Research Article **Allied Sciences**

International Journal of Pharma and Bio Sciences **ISSN 0975-6299**

COMPUTED TOMOGRAPIC STUDIES ON SPHENOID SINUS VARIANTS

[1]VIMAL KUMAR M, [2] SURESH SUKUMAR AND [3]DR. MAMATHA* H,

[1]Research Student, Department of Anatomy, Kasturba Medical College,
[2]Assistant professor Dept. of Medical Imaging Technology, MCOAHS
[3]Assistant professor, Department of Anatomy, Kasturba Medical College, Manipal University, Manipal

ABSTRACT

The sphenoid sinus is deeply seated in the skull and is the most inaccessible paranasal sinus intimately related to numerous vital neural and vascular structures. This work determines the incidence of the anatomical variations of sphenoid sinus reviewed by the CT scan and their impact on related neurovascular structures, for the safe removal of intersphenoidal and pituitary lesions and the Endoscopic Endonasal Transsphenoidal Aproach (EETA) to treat sellar, parasellar,and suprasellar tumours. The CT scan of 80 patients were reviewed regarding the different anatomical variations of the sphenoid sinus: degree of pneumatisation, 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 42 cases showing protrusion and 13 cases with dehiscence of bony wall on ICA. 51 cases showing protrusion and 18 cases showing dehiscence on bony wall of optic nerve. Regarding the pneumatisation of sphenoid sinus, the major type found were of sellar in 62.5%, 25% of cases with presellar, and 15% were of post sellar pneumatisation. The different anatomical configuration of sphenoid sinus is important for adequate treatment of its disease.

KEYWORDS: Carotid artery; Sinus; Computed tomography; Variations

MAMATHA H
Department of Anatomy, Kasturba Medical College, Manipal University, Manipal

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[1].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 withreduced intra- and post operative complications[2].Sphenoid septum is an important landmark during EETA to important structures such as the carotid artery, optic canal, and skull base [3,4].Pneumatisation of these irregular cavities ranged from their absence to extensive. According to the extent of sinus pneumatisation, the bone covering carotid arteries and optic nerves can be thin or even absent, making these structures susceptible to iatrogenic injury[2].

Injury to internal carotid artery or optic nerve is a serious complication of transphenoidal surgery[3]. The different routes to the sella include trans-ethmoidal, 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[5].CT 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[4].

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 80 paranasal CT scan of the south Indian patients attending the E.N.T. department of our medical college. Patients aged between 16 to 65 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 tomographic 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(3) degree of pneumatisation (4)presence or absence of septa or accessory septa were noted.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 density 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.

RESULTS

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

1	Protrusion	Bilateral	unilateral		Total %
			Right	Left	
	Internal carotid artery	20[25%]	4[5%]	18[22.%]	42[52.5%]
	Optic nerve	35[43.75%]	9[11.25%	7[8.75%]	51[63.75%]
2	Dehiscence				
	Internal carotid artery	6[7.5%]	2[2.5%]	5[6.25%]	13[16.25%]
	Optic nerve	15[18.75%]	0	3[3.75%]	18[22.5%]

Table 2
showing the pneumatisation of sphenoid air sinus

Presellar ----25%
Sellar ---------60%
Postsellar ----15%

Figure 1
CT image showing the multiple septations

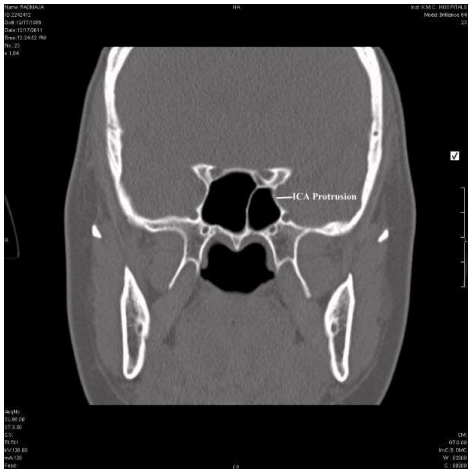

Figure 2
CT image showing the protrusion of internal carotid artery

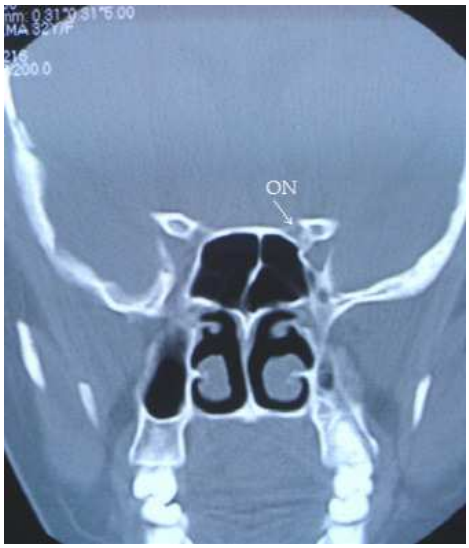

Figure 3
CT image showing the optic nerve (ON) dehiscence

DISCUSSION

Sphenoid sinus is extremely variable in size, shape and relation to the sella. Trasphenoid 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 [1].

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%[2]. 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%[2,3]. In this study, we found that protrusion of internal carotid artery into the sphenoid sinsus in 25% of patients, and dehiscence of the artery was found in 16.5% 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%[3] . In the present study, we found that the protrusion of the optic nerve was seen in 63.7% and dehiscence of the optic nerve in 22.5% 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.

The degree of pneumatisation of the sphenoid was the prime concern for accessing the sella[4]. Type of sphenoid sinus pneumatisation depends on the position of the sinus in relation to the sella turcica. In our study, the most common type of pneumatisation of the sphenoid sinus was the sellar type 60%, followed by presellar and the least encountered was post-sellar with 15%. Similar observations were noted by Hamid O and his collegues[4]. It is comparatively lesser than the

earlier observations of Romano A. et al., Odowy OE et al., and Banna M et al.,[5,6,7].The degree of pneumatisation of sphenoid sinsus varies considerably .The pattern of pneumatisation of sphenoid sinus significantly affects safe access to the sella. Pneumatized sphenoid sinus may distort the anatomical configuration so if unaware, accidental injury to the carotid and optic nerves follows.

The septa of the sphenoid sinus were found to be variable. In most cases, the septum deviates quite laterally and terminates on the carotid artery [4]. Multiple septa were found in half of the cases, these could have been transverse, or vertical and some were difficult to remove. In this situation it is wise to use extreme caution while removing the septum in order to prevent accidental and disastrous injury to the carotid artery.

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 relation-ship into adjacent vital structures whenever trans-sphenoid pituitary surgery is contemplated.

REFERENCES

1. Bademci G, Unal B. Surgical importance of neurovas-cular relationships of paranasal sinus region. Turkish Neurosurgery 2005;15(2):93-6.
2. Hewaidi GH, Omami GM. Anatomic variation of sphenoid sinus and related structures: CT scan study. Libyan J Med, page 128-133. Available at: www//ljm.org.ly
3. Davoodi M, Saki N, Saki G, Rahim F. Anatomical variations of neurovascular structures adjacent sphenoid sinus by using CT scan. Pak J BiolSci 2008;1296):522-5.
4. Hamid O, Filky LE, Hassan O, Kotb A, Fiky SE. Anatomic variations of the sphenoid sinus and their impact on trans-sphenoid pituitary surgery. Skull Base 2008;18:9-16.
5. Romano A, Zuccarello M, Loveren HR, Keller JT. Expanding the boundaries of the transphenoidal approach : A microanatomic study. Clin Anat 2001;14:1-9.
6. Idowu OE, BalogunBO, Okoli CA. Dimensions, septation, and pattern of pneumatisation of the sphenoid si-nus. Folia Morphol 2009;68(4):228-32.
7. Banna M, Olutola PS. Patterns of pneumatisation and septation of the sphenoid sinus. J Can Assoc Radiol 1983;34(4):291-3.
8. William PL. Gray's anatomy 38th edn., London : Churchill Livingstone 1995:585-88.