

Analysis of shapes of Sella Turcica by computed tomography in North Karnataka region.

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Abstract

Background: Sella turcica is an important structure of middle cranial fossa and is bounded by dura of cavernous sinuses bilaterally, the lamina dura and dorsum sellae posteriorly and the tuberculum sellae and planum sphenoidale anteriorly. Precise anatomical knowledge of sella turcica is of utmost importance for radiologists to interpret well for the sellar region pathologies.

Aim: The present study was undertaken to study the normal shapes of sella turcica and to determine difference between the shapes of sella turcica and the age groups.

Material and methods: One thousand six hundred and fifty computed tomographic images (male and female) of healthy Indians of North Karnataka region aged 21-70 years were collected. Radiant dicom viewer software was used to determine shapes of sella turcica in different age groups.

Results: In the present study, oval type was the commonest (82%), followed by round shape (10%), and flat shape was the least common shape (8%). There was no statistical significant difference observed between the shapes and the age groups.

Conclusion: The results of the present study provide morphology of sella turcica with respect to shapes in this geographic area, which may be useful for further research and for management of sella turcica and pituitary diseases.

Key words: Sella turcica, Computed tomography, Shapes

Introduction

Sella turcica, the seat of master endocrine gland pituitary, is an important structure of the middle cranial fossa and is bounded by dura of cavernous sinuses bilaterally, the lamina dura and dorsum sellae posteriorly and the tuberculum sellae and planum sphenoidale anteriorly^[1].

The importance of size and shape of sella turcica in connection with the occurrence of symptoms of pituitary diseases has long been recognized^[2]. The enlarged sella on a radiograph has been found to be associated with Adenomas, Meningiomas, Primary hypothyroidism, Prolactinoma, Gigantism, Acromegaly, Empty sella syndrome, Nelson syndrome. A small size may lead to decreased pituitary function causing symptoms such as short stature^[3].

The sella turcica is variable in size and shape. It has been classified into three types: round, oval and flat^[4]. The sella at times appears to be an excavation beneath the anterior clinoids. This is frequently described in children and has no pathological significance. The floor of sella turcica which in most of the cases is concave may be flat or even convex^[5]. It can also be deep or shallow in both children and adults^[6].

On review of literature, there were very few studies done using lateral cephalometric radiographs to determine the shape of sella turcica and very few studies in Indian population. The CT scan is a superior option than the X- ray to study bony parameters. This study was therefore designed to describe the normal variants of the anatomical shapes of sella turcica.

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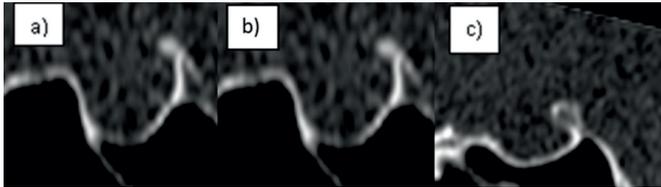
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Materials and methods

After obtaining ethical clearance from the institutional ethics committee (clearance letter number SNMC/IECHSR/2015-16/A-09-1.1 dated 26.08.2015), the study was conducted from December 2015 to November 2017. This study was a hospital based cross sectional study. 1650 Computed tomographic images of skulls covering sellar regions from patients of age group between 21-70 years of both the genders (male - 781 and female - 869) from Department of Radiology, S. N. Medical College and HSK hospital and RC, Bagalkot, Karnataka were collected. The subjects were divided into five age groups with the interval of ten years. The images were analyzed for the shapes of sella turcica by using radiant dicom viewer software (Figure 1). Relevant clinical features of the patients were also collected. CT images of normal brain, PNS covering sellar region and CT images having clear visualization with recognition of dorsum sellae and tuberculum sellae were included in this study. CT images of road traffic accident cases, craniofacial deviation, sellar region pathologies, head injury cases and poor quality images were excluded.

Figure 1. Shapes of sella turcica (a) Oval b) Circular c) Flat)



Results

One thousand six hundred and fifty images were analyzed in this study. 47.33% (781) of the images were of male and the remaining 52.67% (869) were of females and the range of age was 21- 70 years. Oval type was the commonest (82%), followed by round shape (10%), flat shape was the least common shape (8%). There was no statistical significant difference observed between the shapes and the age groups. (Table 1 and Table 2 and Table 3.)

Table 1: Shapes of sella turcica

Shape	Number (Percentage)
Oval	1097 (66.30)
Circular	418 (25.33)
Flat	135 (8.18)

Table 2: Distribution of different shapes of sella turcica in males of different age groups

AGE GROUPS	OVAL	CIRCULAR	FLAT
21-30 YEARS (n- 288)	183	74	31
31-40 YEARS (n- 187)	109	58	20
41-50 YEARS (n- 108)	77	23	08
51-60 YEARS (n- 123)	79	35	09
61-70 YEARS (n- 75)	58	12	05

*Chi square test was used to find the significance. There was no statistical significance observed between the shapes and the age groups in males (χ^2 value = 12.29, P value of 0.14)

Table 3: Distribution of different shapes of sella turcica in females of different age groups

AGE GROUPS	OVAL	CIRCULAR	FLAT
21-30 YEARS (n- 280)	194	69	17
31-40 YEARS (n- 240)	159	63	18
41-50 YEARS (n- 109)	63	36	10
51-60 YEARS (n- 131)	90	28	13
61-70 YEARS (n- 109)	85	20	04

*Chi square test with Yates corrections was used to find the significance. There was no statistical significance observed between the shapes and the age groups in females. (χ^2 value = 13.45, P value of 0.10)

Discussion

Gorden et al examined radiographs of normal children between 1 and 12 years of age and categorized sella turcica into three shapes i. e., circular, oval and flat shaped. Circular and oval shaped sella turcica were observed in the majority of subjects^[7].

Axelsson et al conducted a study in Norway by using lateral cephalometric radiographs. The sella turcica morphology was analyzed and five types of different morphological variations like oblique anterior wall, bridging of sella turcica, double contour of the floor, irregular surface in posterior aspect of dorsum sellae, pyramid like shape of dorsum sellae were recognized^[8].

The morphological variations of the sella turcica are commonly seen in syndromic patients such as in Holoprosencephaly, in which, anterior wall of sella is deviant and partly absent^[9]. In Trisomy 21, the anterior wall is affected in different degrees, from a slight depression in the lower aspect of the anterior wall to more severe cases where the anterior wall is completely separated from the posterior wall^[10]. Anterior wall of sella was uneven in Meckel Gruber syndrome^[11]. In Trisomy 18, sella turcica appears with a malformed posterior wall, with a broad base and often with several notches in the posterior wall^[12].

Alkofide conducted a study to evaluate the morphological shapes of sella turcica in cleft lip and palate patients. Majority of these subjects had morphological aberrations such as double contour of the floor, an irregular posterior wall was found more commonly than normal shaped sella turcica^[13]. J shaped sella was found in intracranial aneurysm^[14].

The three types of sella turcica (circular, oval and flat) reported by Jones et al have also been observed in this study. Jones et al did not report the percentage prevalence of each anatomical type of sella turcica^[15]. In the present study, oval type is the commonest 82%, round 10%, and flat was the least common (8%).

Conclusion

The result of this study will serve as a normative reference standard that could assist in more objective evaluation and detection of pathological conditions of sella turcica and pituitary gland. These findings would also help the radiologist to interpret well for the sellar region pathologies.

References

1. Orrison W. *Neuro imaging. Vol 1. Philadelphia: W.B. Saunders Company; 2000. p. 680-2.*
2. Shaha LV, Patil BG, Kolagi SI. *Computed tomographic study of morphometry of sella turcica in north Karnataka region. J. Pharma. Sci. & Res 2017; 9(8): 1260-1262.*
3. Meyer MP, Reuther T, Stellzig EA. *Bridging of sella turcica in skeletal class I,II,III subjects. Eur J Orthod 2010; 32: 148-153.*
- 4) Jones RM, Faqir A, Millet DT, Mous KF, McHugh S. *Bridging and dimensions of sella turcica in subjects treated by surgical orthodontics means or orthodontics only. Angle Orthod. 2004;75:714-718.*
5. Bruneton JN, Drouillard JP, Sabatier JC, Elie GP, Travenir JF. *Normal variants of the sella turcica. Comparison of plain radiographs and tomograms in 200 cases. Radiology. 1979;131:99-104*
6. Meschan I. *An atlas of anatomy: basic to radiology. Philadelphia: W. B. Saunders; 1976. p. 343-349.*
7. Shaha AM, Bashir U, Ilyas T. *The shape and size of sella turcica in skeletal class I,II,III patients presenting in Islamic international dental hospital, Islamabad. Pak Oral Dent J 2011;31:104-110.*
8. Axelsson S, Storhaug K, Kajer I. *Post natal size and morphology of the sella turcica. Longitudinal cephalometric standards for Norwegians between 6 and 21 years of age. Eur J Orthod 2004;26:597-604.*
- 9) Kjaer I, Fischer-Hansen B. *Human fetal pituitary gland in holoprosencephaly and anencephaly. J Craniofac Genet Dev Biol 1995;15(4):222-9.*

10. Kjaer I, Keeling JW, Reintoft I, Nolting D, Fischer Hansen B. *Pituitary gland and sella turcica in human trisomy 21 fetuses related to axial skeletal development. Am J Med Genet. 1998 Dec 28;80(5):494-500.*
11. Kjaer KW, Hansen BF, Keeling JW, Nolting D, Kjaer I. *Malformations of cranial base structures and pituitary gland in prenatal Meckel syndrome. APMIS 1999b; 107: 937-944.*
12. Kjaer I, Keeling JW, Reintoft I, Hjalgrim H, Nolting D, Fischer Hansen B. *Pituitary gland and sella turcica in human trisomy 18 fetuses. Am J Med Genet A 1998;76:87-92.*
13. Alkofide EA. *Sella turcica morphology and dimensions in cleft subjects. Cleft Palate Craniofacial J 2008;45:647-653.*
14. Wren MWG. *Significance of the so called J shaped sella in the diagnosis of intracranial aneurysm. Brit J Ophthal 1969;53:307-309.*
15. Jones RM, Faqir A, Millet DT, Mous KF, McHugh S. *Bridging and dimensions of sella turcica in subjects treated by surgical orthodontics means or orthodontics only. Angle Orthod. 2004;75:714-718.*

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