

Measurements of Sphenoidal Air Sinuses in Adult Male and Female with CT and MRI

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Abstract

In the past some attempts have been made to study comparative anatomy of the Para nasal air sinuses. Among them some have made efforts to measure the dimensions of these Para nasal air sinuses. Mostly all of study was done on the dry bones in early phase and then with X-rays. As these dimensions are very important to the ENT surgeons and to the neurosurgeon to understand the normal anatomy of these PNS. So, in present study efforts have made to measure the dimensions of sphenoidal air sinus with the help of CT scan and MRI, Which are the latest modalities, which can give more accurate measurements. Here 50 CT scans of PNS of normal adults (37 males, 13 females) at J. J. Hospital radiology department, Byculla, Mumbai were studied. And MRI of Brain including PNS of 100 normal adults (50 males, 50 females) at Breach Candy Hospital, Mumbai was studied.

Keywords: Para nasal air sinus (PNS); Antero posterior(A-P); Transverse (Trans.); Vertical (Vert.); CT scans; MRI.

Aims and Objectives

1) To find out average maximum dimensions (A-P, Transverse, Vertical) of sphenoidal air sinus for adult male, for adult female & Combined for both sexes by CT Scan.

2) To find out average maximum dimensions (A-P, Transverse, Vertical) of sphenoidal air sinus for adult male, for adult female & Combined for both sexes by MRI.

(37 males, 13 females) having normal Para nasal air sinuses were included and studied. All others having abnormal pathology and congenital defect were excluded from study. All these patients were referred to the radiology department of J.J. Hospital, Byculla, Mumbai. (Grant Medical College, Mumbai). All CT Scans were done on SIEMENS, SOMATOM plus-4 machine in both Axial and Coronal planes. Sections having largest dimensions were selected for measurements.

Materials and Methods

CT Scan Study

In this CT Scans of PNS of 50 adult patients

MRI Study

This study includes MRI Brains of 100 adults (50 males, 50 females) having normal Para nasal air sinuses, which were referred for neurological complaints at Breach Candy Hospital, Mumbai. All patients underwent MRI on PHILIPS GYROSCANS ACS-NT,1.5 TESLA machine. After performing MRI, the images having largest dimension were selected for measurements.

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Observations

Table I shows total no. of male and female subjects studied for CT scan study.

Table I: **Total no of Subject studied**

Study	Male	Female	Total no. of subjects
CT SCAN STUDY	37	13	50

Table II shows average maximum dimensions for Male subject as 29.4 mm Antero posterior, 16.3 mm transversely and 25.4 mm vertically.

Table III shows average maximum dimensions for Female subject as 27.3 mm Antero posterior, 14.9 mm transversely and 22.7 mm vertically.

Table IV shows average maximum dimensions for adult (common for both) as 28.3 mm Antero posterior, 15.6 mm transversely and 24.0 mm vertically.

Table V shows total no. of male and female subjects studied for MRI study.

Table VI shows average maximum dimensions for Male subject as 27.48 mm Antero posterior, 14.88 mm transversely and 23.98 mm vertically.

Table VII shows average maximum dimensions for Female subject as 26.92 mm Antero posterior, 15.19 mm transversely and 23.25 mm vertically.

Table VIII shows average maximum dimensions for adult (common for both) as 27.20 mm Antero posterior, 15.03 mm transversely and 23.61 mm vertically.

Discussion

Considerable variations in the sinus size occur from person to person. In the past many anatomists like Van Alvea[1], Schaeffer J.P.[2] have made attempts to find out the maximum dimensions of the normal Para nasal air sinus. The present study also includes the measurements of maximum dimensions

(Antero posterior, transverse, Vertical) of normal adult Sphenoidal air sinus from CT and MRI. As these are the latest advanced modalities made available which were not in the past. So with these modalities we can go towards more accuracy. In the present study, CT scans of 50 adults (37 males, 13 females) having normal Para nasal air sinuses have been selected for measurements of maximum dimensions of Sphenoidal air sinus. Also the MRI of Brain of 100 adults (50 males, 50 females) having normal Para nasal air sinuses have been selected for measurements of maximum dimensions of Sphenoidal air sinus. Also this study provides separate dimensions for Male and female sex. The results of present study were compared with the previous study as follows.

The sphenoidal sinuses lie side by side within the body of sphenoid bone separated by a bony septum. They vary in size and shape and rarely symmetrical. When exceptionally large, they may extend into the pterygoid plates or greater wings and may also spread into dorsum sellae and clinoid process. H. William[3] in his book 'Head and Neck' mentions that the sphenoid sinus is the most variable in the form of any bilateral cavity or organ in human body and it is more variable in Antero posterior dimensions. Further he mentions the average dimensions for the adult sphenoidal sinus giving range as 4 to 44 mm Antero posteriorly, 2.5 to 34 mm transversely, and 5 to 33 mm vertically. Also he gives the reference of average dimensions of sphenoidal sinus by Dixon as 19 to 22 mm Antero posteriorly, 15 to 17 mm transversely, and 18 to 20 mm vertically. While Daniel O. Graney[4] mentions the average dimensions for adult sinus as 23 mm Antero posteriorly, 17 mm transversely and 20 mm vertically. Gerald D. Dodd[5] gives the combined measurements

Table II: **For Male: Average diameter in mm**

Sphenoidal air sinus								
Rt. Side			Lt. side			Average		
A-P	Trans.	Vert.	A-P	Trans.	Vert.	A-P	Trans.	Vert.
28.9	16.0	25.12	29.9	16.5	25.7	29.4	16.3	25.4

Table III: For Female: Average diameter in mm

Sphenoidal air sinus								
Rt. Side			Lt. side			Average		
A-P	Trans.	Vert.	A-P	Trans.	Vert.	A-P	Trans.	Vert.
27.0	14.6	22.5	27.5	15.2	23	27.3	14.9	22.7

Table IV: Common for both Sexes: Average diameter in mm

Subject	Sphenoidal air sinus		
	A-P	Trans.	Vert.
Male:	29.4	16.3	25.4
Female	27.3	14.9	22.7
Common for both	28.3	15.6	24.0

Table V: FOR MRI STUDY: Total no of Subject studied

Study	Male	Female	Total no. of subjects
MRI STUDY	50	50	100

for both sinuses in the adult as 22 mm Anteroposterior, 20 mm transverse and 22 mm vertically. Gray's[6] textbook of anatomy mentions average dimensions for adult sphenoidal as 21 mm Antero posteriorly, 18 mm transversely and 20 mm vertically. Schaeffer J.P.[2] in 'Morris Human Anatomy' book (11th edition) mentions the average dimensions as 12 mm Antero posteriorly, 18 mm transversely and 20 mm vertically. While Lee B. Lusted and Theodore E. Ketas[7] gives the separate dimensions for right and left sphenoidal sinus at 14 years of age as for right sphenoidal sinus 12 mm Antero posteriorly, 9 mm transversely and 14 mm vertically. For the left sphenoidal sinus 7 mm Antero posteriorly, 14 mm transversely and 15 mm vertically.

sphenoidal sinus as 27.2 mm Antero posteriorly, 15.0 mm transversely, 23.6 mm vertically. If we compared this readings with past studies, they are within the range of past studies. The Antero posterior and vertical dimensions from the present data is recorded little more as compared to the past. This may be as due to more accuracy of this new and latest modalities like CT scans and MRI. Which were not available in the past.

The present study data from computerized tomographic scans provides the average maximum dimensions for adult sphenoidal sinus as 28.3 mm Antero posteriorly, 15.6 mm transversely , 24.0 mm vertically. While the data from Magnetic resonance imaging provides the average dimensions for adult

Also if dimensions compared among CT and MRI, then dimensions from MRI are less by few mm and this may be as clarity of mucosa is more on MRI and clarity of bone is more on CT scan.

Table VIII: Common for both Sexes: Average diameter in mm

Subject	Sphenoidal air sinus		
	A-P	Trans.	Vert.
Male:	27.48	14.88	23.98
Female	26.92	15.19	23.25
Common for both	27.20	15.03	23.61

Table VI: For Male: Average diameter in mm

Sphenoidal air sinus								
Rt. Side			Lt. side			Average		
A-P	Trans.	Vert.	A-P	Trans.	Vert.	A-P	Trans.	Vert.
27.19	14.63	23.77	27.77	15.14	24.19	27.48	14.88	23.98

Table VII: For Female: Average diameter in mm

Sphenoidal air sinus								
Rt. Side			Lt. side			Average		
A-P	Trans.	Vert.	A-P	Trans.	Vert.	A-P	Trans.	Vert.
26.57	15.00	23.03	27.26	15.38	23.57	26.92	15.19	23.25

Summary and Conclusions

CT scan study

- 1) Data from present study provides the average dimensions for adult male Sphenoid Sphenoidal air sinus as; A-P- 29.4 mm, Trans-16.3 mm, Vert.-25.4 mm.
- 2) Data from present study provides the average dimensions for adult Female Sphenoidal air sinus as; A-P- 27.3 mm, Trans- 14.9 mm, Vert.-22.7 mm.
- 3) Data from present study provides the average dimensions Common for both sex Sphenoidal air sinus as; A-P- 28.3 mm, Trans- 15.6 mm, Vert.- 24 mm.

MRI study

- 1) Data from present study provides the average dimensions for adult male sphenoidal air sinus as; A-P-27.4 mm, Trans-14.8 mm, Vert.- 23.98 mm.
- 2) Data from present study provides the average dimensions for adult Female Sphenoidal air sinus as; A-P- 26.92 mm, Trans-15.1. mm, Vert.- 23.25 mm.
- 3) Data from present study provides the average dimensions Common for both sex Sphenoidal air sinus as; A-P- 27.2 mm, Trans- 15.03 mm, Vert.- 23.6 mm.

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