

# Morphometric analysis of opticochiasmatic apparatus in South Indian human dry skulls

V. T. Thamaraiselvi, Dinesh Premavathy\*

## ABSTRACT

**Aim:** This study aims to analyze the morphometry of opticochiasmatic apparatus in South Indian dry skulls. **Introduction:** Opticochiasmatic apparatus includes clinoid processes, sulcus chiasmaticus, hypophyseal fossa, and optic canal. Anatomically and clinically, this area is considered as very important and highly complicated area to approach in surgical conditions due to close association of anatomical structures such as optic and its vessels, hypophysis cerebri with infundibulum, cavernous sinuses. **Materials and Methods:** The study used dry skulls of South Indian populations and Vernier caliper for measurement. **Results:** According to the present study, the mean value of interanterior clinoid process and interposterior clinoid process is 18.25 mm and 12.53 mm. The mean of distances between anterior and posterior clinoid process on the right and left side is 13.41 mm and 13.55 mm, respectively. The mean of distance of the oblique axis between the right anterior clinoid and left posterior clinoid processes is 16.83 mm and for the distance of the oblique axis between the left anterior clinoid and right posterior clinoid process is 18.14 mm. The mean for the diameter of hypophyseal fossa and optic canal of the right and left side is 12.4 mm, 4.36 mm, and 4.31 mm, respectively. For the sulcus chiasmaticus is 14.92 mm. **Conclusion:** The present study thus concluded that the morphometric knowledge of opticochiasmatic apparatus is of utmost important in anthropological studies and operative surgeries.

**KEY WORDS:** Clinoid process, Hypophyseal fossa, Sella turcica

## INTRODUCTION

The hypophyseal fossa is seen in the middle cranial fossa in the cranial cavity. It is a saddle-shaped depression found in the body of the sphenoid bone and in between the tuberculum sellae and dorsum sellae. It forms the base for the sella turcica so that the hypophysis cerebri or pituitary gland lodges in this fossa. The boundaries of hypophyseal fossa are anteriorly by the tuberculum sellae, posteriorly by the dorsum sellae, and laterally between the cavernous sinuses. It is important to know the dimensions the hypophyseal fossa for the surgical procedures, i.e., tumors in the pituitary gland, hypophyseal adenomas, cavernous sinus adenoma, pathological conditions of the pituitary, and treatment planning for orthodontic treatments.<sup>[1-4]</sup>

The anterior clinoid process is situated in the medial side of the posterior border in the lesser wing of the sphenoid

bone in the middle cranial cavity. The structures related to the anterior clinoid process are in ophthalmic artery a branch of internal carotid artery, carotid groove, and occasionally caroticoclinoid foramen. It is important to study and know about the anatomical alterations in the clinoid process as it is essential in neurosurgeries such as aneurysms in sella turcica regions and anterior clinoidectomy procedures.<sup>[5-7]</sup>

The superior surface in the body of the sphenoid bone has a ridge behind it forms the anterior border of the sulcus chiasmaticus, behind, it lies the optic chiasma of the optic nerve. On either side of it lies the optic foramen which transmits the ophthalmic artery and the optic nerve into orbit.<sup>[8]</sup> During the endoscopic procedures in the cavernous sinus and the sulcus chiasma region, it is important to know about the anatomical location and the variations in this region.<sup>[9]</sup>

Optic foramen opens into the optic canal in the sphenoid bone. The optic canal is related medically to the body of the sphenoid bone and laterally to the lesser wing of the sphenoid.<sup>[8]</sup> It is bounded by

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Department of Anatomy, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, Tamil Nadu, India

\*Corresponding author: Dr. Dinesh Premavathy, Department of Anatomy, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road, Chennai – 600 077, Tamil Nadu, India. Mobile: +91-8939307076. E-mail: [dinesh801anatomy@gmail.com](mailto:dinesh801anatomy@gmail.com)

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the anterior clinoid process laterally and medially by the sphenoidal air sinus.<sup>[10]</sup> The optic canal transmits important structures such as optic nerve and ophthalmic artery with the sympathetic nerve fibers into orbital cavity. The optic canal lies in between a flat anterior root and a thick posterior root; these roots connect the body of the sphenoid and the lesser wing of the sphenoid.<sup>[11]</sup> This region is given more importance because any damage to the optic canal may impair the vision. Hence, it is very much essential to have on knowledge on basic of the optic canal as it used in the neurosurgeries, malignant tumor, and angioma in the lesser wing of sphenoid; the surgical procedure is through the optic canal.<sup>[10]</sup>

The present study focuses on the opticochiasmatic apparatus, which includes the clinoid processes, sulcus chiasmaticus, sphenoidal ridge, hypophyseal fossa, and optic canal. The purpose of this study is to analyze the morphometry of the opticochiasmatic apparatus. The opticochiasmatic apparatus plays a great role in the optic canal related surgeries and other neurological surgeries.

## MATERIALS AND METHODS

A total of 30 dry human skulls from the Department of Anatomy in Saveetha Dental College were used to carry out this study. The parameters included in this study are interanterior clinoid process distance, interposterior clinoid process distance, distances between anterior and posterior clinoid process on the right and left side, distance of the oblique axis between the right anterior clinoid and left posterior clinoid processes, distance of the oblique axis between the left anterior clinoid and right posterior clinoid processes, diameter of hypophyseal fossa, and diameter of optic canal and sulcus chiasmaticus measured using a digital Vernier caliper. The data were obtained and statistically analyzed.

## RESULTS

The present study shows that the mean length of the interanterior clinoid process is  $18.258 \pm 0.09$  mm and interposterior clinoid process is  $12.53 \pm 0.06$  mm. The distance between the anterior and posterior clinoid process on the right and left side is  $13.41 \pm 0.07$  mm and  $13.55 \pm 0.07$  mm, respectively. The oblique axis between the right anterior and left clinoid processes was found to be  $16.83 \pm 0.08$  mm, and similarly, the oblique axis between the left anterior and right clinoid processes was  $18.14 \pm 0.08$  mm. The diameter of the optic canal on the right and the left side was  $4.36 \pm 0.01$  mm and  $4.31 \pm 0.01$  mm, respectively. The diameter of the hypophyseal fossa was  $12.4 \pm 0.06$  mm. The sulcus chiasmaticus was measured to be  $14.92 \pm 0.08$  mm.

## DISCUSSION

The opticochiasmatic apparatus is one of the most important structures associated with structures such as anterior clinoid, sphenoidal ridge, optic canal, posterior clinoid, sulcus chiasmaticus, and hypophyseal fossa. The opticochiasmatic apparatus is involved in neurological surgeries. The lesions or aneurysms or tumor in this area can be approached pterional, subtemporal approach, facial translocation approach, extended basal frontal approach, etc.<sup>[12]</sup>

The results of the present investigation reported that the average length of the interanterior clinoid process was  $18.258 \pm 0.09$  mm [Figure 1]. The length of interanterior clinoid process was statistically significant ( $P < 0.05$ ). There was no previous study conducted to measure the length of the interclinoid process. The average length of the interposterior clinoid process was  $12.53 \pm 0.06$  mm [Figure 1]. The length of interposterior clinoid process was not statistically significant ( $P < 0.05$ ).

The average distance between the anterior and posterior clinoid processes on the right and left side is  $13.41 \pm 0.07$  mm and  $13.55 \pm 0.07$  mm, respectively [Figure 2]. The average distance between the anterior and posterior clinoid processes was not statistically significant ( $P < 0.05$ ). The oblique axis between the right anterior and left clinoid processes was found to be  $16.83 \pm 0.08$  mm [Figure 3]. The results are not statistically significant ( $P < 0.05$ ). The oblique axis between the left anterior and right clinoid processes was  $18.14 \pm 0.08$  mm [Figure 3]. The results are also statistically significant ( $P < 0.05$ ). This is to our knowledge, there are no previous studies conducted regarding the oblique axis between clinoid process measurements.

The average diameter of the optic canal on the right and left side is  $4.36 \pm 0.01$  mm and  $4.31 \pm 0.01$  mm, respectively [Figure 4]. The results obtained in the study conducted by Purohit *et al.*, 2016,<sup>[13]</sup> are

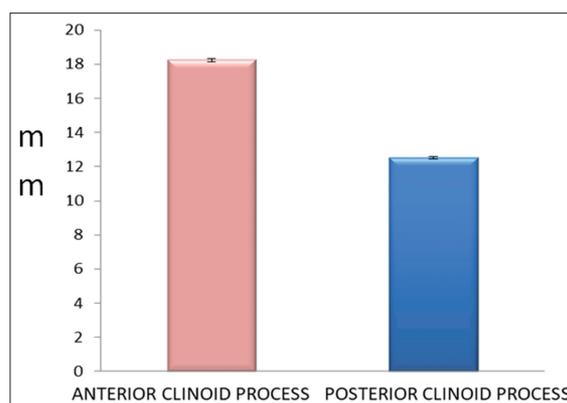
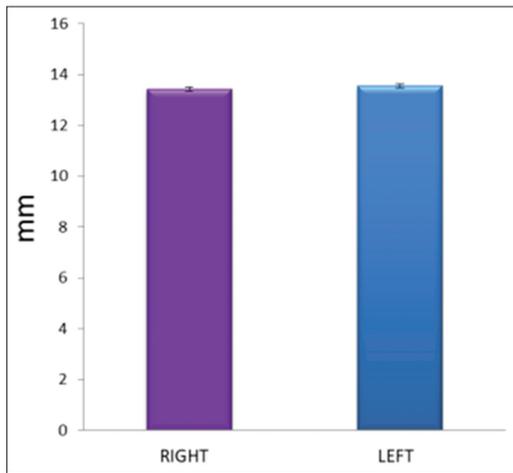
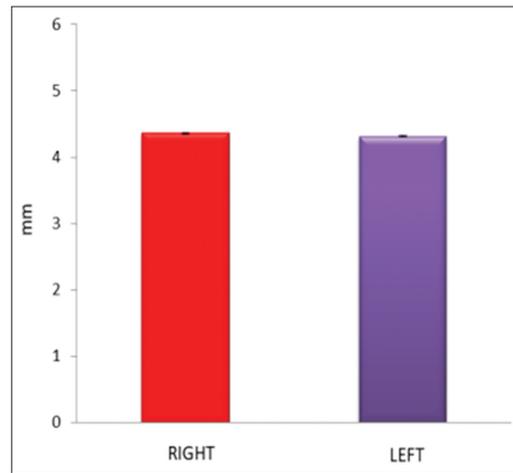


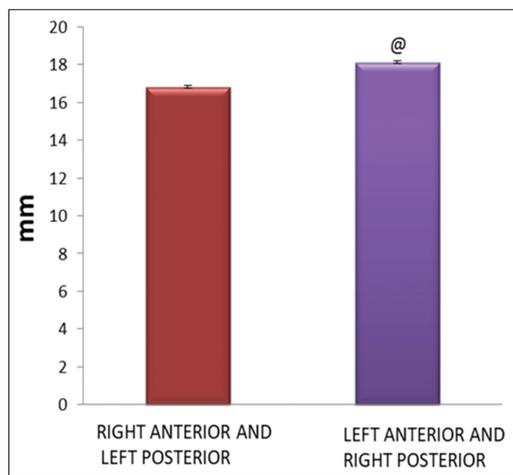
Figure 1: Distance between interclinoid processes



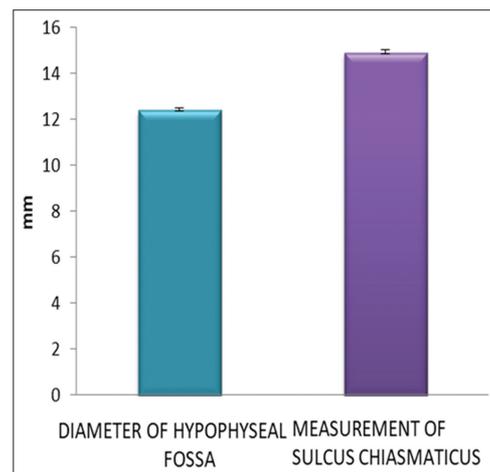
**Figure 2:** Distance between the anterior clinoid and posterior clinoid processes



**Figure 4:** Diameter of optic canal



**Figure 3:** Oblique axis between the clinoid processes



**Figure 5:** Diameter of hypophyseal measurement of fossa sulcus chiasmaticus

5.03 ± 0.72 mm and 5.02 ± 0.76 mm in the right and left side, respectively, similar to the current study.

The average diameter of the hypophyseal fossa in the present study was 12.4 ± 0.06 mm [Figure 5]. The results obtained in the study conducted by Konwar *et al.*, 2016,<sup>[14]</sup> are 7.70 ± 0.99 mm and 7.55 ± 1.28 mm in male and female, respectively. The results obtained in the study are not statistically significant ( $P < 0.05$ ). The dimension of sulcus chiasmaticus is 14.92 ± 0.08 mm [Figure 5]. The results obtained in the study are not statistically significant ( $P < 0.05$ ).

## CONCLUSION

The present study thus concluded that the morphometric knowledge of opticochiasmatic apparatus is of utmost important in anthropological studies and operative surgeries.

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