

Morphological and morphometrical analysis of sphenoidal tubercle with reference to spine of sphenoid bone in dry human skull

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ABSTRACT

Introduction: The sphenoid bone is an unpaired bone of the neurocranium. It is arranged in the norma basalis part of skull toward the front, before the temporal bone, and the basilar part of the occipital bone. This bone accidentally presents varied morphology so its description and denomination are a topic of discussion. The aim of the study is to determine the morphological and morphometrical analysis of sphenoidal tubercle with reference to the spine of sphenoidal bone.

Materials and Methods: The study was performed in 50 dry human skull bones of unknown sex and without any gross abnormality was collected from the Department of Anatomy, Saveetha Dental College, Chennai, for evaluation. Anteroposterior, transverse, and vertical diameter at the base of sphenoidal tubercle were measured. Values are expressed as mean \pm standard deviation. **Results:** The maximum anteroposterior diameter of the sphenoidal tubercle is 6.33 mm and the minimum is 1.55 mm. The maximum vertical diameter of the sphenoidal tubercle is 6.71 mm and the minimum is 0.87 mm. The maximum transverse diameter of the sphenoidal tubercle is 7.11 mm and the minimum is 0.93 mm. **Conclusion:** Due to the localization of the sphenoid tubercle in close proximity to the maxillary artery groove and maxillary nerve groove, it serves as an anatomical landmark that should be considered as a parameter for the surgical approach of the infratemporal fossa and the neurovascular elements contained in it.

KEY WORDS: Morphology, Morphometry, Sphenoid bone, Sphenoidal tubercle, Spine of sphenoid bone

INTRODUCTION

The sphenoid bone is an irregular type of unpaired bone of the cranium forming the middle cranial fossa. It is arranged in the norma basalis part of the skull toward the front, before the temporal bone, and the basilar part of the occipital bone. The sphenoid bone is one of the very important bones of the neurocranium. Its shape resembles that of a butterfly or bat in containing a central body, two wings on each side and processes. Sphenoidal tubercle is a bony elevation located in the anterior edge of the infratemporal crest of the sphenoid greater wing, where the temporal and lateral pterygoid muscles have their origin.^[1] This bone accidentally presents varied morphology so its description and denomination are a topic of discussion. Sphenoidal

tubercle is a constant bone accident with a varied morphology and measures.^[2] Due to its anatomical relations with important neurovascular elements such as the maxillary artery and the maxillary nerve, it may be used as a reference point for surgical access to the infratemporal fossa.^[3]

The infratemporal spine, or sphenoidal tubercle, is a bony structure described in both classical anatomical literature and contemporary literature. However, the available literature does not mention the specific anatomical characteristics or the distribution of this bony element in the population. Sphenoidal tubercle is a surgical reference point for the search of maxillary nerve in the surgical access to the infratemporal fossa, considering its close relationship with the groove of the maxillary nerve located in the maxillary tuberosity when it is heading toward the orbit through the inferior orbital fissure such as infraorbital nerve and the relation established through the origin of the deep portion of the temporal muscle with the foramen rotundum.^[4,5]

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Moreover, the superficial variant of maxillary artery presents a lateral pathway respect to lateral pterygoid muscle, getting closer to infratemporal crest and sphenoidal tubercle. This variant is presented in about 45% of cases, although in oriental population, it has been documented a frequency of 93%.^[6]

A distinct sulcus can be observed in the maxillary tuberosity. The presence of this sulcus is defined in several classical textbooks of anatomy. The sulcus is concave anteriorly in which the maxillary artery traverses during its course through the infratemporal region and thus has a close relationship with the maxillary tuberosity.^[7,8] Sphenoidal tubercle presents a varied morphology and measurements which indicates that receive external influences, possibly associated with muscular traction generated by the deep portion of temporal muscle and lateral pterygoid muscle.^[9] Considering this variant and the surgical relevance due to its neurovascular relations, our objective is to determine the morphological and morphometric characteristics of sphenoidal tubercle and also establish the relationship with bone parameters associated to maxillary nerve and maxillary artery pathways.^[10]

MATERIALS AND METHODS

A cross-sectional study was performed on 50 dry human skull bones of unknown sex and without any gross abnormality which was collected from the Department of Anatomy, Saveetha Dental College, Chennai, for evaluation. With the help of Vernier caliper, the measurements such as anteroposterior diameter, vertical diameter, and transverse diameter were measured at the base of sphenoidal tubercle to establish the sphenoidal tubercle dimensions. The vertical diameter was measured from the base, at the level of infratemporal crest, to its apex, or

the inferior margin according to the morphological pattern presented. The results obtained were analyzed, tabulated, and represented graphically.

RESULTS

The data observed from the morphometrical dimensions of sphenoidal tubercle of this study are shown in Table 1 and Figure 1. The maximum anteroposterior diameter of the sphenoidal tubercle is 6.33 mm and the minimum is 1.55 mm. The maximum vertical diameter of the sphenoidal tubercle is 6.71 mm and the minimum is 0.87 mm. The maximum transverse diameter of the sphenoidal tubercle is 7.11 mm and the minimum is 0.93 mm. The mean anteroposterior diameter of the sphenoidal tubercle was 3.94 mm, vertical diameter was 3.78 mm, and transverse diameter was found to be 4.02 mm.

DISCUSSION

Ramos *et al.* reported that sphenoidal tubercle had a prevalence of 98.3% of all dry skulls analyzed with a bilateral presentation in 76.6% of the cases.^[4] Cáceres *et al.* conducted a study on 57 skulls, of indeterminate sex and age. The findings of this study showed that the

Table 1: Range of morphometrical values of sphenoidal tubercle (mm)

Morphometry	Range of sphenoidal tubercle (mm)		
	Maximum (mm)	Minimum (mm)	Mean (mm)
Anteroposterior diameter	6.33	1.55	3.94
Vertical diameter	6.71	0.87	3.78
Transverse diameter	7.11	0.93	4.02

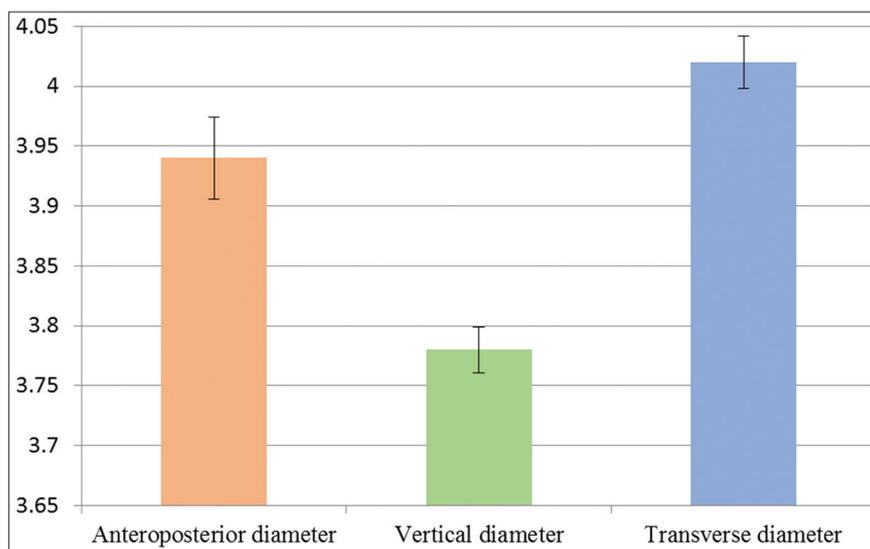


Figure 1: Graph showing various measurements of sphenoidal tubercle (mm). The values are expressed as mean ± standard deviation

morphometry of the sphenoidal tubercle. According to him, the pyramidal form of tubercle was the most frequent type with 25.7% of occurrence. The average diameters were of 4.12 mm anteroposterior, 5.50 mm transverse, and 3.89 mm vertical. The average distance to the grooves of the maxillary artery and maxillary nerve was 9.04 mm and 7.6 mm, respectively.^[9]

While a conventional anatomy textbook names this bony process as a tubercle, a few writers have proposed a difference in section to infratemporal spine.^[11,12] Due to their perceptions, where the structural morphology presents a higher recurrence, particularly the spiniform subtype of the tubercle.^[13,14] The location and dimension of the sphenoidal tubercle vary in different bony skeleton, and a correct and clear knowledge of its structural variations provides some basic information on its clinical implication.

CONCLUSION

Due to the localization of the sphenoid tubercle in close proximity to the maxillary artery groove and maxillary nerve groove, it serves as an anatomical structural landmark that should be considered as a parameter for the surgical approach of the infratemporal fossa and the neurovascular elements contained in it.

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