

A Study on the Shape of Sella Turcica

Swapna R. Chavan*, A.S. Katti**, N.G. Herekar***

Abstract

The importance of size and shape of the sella turcica in connection with the occurrence of symptoms of pituitary diseases has long been recognized. Present study was aimed to study normal shape of Sella turcica by radiographs. In the present study, lateral radiographs of skulls of four hundred and forty seven subjects of known age (between 13 to 55 years) and sex (two hundred and thirty seven males; two hundred and ten females) were studied. The Sella Turcica is classified into three basic shapes Oval, Round & Flat. Oval shape is most commonly found and flat least commonly found in Maharashtrian population.

Keywords: Sella Turcica; Computed Radiographs; Pituitary Gland; Maharashtrian Population.

Introduction

The sella turcica is a structure easily recognized on lateral cephalometric radiographs and often used for cephalometric analysis. This makes it a good source of additional diagnostic information related to any pathology of the hypophysis, or to the various syndromes that affect the craniofacial region. According to Isadore Meschan [1], the deformity of sella turcica is an important and only clue that abnormality exists within the cranium; hence a familiarity with its anatomy and radiological appearance is essential.

The sella turcica, a deep depression in the floor of the skull which contains the pituitary gland. This word is translated from the Latin as "Turkish saddle", *sella* meaning saddle and *turcica*- "of the Turks". (called the *sella equestris* by Romans) the phrase "Turkish saddle" appeared, used by Europeans as a generic reference to any saddle with a high back and front. And so the rationale use of

sella turcica in anatomy, which began appearing in medical texts in the 17th century: the saddle-like fossa of the sphenoid bone which has a tall posterior "cantle" and anterior "pommel" (A. Carey) [2].

Schuller³ believed that the difference in the shape of the sella mainly dependant on the degree of development of sphenoid sinus. Lying under floor these must influence the changes in the sella turcica in pathological states. The radiographic interpretation and significance of changes in sella turcica are dependent upon the accurate knowledge of anatomy of this structure and closely related parts of brain and cranium [3].

According to Isadore Meschan [1], the deformity of sella turcica is often the only clue that abnormality exists within the cranium; hence a familiarity and knowledge with its anatomy and radiological appearance is essential.

Clinicians should be aware of the normal radiographic appearance and morphometric variations of this area, in order to identify and investigate deviations that may reflect pathological situations, even before these become clinically apparent (M. Andredaki) [4].

Author's Affiliation: *Assistant Professor, HBTMC & Dr. RNCH, Mumbai. **Associate Professor ***Professor and Head Dept. of Anatomy, Govt. Medical College, Miraj (MS) India.

Corresponding Author: Swapna R. Chavan, Assistant Professor, Department of Anatomy, HBT Medical College and Dr. R N Cooper Municipal General Hospital, (HBTMC & Dr. RNCH), Juhu, Mumbai- 400056.

E-mail: drswapnarc@gmail.com

Material & Method

A total four hundred and forty seven normal lateral view radiographs of skull were included in the study.

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Age groups selected were 13 to 55 years and out of total radiographs 237 male and 210 female computed radiographs obtained and measurements taken in radiology department of various institutes. Computed radiography (CR) method used. Radiographs of both sexes were taken with subject position – Lateral rotation of skull. X-ray tube focused on head. Cassette is placed below head. The center point is over the hypophyseal fossa – 1 cm above the orbitomeatal line and 2.5 cm anterior to the external auditory meatus with head in the true lateral position (Sutton) [3]. Exposure is made with tube voltage 50 – 90 KVP. The distance was 100 cm fixed between x-ray tube and film plate.

Radiographs of poor quality and abnormal sella

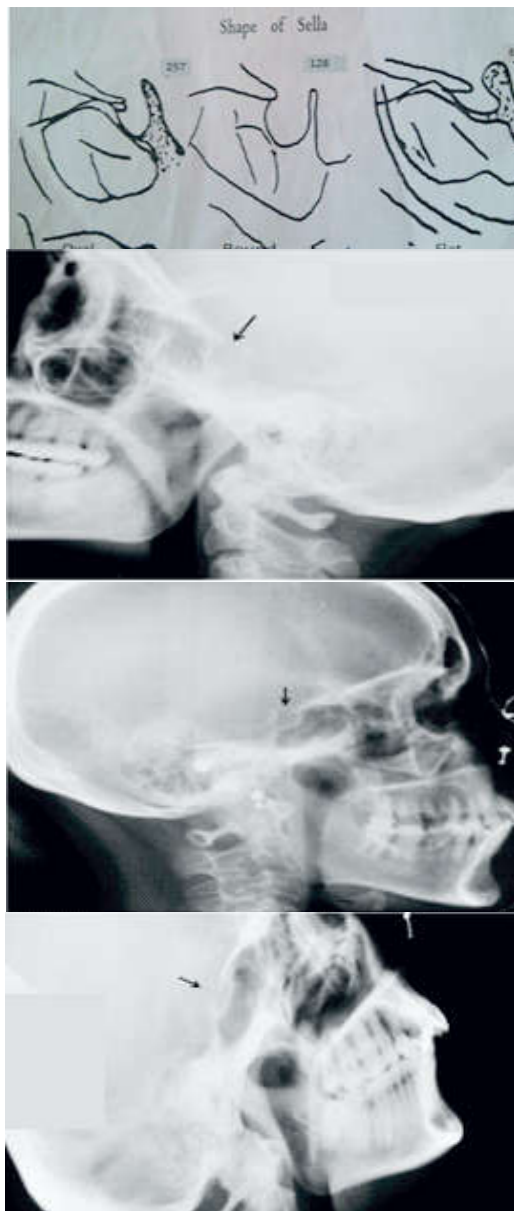


Fig. 1: Different shapes of Sella Turcica (Agrawal et al 1968)

turcica were excluded from the study.

Radiographs diagnosed as normal by experienced radiologist were included.

For present study shape of Sella Turcica divided into three (picture plate 1 shows).

1. Oval
2. Round
3. Flat

The age group chosen for present study is thirteen years to fifty five years as; in children the hypophyseal fossa increases with the growth of pituitary gland and becomes smaller if the gland decreases in size. The pituitary gland enlarges during the period of active growth, results in sella to enlarge with it. Later the pituitary gland may decrease in size but sella remain unchanged (Taveras and Wood) [5]. As age advances (result of age) atrophy of dorsum sellae may occur (Schuller) [3].

Observation

The results obtained are summarized in Table 1, Table 2, Table 3.

A total of 447 subjects were involved in study. Of this, 237 males and 210 females.

The various anatomical shapes of sella turcica seen in the study are shown in Table 1. The prominent shape of sella studied is oval [Figure 1].

It is observed that oval shape is most common (57.5%) in whole population. Next common shape is round (28.6%) and the rare shape is flat (13.9%).

Females

- In females, Oval shape is most common (51.42%), then next common shape found is round (34.76%) and rare shape is flat (13.80%).
- Percentage of round shape goes on increasing, whereas percentage of flat shape decreases with age.

Males

- Almost similar pattern found in that of Males.
- In 13-25 years age group percentage of flat shape is more than round whereas in 26 - 40 and 41 - 55 years age groups round shape is more common than flat.
- In males, Oval shape is most common (62.8%), then next common shape found is round (23.2%) and rare shape is flat (13.9%)

Table 1: Showing shape of sella turcica in whole sample size (M & F)

Shape	Female	Male	Total	%
Oval	108	149	257	57.5
Round	73	55	128	28.6
Flat	29	33	62	13.9
Total	210	237	447	100.0

$X^2 = 7.73$ $p = 0.02$, significant

Interpretation:- Shape of Sella turcica is dependent of Sex

Table 2: Distribution and comparison of males according to shape of sella turcica in different age groups

Age Group in years	Shape of sella turcica in males						Total
	Oval		Flat		Round		
	No.	%	No.	%	No.	%	
13 to 25	44	58.6	16	21.3	15	20	75
26 to 40	51	63.0	8	9.9	22	27.2	81
41 to 55	54	66.7	9	11.1	18	22.2	81
Total	149	62.8	33	13.9	55	23.2	237

$X^2 = 5.68$ $p = 0.22$, Not significant

Interpretation:- Shape of Sella turcica is independent of age in males

Table 3: Distribution and comparison of females according to shape of sella turcica in different age groups

Age Group	Shape of sella turcica in females						Total
	Oval		Flat		Round		
	No.	%	No.	%	No.	%	
13 to 25	37	47.4	23	29.5	18	23.1	78
26 to 40	44	60.3	03	4.1	26	35.6	73
41 to 55	27	45.8	03	5.1	29	49.2	59
Total	108	51.42	29	13.80	73	34.761	210

$X^2 = 30.42$ $p = 0.00004$, significant

Interpretation:- Shape of Sella turcica is dependent of age in females

Discussion

The sella turcica has been a subject of research for many workers.

The normal variation in the measurement of sella turcica were studied by Gordon and Bell (1921) [6], Enfield (1928) [7], Kornblum (1932) [8], Haas (1954) [9], Pendegrass et al (1956) [10], Jupe and Northfield (1956) [11], Mahmoud (1958) [12], Khanna (1962) [13], Lal et al (1965) [14], Agrawal et al (1968) [15].

Over 100 skulls of both sexes studied by Fitzgerald (1910) [16] and determined varying shapes of the fossa by series of cast.

Camp (1924) [17] classified the normal sella turcica into three types circular, oval and flat. And also mentioned the typical sellar changes associated with intra-sellar tumours as 1) Uniform circular enlargement of sella turcica 2) erosion and erection of dorsum sellae and 3) depression of sellar floor which may show a double line.

However in 1949 camp stated the fact is that "the circular uniformly enlarged sella, long recognised as characteristic of pituitary tumour may be produced by tumours situated elsewhere within cranial cavity"

Jones RM [18] in 2004 reported that the anatomy of sella turcica is variable in size and shape. He also classified sella turcica into three types: round, oval, flat. It can also be deep or shallow in both (children and adults).

M. Andredaki (2007) [4] Selected standardised lateral cephalograms of 184 healthy Greeks (91 males and 93 females) between the age group of 6 to 17 years. The tracings were superimposed using procrustes method and the average shape was computed. Principle component analysis (PCA) was used to assess shape variability. The data was correlated with centroid size, age and gender.

A. D. Zagga et al (2008) [19] classified the shape of the sella turcica into three types: round, oval and flat. It can also be deep or shallow in both children and adults. The floor of the sella turcica which in most cases is concave may be, flat or even convex. A total of 228 subjects were involved in this study. Of this 171 were males, and 57 were females.

- Table no. 4 shows that most commonly found shape is oval.
- It was noted among shape of sella turcica, majority of the workers have found least percentage of Flat sella, but B. N. Lal et al (1965) [14] and G. N.

- Agrawal et al (1968) [15] observed least percentage of round shape.
- In present study least found shape is Flat sella., similar findings are mentioned by Camp (1924) [17], Heublein (1946) [20], Isadore Meschan (1975)¹, S. K. Bhargava et al (1978) [21].
- The percentage of oval shape given by A. D. Zagga (2008) [19] are higher than present study.
- The sella turcica shape percentages of present study correlate with that of camp (1924) [17], S. K. Bhargava et al (1978) [21].
- Bhargava (1978) [21] has studied 1100 normal individuals (free from neurological ailments) to measure normal sella turcica in lateral view of skull taken at a constant focus film distance of 40" The shape of sella in present series is oval 60 percent, circular 24.8 percent and flat 15.2 percent.

Table 4: Showing comparison of sella turcica shape in male's of present study with the findings of previous studies.

Series	Oval %	Round %	Flat %
Camp (1924) ¹⁷	58	25	17
Heublein (1946) ²⁰	53	23	19
B. N. Lal et al (1965) ¹⁴	64.75	17.19	18.06
G. N. Agrawal et al (1968) ¹⁵	62.8	18.2	19
Isadore Meschan (1975) ¹	58	24.4	17.2
S. K. Bhargava et al (1978) ²¹	60	24.8	15.2
A. D. Zagga (2008) ¹⁹	83	11	6
Present study	57.5	28.6	13.9

Table 5: Showing age group wise comparison of sella turcica shape in Male's of present study with the findings of previous studies

Series	13-25			26-40			41-55		
	Oval %	Flat %	Round %	Oval %	Flat %	Round %	Oval %	Flat %	Round %
B. N. Lal et al (1965) ¹⁴	55.0	29.3	16.6	73.0	1.9	24.4	67.2	6.56	26.2
G. N. Agrawal et al (1968) ¹⁵	53	28	19	70	4	26	65	7	28
Present study	52.9	25.4	21.5	61.6	7.14	31.16	57.8	8.57	33.57

- Table 5 shows the most predominant shape found is oval. Second most common shape is round except in 13 – 25 years age group where flat shape is more common than round.
- In the study of B. N. Lal et al (1965) [14] and G. N. Agrawal et al (1968) [15] as the age advances percentage of flat shape decreases whereas oval and round shape increase comparatively. Exactly similar findings are observed in present study.
- Thus our study correlates well with B. N. Lal et al (1965) [14] and G. N. Agrawal et al (1968) [15].
- Predominant oval and round shape with the advancement of age may implies that the depth of sella keeps on increasing till much later age than length of sella (Lal et al) [14].
- This increase in depth is at the cost of sphenoid sinus (Agrawal et al) [15].

Summary & Conclusion

Total four hundred and forty seven (237 male and 210 Female) lateral view radiographs of skull of age 13 to 55 years were studied.

Most frequent shape of sella turcica has been found to be oval in all age groups; with a maximum of 61.6% in 26-40 years age group. However the incidence of round sella was significantly higher in the elderly age groups.

Thus, from the present study, different shapes of sella turcica were obtained from normal radiographs of Maharastrian subjects. Careful study of the shapes can be used in radiological detection of pituitary tumours, suprasellar or parasellar tumours etc. Thus this study presents comprehensive data about shape of sella turcica. The normal shape can be used as

reference values for evaluating various pathological (clinical) conditions related to sella turcica in Maharashtra population.

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