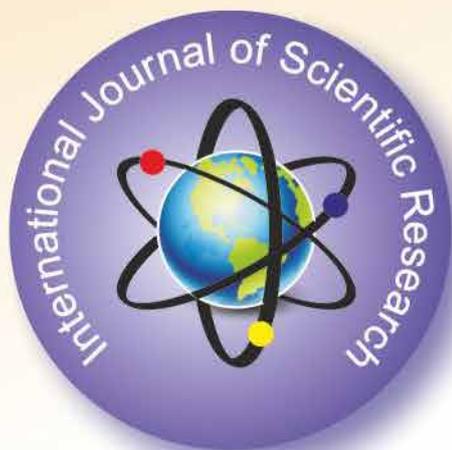


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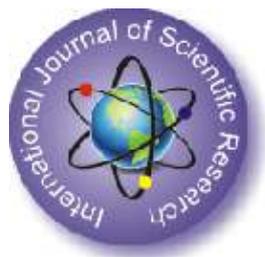
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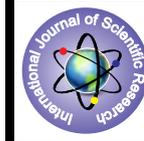
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## Study on Sphenoid Sinuses Variants in Magnetic Resonance Imaging of South Indian Population



### Medical Science

**KEYWORDS :** Carotid artery, Sinus, Magnetic Resonance Imaging, Variation, endoscopic endonasal transsphenoidal approach

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### ABSTRACT

*The aims of this study are to evaluate the incidence of the different anatomical variations of the sphenoid sinus that are relevant to trans-sphenoid pituitary surgery as detected by preoperative MRI and CT scans and to highlight the impact of these variations on this type of surgery.*

*The MRI scan of 95 patients were reviewed regarding the different anatomical variations of the sphenoid sinus: protrusion of internal carotid artery (ICA) and optic nerve (ON), and dehiscence of the walls of ICA and ON, and the septation pattern. We found 55 cases showing protrusion and 16 cases with dehiscence of bony wall on ICA. In 57 cases showing protrusion and 23 cases showing dehiscence on bony wall of optic nerve. The different anatomical configuration of sphenoid sinus is important for adequate treatment of its disease*

### Introduction:

Sphenoid sinuses are most inaccessible paranasal sinuses and are surrounded by significant anatomical structures such as the orbit and its contents, cavernous sinus and ICA and the anterior cranial fossa. Only thin plates of bones separate these structures from the sphenoid sinus<sup>1</sup>. The endoscopic endonasal transsphenoidal (EETA) approach is in widespread use for the treatment of sphenoid sinus, and sellar and suprasellar tumours. It appears to be less traumatic than the traditional microsurgical approach with reduced intra- and post operative complications<sup>2</sup>. Sphenoid septum is an important landmark during the endonasal endoscopic trans-sphenoid approach to important structures such as the carotid artery, optic canal, and skull base<sup>3,4</sup>. Pneumatisation of these irregular cavities ranged from their absence to extensive. According to the extent of sinus pneumatization, the bone covering carotid arteries and optic nerves can be thin or even absent, making these structures susceptible to iatrogenic injury<sup>2</sup>.

Injury to internal carotid artery or optic nerve is a serious complication of trans sphenoid surgery<sup>3</sup>. The different routes to the sella include transethmoidal, transnasal, trans-septal whether microscopic or endoscopic, ultimately pass through the sphenoid sinus to reach the sella. Therefore anatomical variations of the sphenoid sinus have major impact on the surgical access and the possibility of complications<sup>5</sup>. MRI is the most precise imaging technique to demonstrate paranasal air sinuses. Axial and coronal views may be useful for delineating the anatomical landmarks of the sinusoidal cavity, but coronal scans shows progressively deeper structures as they are encountered by the surgeon during the operation<sup>4</sup>.

The aim of the study is to evaluate the incidence of the different anatomical variations of the sphenoid sinus that are relevant to trans- sphenoidal pituitary surgery.

### Materials and methods:

This prospective study comprised 95 paranasal MRI scan of the south Indian patients attending the E.N.T. department of our medical college. Patients aged between 16 to 60 years, who are subjected to radiological investigations after a clinical examination and diagnosis in sinusitis were included for the study. Patients with prior sinus surgery, sinonasal tumours, facial trauma and patients younger than 16 years were excluded because the extension of nasal cavity into the body of the sphenoid sinus is present before birth but does not reach its full extension until adolescence.

For the imaging studies, systemic studies of the nasal sinus region were performed in coronal scans of all cases. In all the patients, the (1) protrusion of internal carotid artery (ICA) and the optic nerve (ON) (2) dehiscence of the bony wall of ICA and ON. In coronal sections, protrusion of ICA and ON was determined by finding any degree of protrusion of the structures into sinus cavity and dehiscence is defined as absence of visible bone den-

sity separating the sinus from the concerned structure. Whenever a clear decision between very thin wall and total dehiscence was not feasible the results were accepted as dehiscence.

Bar Diagram 1 about here

Bar Diagram 2 about here

### Discussion:

Sphenoid sinus is extremely variable in size, shape and relation to the sella. Transsphenoid surgery, either microscopic or endoscopic is a safe procedure. Combination of trans-sphenoid route with the endoscopic or neuronavigation may improve the effectiveness of operation. Sphenoid sinuses are the most inaccessible paranasal sinuses and are surrounded by significant anatomical structures such as the orbit and its contents, cavernous sinus and ICA and the anterior cranial fossa. Only thin plates of bones separate these structures from the sphenoid sinus (Bademci G et al., 2005).

### Internal carotid artery:

Hewadi et al., reported that the internal carotid artery was protruded into the sinus cavity in 41% of patients, and dehiscence of the artery in 30% (Hewaidi GH, Omami GM et al.). Sirikei et al., encountered least incidence of 26.1% protrusion of ICA. Whereas higher incidence of protrusion of ICA was reported by Sethi et al., 93% and dehiscence by Davoodi et al., 41.95% (Davoodi M et al., 2008). In this study, we found that protrusion of internal carotid artery into the sphenoid sinus in 57.89% of patients, and dehiscence of the artery was found in 16.8% of cases. If the surgeon is unaware of dehiscence or protrusion of the artery, fatal hemorrhage can occur because it is hardly possible to control the bleeding from a ruptured ICA within the sphenoid sinus.

### Optic nerve:

Studies done by Bademci et al., reported 34.4% of protrusion of the ON into sinus cavity. Higher rates of protrusion of ON was reported by Davoodi et al., 36.45% (Davoodi M et al., 2008). In the present study, we found that the protrusion of the optic nerve was seen in 60% and dehiscence of the optic nerve in 24.2% of the patients. The optic canal is the place where optic nerve is least nourished, which makes it very susceptible to injury. Hence compression of the optic nerve can cause ischemia and venous congestion of the nerve. Optic nerve injury can occur in case of protrusion or dehiscence either due to surgical trauma or as a complication of sinus disease. If the surgeon damages the nerve within the sinus, the risk of blindness is high. Moreover, visual deficits may result from sphenoid sinus infection or from a mucocele compressing the optic canal or nerve.

### Conclusion:

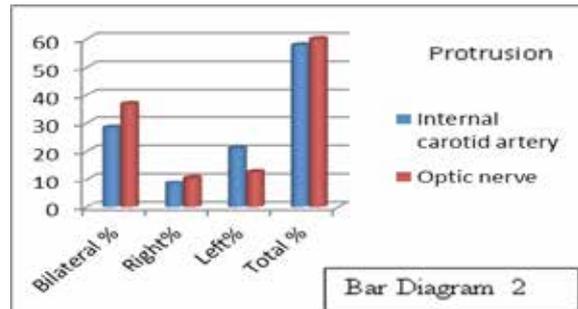
In order to avoid morbid consequences during surgery, it is imperative that clinicians determine the location and extent of the walls of the sphenoid sinus and its relationship into adjacent

vital structures whenever trans-sphenoid pituitary surgery is contemplated

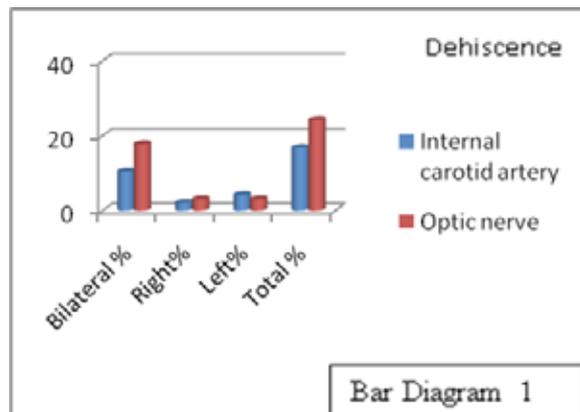
**Results:**

Protrusion	Bilateral%	Unilateral%		Total %
		Right%	Left%	
1 Internal carotid artery	27[28.42%]	8[8.5%]	20[21.05%]	55[57.89%]
Optic nerve	35[36.84%]	10[10.52%]	12[12.6%]	57[60%]
Dehiscence				
2 Internal carotid artery	10[10.5%]	2[2.1%]	4[4.2%]	16[16.8%]
Optic nerve	17[17.8%]	3[3.1%]	3[3.1%]	23[24.2%]

Table 1: showing the percentage of protrusion, dehiscence of internal carotid artery and optic nerve.



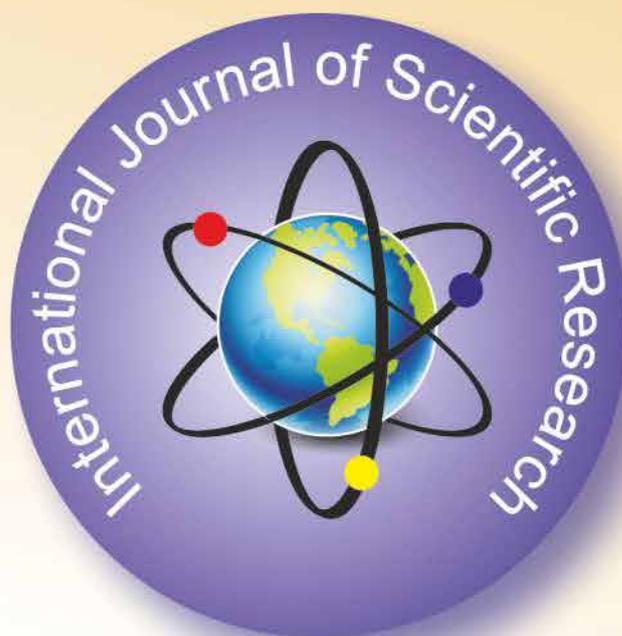
Bar Diagram 2: showing the percentage of protrusion of internal carotid artery and optic nerve.



Bar Diagram 1: showing the percentage of dehiscence of internal carotid artery and optic nerve.

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