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MORPHOLOGY OF SELLA TURCICA IN CLASS I, II AND III MALOCCLUSION- A RETROSPECTIVE CEPHALOMETRIC STUDY

Dental Science

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ABSTRACT

Objective: To find the prevalence of shapes of sella turcica (ST) in different skeletal malocclusion in Nepalese population.
Methods: 90 cephalometric radiographs were selected from the database of the Department of orthodontics and were segregated according to different morphology of sella turcica among different skeletal malocclusion.
Results: Descriptive analysis showed that bridging, double contour floor and pyramidal shape of dorsum sella of sella turcica were most common among class I malocclusion. Class II malocclusion showed highest prevalence for notching in dorsum sella whereas class III malocclusion showed maximum prevalence of normal and hypotrophic posterior clinoid process. Class I and II malocclusion showed equal prevalence of hypertrophic posterior clinoid process and oblique contour of floor where as oblique anterior wall were equally seen in class II and III malocclusion
Conclusions: The shape of sella turcica can act as an important tool for earlier determination of dentofacial anomalies.

KEYWORDS

Cephalometric radiographs; malocclusion; sella turcica morphology

INTRODUCTION

The sella turcica (ST) is a saddle-shaped structure located on the intracranial surface of the sphenoid bone in the middle cranial fossa. Cephalometric radiographs are used by the orthodontists to trace this important landmark (sella point, S) to determine the corresponding positions of maxillae and mandible to each other as well as to the cranium. These radiographs can and should be used to distinguish any sellar changes which can be manifestations of pituitary gland pathologies. Hence, it become important for the clinician to know the normal and abnormal variations in the morphology of ST (Jones *et al.,* 2005; Sathyanarayana *et al.,* 2013)

Anatomically, the ST can be divided into three segments, namely: an anterior wall (tuberculum sellae), a floor, and a posterior wall (dorsum sellae) (Jones *et al.,* 2005). Many authors had suggested numerous classification for ST morphology but the most recent classification is proposed by Kucia *et al* (2014). According to this classification, ST can be divided into normal, oblique anterior wall, sella turcica bridging, double contour of the floor, irregularity (notching) in the posterior part of the dorsum sellae, pyramidal shape of the dorsum sella, hypertrophic posterior clinoid process, hypotrophic posterior clinoid process and oblique contour of the floor.

Cranial neural crestal cells are found to be strongly associated with the genesis of both ST and derivatives of the frontonasal process/first pharyngeal arch. Frontonasal process/first pharyngeal arch in turn are responsible for forming proximal maxillae and mandible (Miletich I *et al.,* 2004). Previous studies also demonstrated a strong correlation between cranio-/dentofacial anomalies with morphological variants of ST (Leonardi *et al.,* 2006). So, it become important for a clinician to have an idea about different morphological variants of ST, as it can act as an important tool for prediction of cranio-/dentofacial anomalies Hence, with this rationale we had conducted this study to describe morphological variants of ST in different skeletal malocclusion in Nepalese subjects.

MATERIALS AND METHODS

90 cephalometric radiographs (Male: 30; Female: 60) with different skeletal malocclusion (Class I: 30; Class II: 30; Class III: 30) were selected from the database of the department of orthodontics of the Dhulikhel hospital for analysis. Inclusion criteria was radiographs of good diagnostic quality. The exclusion criteria were poor visibility of the ST on lateral cephalometric radiographs, the presence of cleft lip/palate or both, craniofacial anomaly or syndrome, and history of trauma or chemotherapy. These radiographs were segregated using Kucia et al classification into 9 different subtypes namely; normal, oblique anterior wall, sella turcica bridging, double contour of the floor, irregularity (notching) in the posterior part of the dorsum sellae, pyramidal shape of the dorsum sella, hypertrophic posterior clinoid process, hypotrophic posterior clinoid process and oblique contour of the floor. These segregation were done independently by two different observers. Any doubts in categorizing these variants were clarified through discussion between the observers.

STATISTICAL ANALYSIS

Data were analyzed using the Statistical Package for Social Sciences version 21.0 for Windows (SPSS Inc.: Chicago, Illinois, USA). Descriptive analysis was done to determine morphological variants of ST in different sagittal skeletal classes.

RESULTS

The study revealed that bridging type of variant was the most common variant among all types of skeletal relationships followed by oblique anterior wall, oblique contour of floor, double contour of floor, hypertrophic posterior clinoid process, hypotrophic posterior clinoid process, irregularity (notching) in dorsum sellae and pyramidal dorsum sellae. All types of skeletal malocclusion showed bridging as the most common variant of sella turcica; however it was highest among the cases of skeletal class I malocclusion. Irregularity (notching) in the posterior part of the ST was most prevalent in class II malocclusion. Hypotrophic ST was most commonly seen in skeletal class III malocclusion, however, both skeletal class I and II malocclusion showed equal distribution of hypertrophic and oblique contour of ST. The prevalence of oblique anterior wall of ST was most common in skeletal class II and III malocclusion. (Table1)

MALOCCLUSION	DIFFERENT VARIANTS OF MORPHOLOGY OF SELLA TURCICA									
	Normal	Bridging	Hypotrophic posterior clinoid process	Hypertrophic posterior clinoid process	Oblique anterior wall	Oblique contour of the floor	Double contour of the floor	Pyramidal Dorsum sella	Irregularity (notching) In dorsum sella	TOTAL
Class I	06 (20.0%)	11 (36.7%)	00 (0.0%)	02 (6.7%)	03 (10.0%)	03 (10.0%)	03 (10.0%)	02 (6.7%)	00 (0.0%)	30 (100%)
Class II	08 (26.7%)	07 (23.3%)	01 (3.3%)	02 (6.7%)	04 (13.3%)	03 (10.0%)	02 (6.7%)	00 (0.0%)	03 (10.0%)	30 (100%)
Class III	12 (40.0%)	08 (26.7%)	02 (6.7%)	01 (3.3%)	04 (13.3%)	02 (6.7%)	01 (3.3%)	00 (0.0%)	00 (0.0%)	30 (100%)
Total	26 (28.9%)	26 (28.9%)	03 (3.3%)	05 (5.6%)	11 (12.2%)	08 (8.9%)	06 (6.7%)	02 (2.2%)	03 (3.3%)	90 (100%)

TABLE 1: DISTRIBUTION OF VARIANTS OF SELLA TURCICA IN SKELETAL CLASS I, II AND III MALOCCLUSION

DISCUSSION

Embryologically, pituitary gland originates as a result of interaction between oral and neural ectoderm which forms anterior and posterior part of the gland. Various common signaling molecular pathways mediated through bone morphogenetic proteins, hedgehog proteins and fibroblasts growth factors are responsible for growth of both pituitary as well dentofacial structures (Kim H J *et al.,* 1998; Trier *et al.,* 2001) Any disturbances in these signaling pathways can result into different variations and anomalies in dentofacial structures which can be predicted by appraisal of morphology of ST (Leonardi *et al.,* 2006).

Morphology of ST has been classified by different authors. Gordon and Bell (1922) classified the sella turcica into circular, oval, and flattened, or saucer shaped. Axelsson *et al.* (2009) has classified morphological variants into: oblique anterior wall, sella turcica bridging, double contour of the floor, irregularity (notching) in the posterior part of the dorsum sellae and pyramidal shape of the dorsum sella. Recently, Kucia *et al.* (2014) has extended the classification by adding three other variants: hypertrophic posterior clinoid process, hypotrophic posterior clinoid process and oblique contour of the floor. Hence, we used this extended classification in our study to describe morphological variants of ST in different skeletal malocclusion.

Our study demonstrates equal prevalence of both normal and bridging variants of ST. It is an uncommon finding in comparison with other previous studies where normal ST had highest prevalence rate (Axelsson *et al.,* 2004; Alkofide *et al.,* 2007) Bridging was highest among skeletal class I malocclusion. This finding was similar to the findings of Kucia *et al.* (2014). However, other studies has revealed that bridging is most common among cases of skeletal class III (Abdel Kader H M, 2007). In our study, other morphological variants that are oblique anterior wall, oblique contour of floor, double contour of floor, hypertrophic posterior clinoid process, hypotrophic posterior clinoid process, irregularity of dorsum sella and pyramidal dorsum ST followed the descending order of prevalence. Kucia *et al* (2014) found bridging, irregularity of dorsum sella, hypertrophic posterior clinoid process, double contour of floor, pyramidal dorsum ST, oblique anterior wall, hypotrophic posterior clinoid process and oblique contour of floor as the descending order of prevalence in total subjects.

Our study demonstrate that bridging, double contour floor and pyramidal shape of dorsum sella of ST were most common among class I malocclusion. Class II malocclusion showed highest prevalence for notching in dorsum sella whereas class III malocclusion showed maximum prevalence of normal and hypotrophic posterior clinoid process. Class I and II malocclusion showed equal prevalence of hypertrophic posterior clinoid process and oblique contour of floor where as oblique anterior wall were equally seen in class II and III malocclusion. Kucia *et al* (2014) found that normal, bridge, hypertrophic posterior clinoid process and double contour floor were most common among class I malocclusion. Class II malocclusion showed highest prevalence of oblique anterior wall, pyramidal shape of dorsum sella and notching in dorsum sella. Hypotrophic posterior clinoid process were equally common in skeletal class I and II malocclusion whereas class II and III showed equal prevalence for oblique anterior wall. The prevalence of some variants of ST morphology is similar to the findings of Kucia *et al* (2014) but few of them are different and according to us these differences can be due to different sample size and ethnicity of subjects.

CONCLUSION

The ST morphology can and should be used as a diagnostic tool to predict dentofacial anomalies. This information can be used by the clinicians to enable early diagnosis as well as preventive/early treatment of dentofacial as well as systemic anomalies.

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