



## Introduction

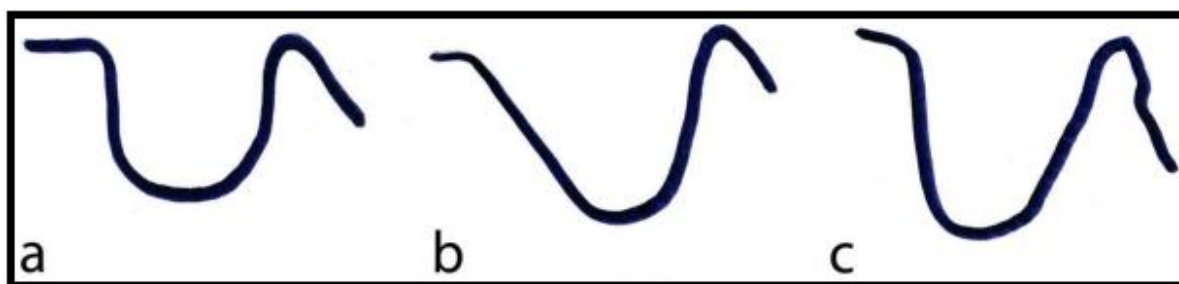
Sella turcica (ST) is a saddle-shaped structure located on the intracranial surface of the sphenoid bone in the middle cranial fossa [1]. From anterior to posterior, the sella is made up of the two anterior clinoid processes, the tuberculum sella and the pituitary or hypophyseal fossa covered by the diaphragm sellae, and the two posterior clinoid processes. The hypophyseal fossa is the actual basal concavity of sella turcica that house the pituitary gland over the sphenoid sinus [2].

Sella turcica, literally “Turkish saddle,” is one such mysterious term. Besides its Latin name, this term has also been translated and adopted into all major languages of the world and is frequently used in medical literature [3]. The development of the pituitary gland is closely

coordinated with the development of the sella turcica. The development of the pituitary gland must be completed before the sella turcica can be formed. It is presumed that a deviation in the development of the pituitary gland will result in a deviation in the morphology of the sella turcica [4].

The sella turcica serves as an important anatomical reference in orthodontics partly because the s-point, placed centrally in the sella region, is a central fix point in cephalometric analysis and partly because the contour of the anterior wall is used in evaluation of craniofacial growth. Length, depth, and diameter of the sella turcica have been calculated since the 1950s and 1960s [5, 6]. The centre of the sella turcica was defined as the s-point by Björk (1947) [7].

**Figure – 1:** Schematic drawings of sella turcica contours observed in different profile radiographs of normal, young individuals. Anterior direction to the left. (a) This contour was observed in approximately 70% of the cases. (b) Slightly oblique anterior wall was observed in approximately 20% of the cases. (c) Slightly abnormal posterior wall was observed in approximately 10% of the cases.



**Figure – 2:** Classification of the three types of the sella turcica: (A) oval, (B) circular, (C) flat.



The main morphological characteristics are schematically shown in **Figure – 1**.

feature seems to be more important than the size of the fossa [8].

In lateral radiographs, the sella turcica is usually demarcated by a dense thin white line. This

Morphologically, three basic types - oval, round, and flat - have been classified, the oval and

round types being the most common (**Figure - 2**).

The radiological diagnosis of an enlarged sella turcica has been found to be associated with adenomas, mucocele, meningioma, primary hypothyroidism, prolactinoma, gigantism, acromegaly, empty sella syndrome (non-functioning pituitary glands), and Nelson syndrome [9]. Moreover, tumors such as craniopharyngioma and intrasellar aneurysm can be responsible for an enlargement of the sella turcica with bony destruction and invasion into the surrounding structures [10]. In contrast, an abnormally small sella turcica seems to be rare and found in primary hypopituitarism and Sheehan's syndrome [11].

### Materials and methods

This was a prospective clinical study which was conducted in the Postgraduate Department of Oral Medicine and Radiology of Government Dental College and Hospital Srinagar. This prospective study included total of digital lateral cephalometric radiographs of 180 patients (90 males and 90 females) between 12-65 years of age that reported to the Postgraduate Department

of Oral Medicine and radiology of Government Dental College and Hospital Srinagar.

### Inclusion criteria

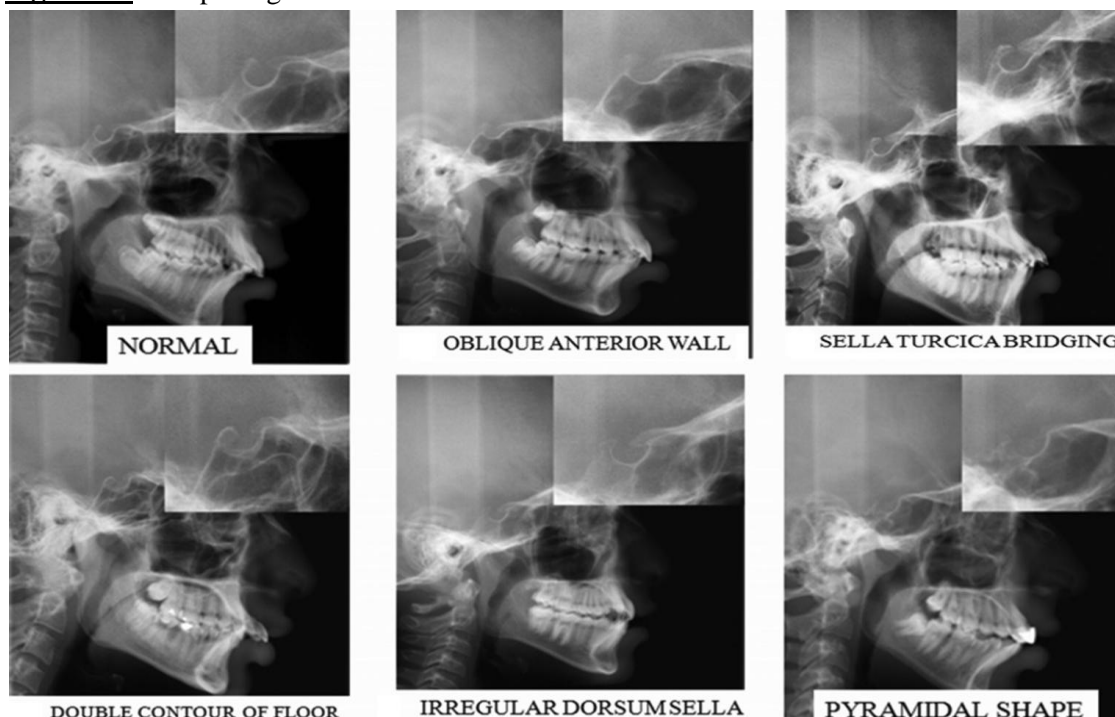
- Healthy patients without any history of systemic diseases.
- Patients in the age group of 12-65 years.
- Patients advised for lateral cephalometric radiographs for orthodontic treatment.

### Exclusion criteria

- Individuals with congenital defects in the craniofacial region like clefts and malformations.
- History of craniofacial fractures.
- Patients suffering from disorders of bone, nutritional deficiencies and endocrinal disturbances.

Digital lateral cephalometric radiographs were taken by using CARESTREAM SC8100 machine with a tube voltage of 73 kV, tube current of 10mA and exposure time of 10sec. All lateral cephalometric radiographs were taken by New-Tom VGi Scanner (QR srl; Verona, Italy) in standard resolution mode and analyzed them by NNT Dicom version 8.0.0.0 software.

**Figure – 3:** Morphological variants.



According to Axelsson, et al., the five morphological variations are oblique anterior wall, bridging of sella turcica, double contour of the floor, irregular surface (notch like depression) in the posterior aspect of the dorsum sella, and pyramid shape of dorsal sellae (Figure – 3) [12].

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Statistical software SPSS (version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data. Continuous variables were expressed as Mean±SD and categorical variables were summarized as percentages. Student's independent t-test was employed for comparison of various dimensions as per gender. Analysis of variance (ANOVA) was applied for comparison of various dimensions according to age. Graphically the data was presented by bar and pie diagrams. A P-value of less than 0.05 was considered statistically significant.

### Results

Age distribution of study patients was as per Table – 1. Gender distribution of study patients was as per Table – 2.

**Table – 1:** Age distribution of study patients.

Age (Years)	Number	Percentage
10-20	47	26.1
20-30	62	34.4
30-40	24	13.3
40-50	34	18.9
50-60	13	7.2
Total	180	100
Mean±SD (Range) = 30.2±12.29 (12-59)		

Morphology of sella turcica was found to be typical in just 33.9% of cases. Within the atypical sellae most had oblique anterior wall (27.2%), followed by double contour of the floor (15%), pyramidal shape (14.4%), irregular

dorsum sella (6.7%) and bridging (2.8%) shown in the Table – 3.

**Table – 2:** Gender distribution of study patients.

Gender	Number	Percentage
Male	90	50.0
Female	90	50.0
Total	180	100

**Table – 3:** Morphological type.

Morphological type	Number	%
Normal	66	36.2
Oblique anterior wall	42	23.3
Bridging	6	3.3
Double contour of the floor	21	11.6
Pyramidal shape	27	15
Irregular Dorsum Sella	18	10
Total	180	100

### Discussion

The sella turcica is a saddle-shaped depression in the body of the sphenoid bone of human skull and of the skulls of other hominids including chimpanzees, orangutans, and gorillas. The pituitary gland of hypophysis is located within the most inferior aspect of the sella turcica, the hypophyseal fossa.

It serves as a cephalometric landmark. The morphology is very important for the cephalometric position of the reference point sella, not only for evaluating craniofacial morphology [13]. Knowledge of morphological variations is essential for understanding the etiology of some clinical symptoms and for safety in surgical management [14].

Gorden and Bell in 1922 examined radiographs of normal children in between 1 and 12 years of age and categorized sella turcica into three shapes, circular, oval, flat/saucer shaped. Circular or oval shaped sella turcica were observed in majority of subjects, and they arrived at a conclusion that not all cases could easily be put into such a broad three-way classification [15]. Axelsson, et al. conducted a study in Norway using lateral cephalometric radiographs

of males and females in age range of 6-21 year in 2004 to determine variations in size and shape of sella turcica. The sella turcica morphology was analyzed and five types of different morphological aberration like oblique anterior wall, bridging of sella turcica, double contour of the floor, irregular surface (notch like depression) in the posterior aspect of the dorsum sellae, pyramid-like shape of the dorsum sellae were recognized [12].

In our study, out of the 180 lateral cephalograms explored, the predominant shape was found to be 36.2% normal followed by 23.3% oblique anterior wall, pyramidal shape 15%, Double contour of the floor 11.6%, 10% irregular dorsum sella, 3.3% bridging in decreasing of frequencies. The most common morphology seen was normal (36.2%) which was in accordance with the previous studies conducted by E A Alkofide [16], Nagaraj, et al. [17], Haritha Pottipali Sathyanarayana, et al. [18], Chauhan, et al. [19], Boddeti SS, et al. [20], and the least common morphology seen was sella turcica bridging (3.3%) which was in accordance to the studies conducted by E A Alkofide [16], G. Magat, S. Ozcan Sener [21], and Boddeti SS, et al. [22].

In a study conducted by Nagaraj, et al. [17], the morphology was found to be 46.5% normal followed by oblique anterior wall 29%, sella turcica bridging 7.5%, irregular dorsum sella 7%, pyramid shape 6.5%, double contour of the floor 3.5%.

Another study conducted by Haritha Pottipali Sathyanarayana, et al. [18], the shape was found to be normal 61%, followed by irregular dorsum sella 15%, sella turcica bridge 8%, double contour 5.5%, pyramid shape 5.5%, oblique anterior wall 5%.

In our study, the normal morphology seen in 36.2%, which was almost at par with the studies conducted by and G. Magat, S. Ozcan Sener [21], they found the normal sella morphology in 39%.

Oblique anterior wall was seen in 23.3% which was almost at par with the study conducted by Nagaraj, et al. [17]. They found oblique anterior wall in 29%.

Double contour of the floor was seen in 11.6% which was in almost at par with the study conducted by G. Magat, S. Ozcan Sener [21]. They found double contour of the floor in 14.6%. Pyramid shape of the sella turcica was seen in 15% which was almost at par with the studies conducted by Boddeti SS, et al. [20], G. Magat, S. Ozcan Sener [21] and Arthrisri, et al. [22]. They found pyramid shape in 13.8%, 15.5% and 14.5% respectively.

## Conclusion

The exact dimensions of sella turcica are an important consideration in the diagnosis, prognosis, and treatment of diseases related to the pituitary gland and brain. The morphology of sella turcica is different from person to person. Morphological types of sella turcica in this study can be used as reference for additional investigators such as radiologists, orthodontists, maxillofacial surgeons, and neurosurgeons to interpret and plan surgical procedures involving the sellar region. Moreover, the studies in which internal carotid arteries, sphenoid air sinuses, cavernous sinuses, intracranial portions, and pituitary gland sizes are evaluated as three dimensional in both genders at different ages may provide clearer information about the morphology and shape of sella turcica.

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