower impaction was a bit higher among cases with complete bridging. It was also observed that more than 60.0% of those with age ≤ 22 years had partial bridging and majority (72.0%) of those with age > 22 had complete bridging. The age had a significant association with Sella Turcica bridging with p-value 0.047 (Figure.4-9).

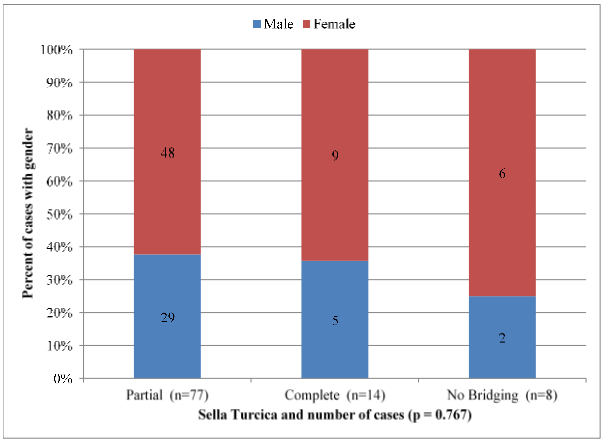

Figure 4: Gender distribution and its association with Sella Turcica status

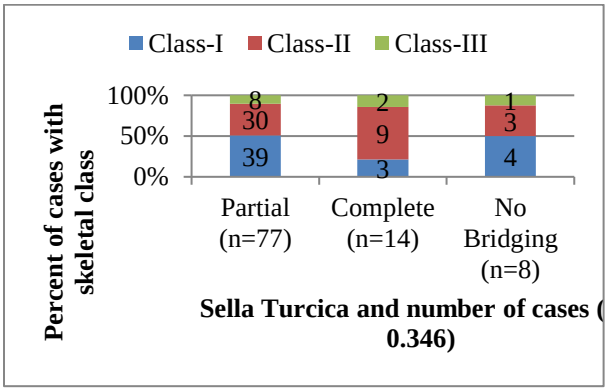

Figure 5: Distribution of skeletal class and its association with Sella Turcica status

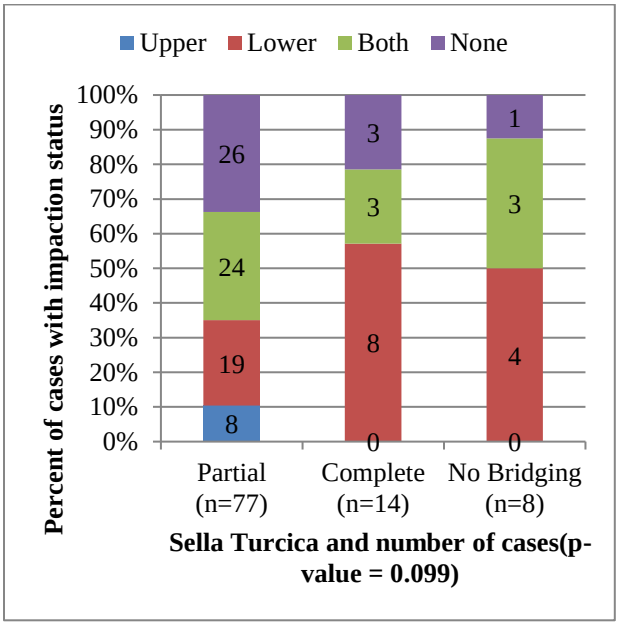

Figure 6: Distribution of impaction and its association with Sella Turcica status

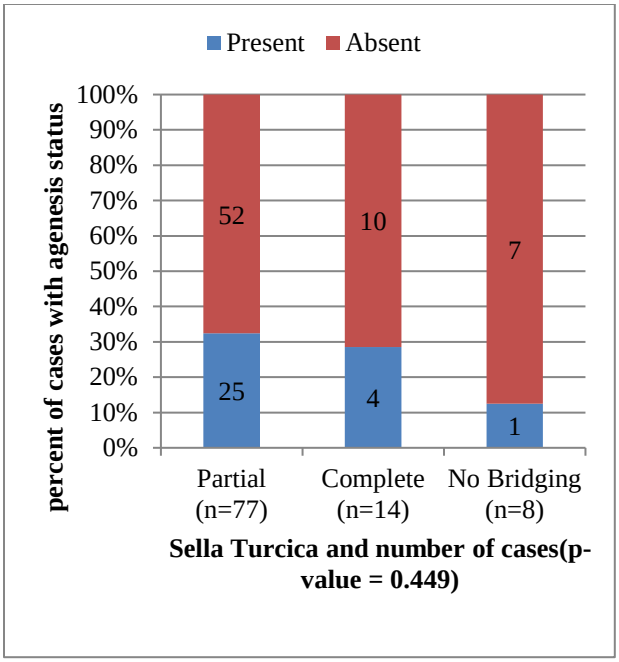

Figure 7: Distribution of agenesis and its association with Sella Turcica status

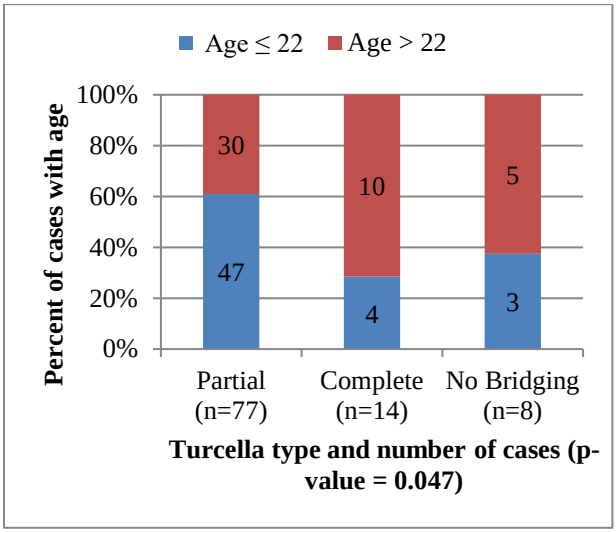

Figure 8: Distribution of age and its association with Sella Turcica status

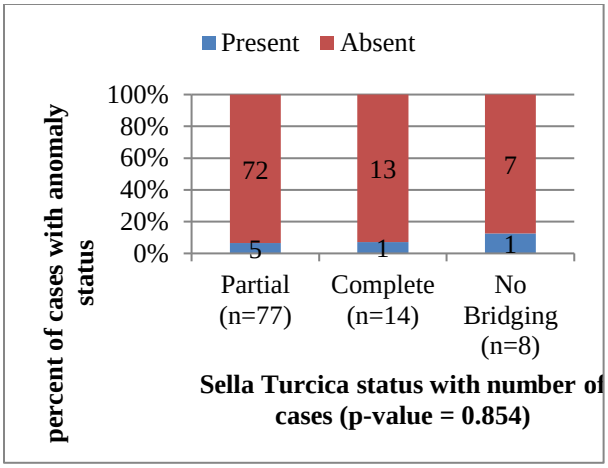

Figure 9: Distribution of anomalies and its association with Sella Turcica status

Multinomial logistic regression was applied to see the impact of agenesis in relation to impaction in presence of other covariates on Sella Turcica status and it was observed that none of the variables including agenesis and impaction showed any significant association with Sella Turcica. Details with simple and adjusted odds ratios are well depicted in (table. II).

Table II: Association of Sella turcica with agenesis in presence of multiple factors by multinomial regression analysis

Sella Turcica(a)			Bridging	No bridging	Odds Ratio	95% Confidence Interval for Odds ratio		Adj. Odds Ratio	95% Confidence Interval for Adj. Odds ratio	
						Lower Bound	Upper Bound		Lower Bound	Upper Bound
Partial		Intercept								
	Agenesis	Present	25	1	3.37	0.39	28.86	4.12	0.38	45.20
		Absent	52	7	Ref			**Ref**		
	Impaction	**Upper**	**8**	**0**	∞	**--**	**--**	**30013319.2**	**0.00**	.[c]
		Lower	19	4	0.18	0.02	1.77	0.13	0.01	1.61
		Bothe	24	3	0.31	0.03	3.16	0.18	0.01	2.36
		None	26	1	Ref			**Ref**		
	gender	Male	29	2	1.81	0.34	9.58	2.78	0.37	20.96
		Female	48	6	Ref			**Ref**		
	Skeletal	Class-I	39	4	1.22	0.12	12.40	2.88	0.19	44.07
		Class-II	30	3	1.25	0.11	13.96	2.43	0.16	37.82
		Class-III	8	1	Ref			**Ref**		
	Anomaly	Present	5	1	0.49	0.05	4.77	0.21	0.01	3.49
		Absent	72	7	Ref			**Ref**		
	Age	≤ 22	47	3	2.61	0.58	11.74	3.32	0.60	18.34
		> 22	30	5	Ref			**Ref**		
Complete bridging		Intercept								
	Agenesis	Present	4	1	2.80	0.26	30.70	3.09	0.22	42.96
		Absent	10	7	Ref			**Ref**		
	Impaction	Upper	0	**0**	0.00	--	--	0.37	0.37	0.37
		Lower	8	4	0.67	0.05	8.64	0.56	0.03	9.23
		Bothe	3	3	0.33	0.02	5.33	0.28	0.01	5.69
		None	3	1	Ref			**Ref**		
	gender	Male	5	2	1.67	0.24	11.58	2.03	0.20	20.35
		Female	9	6	Ref			**Ref**		
	Skeletal	Class-I	3	4	0.38	0.02	6.35	0.44	0.02	10.53
		Class-II	9	3	1.50	0.10	23.07	2.20	0.11	45.92
		Class-III	2	1	Ref			**Ref**		
	Anomaly	Present	1	1	0.54	0.03	9.99	0.22	0.01	6.45
		Absent	13	7	Ref			**Ref**		
	Age	≤ 22	4	3	0.67	0.11	4.21	0.64	0.08	4.89
		> 22	10	5	Ref			**Ref**		

a. The reference category is: No Bridging.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Discussion

The study was conducted to find possible association between sella turcica bridging with third molar agenesis, variation in impaction of third molar, sex predilection, age and prevalence in different skeletal classes.

Elham suggested increased number of cases with third molar agenesis having palatally

displaced canines.[17] Our study also concurred that third molar agenesis and sella turcica bridging are insignificantly associated with anomalies like palatal displaced canine (p-value 0.894). However, previous study had a larger sample size which might have increased the scope of finding anomalies. They also reported a high incidence of at least one molar tooth impaction in maxilla (38%) and the mandible (67%)[17], which is in agreement to our study in which higher incidence of upper and lower molar impaction was found in third molar agenesis cases (p-value 0.005) whereas association between sella turcica bridging also showed promise in molar impaction but results were insignificant.

In 2017, Singh *et al.* reported increased incidence of third molar agenesis in female patients ($p<0.001$). Maxilla was found to be the dominant jaw [18], which is in contrast with our findings showing increased prevalence of third molar agenesis in male patients. However, female patients were predominant in cases with sella turcica partial bridging but the relation with gender predilection was found insignificant. Gender variation could be because the study sample for previous study included patients reporting to the general outdoor for dental checkup; whereas patients included in our study came from Orthodontic outdoor. The variation in these results could also be because of ethnic and racial differences as our study was conducted on Pakistani population.

Ali *et al.* in 2014 found increased incidence of partial bridging of sella turcica, lesser complete bridging with significant association of palatally displaced canines ($p<0.001$).[8] Compared to our study, cases of sella turcica bridging has insignificant association with anomalies like palatally displaced canines. Leonardi *et al.* reported increased incidence of dental anomalies associated with sella turcica bridging which is contradictory to our study [14]. Leonardi *et al.* also reported significant association of sella turcica bridging with maxillary and mandibular tooth transposition which is found contradictory to our results.[12] Disparities among the findings might be due to racial variations and sample size.

Sella turcica bridging was found to be significantly associated with skeletal class III patients compared to class I skeletal patients.[11] The present study highlighted that skeletal class was insignificantly associated with sella turcica bridging and third molar agenesis.

Alkofide studied the same phenomenon on Saudi nationals and found normal sella turcica morphology in 67% of cases and noted increased pattern in Skeletal Class II cases with narrow morphology and Class III skeletal pattern with large diameter.[6] Increased age was found significantly associated with sella turcica morphological changes concurrent to the present study.

Alam reported in 2014 significant trend of skeletal class II and class III in Chinese and Malaysian populations with third molar agenesis ($p<0.005$) with maxilla being the prominent jaw. The variation in results could be because of increased incidence of class II facial forms being more common in our population.

Our study highlighted the importance of sella turcica bridging as diagnostic marker for third molar agenesis and third molar impaction. Further research should be conducted as a multicentered approach to rule out variations with other studies on basis of gender, age, skeletal class and anomalies.

Conclusions

From the present study it can be concluded that Sella turcica bridging is trivial in predicting third molar agenesis. Third molar agenesis is more common in male patients while female patients show a higher incidence of partial sella bridging. Third molar agenesis is positively associated with upper and lower third molar impaction. Skeletal class relation is not associated with third molar agenesis and sella turcica bridging. Lastly the chances of sella turcica bridging increases with age.

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