



ASSESSMENT OF THE FRONTAL SINUSES DIMENSIONS IN GENDER DETERMINATION AMONG A SAMPLE OF WESTERN UP POPULATION USING MULTI-DETECTOR COMPUTED TOMOGRAPHY

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Abstract

Aim-The goal of the study is to assess the dimensions of the frontal sinus between the two gender among a sample of the western UP population with MDCT.

Materials And Method- This was a prospective cross-sectional study involving 120 patients (aged 20-60) furthermore, each participant's gender, and age were documented. The study excluded those who had Sinusitis, Incomplete growth of sinuses, Unable to visualize, and congenital anomalies. Scans were performed using Philips ingenuity core 128 slice CT scan at the Radiology department of Teerthankar Mahaveer Hospital and Research centre, Moradabad.

Results- The Independent sample "t" test was used to compare age, axial width; depth of frontal sinus, coronal height, and distance according to gender. There was a difference ($p < 0.05$) in the depth of frontal sinuses, coronal height, and distance among males and females. The Paired "t" test was used to compare axial width, depth of frontal sinus, and coronal height between the left and right sides. There was a difference ($p < 0.05$) in the depth of the frontal sinus and coronal height between the left and right sides. Among males, there was a difference ($p < 0.05$) in the depth of the frontal sinus and coronal height between the left and right sides. Also, within females, coronal height exhibited a difference between both sides. There was a difference in the depth of the frontal sinus between the two sides within the age group of 20-30 years. Also, coronal height exhibited a variation among the left side and right side within the people ageing 31-40, 41-50, and 51-60 years.

Conclusion- Males had noticeably larger frontal sinus axial width and depth values, and these can be utilized in forensics to identify gender. Coronal distance and height of considerably frontal sinuses are greater in men than in women.

Keywords- Frontal sinus, Axial Width, Depth, Coronal Height, and Distance.

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INTRODUCTION

Auseful imaging technique for identifying unidentified human remains is (CT), which can also be utilized to assess the paranasal sinuses and craniofacial bones. The frontal sinus dimensions can be measured with precision and value. In comparison to traditional radiographs, CT has many advantages. First, it offers the chance to avoid superimposing structures outside the desired plane and enables the observation of minute density changes. Second, image manipulation is simple, and image segmentation can display internal locations that need to be examined.^[1]

Third, measurements can be made more precisely and craniometric points can be properly located than in traditional radiography. Areas and volumes can be calculated. Fourth, the movie presents the technical specifics and patient knowledge that can be very helpful for the identification process. Among the most crucial components of forensic medicine is the identification of human remains. In forensic investigations, determining a person's gender is also of utmost significance.^[1]

Compared to tooth enamel, bones in the body degrade the least after death, and skeletal remains have been used to sex a person. Determination of identity and sex, however, are difficult tasks when dramatic Post-mortem modifications have emerged in mass tragedies like explosions, combat, and other similar events in airplane accidents. In forensic medicine, radiological identification of individuals continues to play a crucial role, particularly in cases when DNA analysis is challenging or when the body is putrid, fractured, carbonized, or skeletonised.^[1] Only 4% of people lack the frontal sinus, which has significant differences in shape, size, and symmetry and is therefore a crucial characteristic in determining gender dimorphism³ and enabling subject identification.^[2]

To be useful for forensic identification, morphological traits shown on radiographs must satisfy two conditions: first, they must be specific to the individual, and second, they must last more than their ongoing life span. The frontal sinuses fulfil both of these conditions. The frontal sinuses' anatomy underwent its first radiological study by Turner and Porte.^[3]

Computed tomography is a diagnostic imaging method of test. Various images of the internal body structure are created quite similar to x-rays.^[4] With Ingenuity CT, you may have complete

trust in the image quality, the appropriate dose for the patient, the iterative reconstruction technique's calculation-in-second speeds, and your investment. Imagine using up to 80% less dosage while still achieving better spatial resolution and diagnostic image quality. Using up to 15% less injected contrast regularly. Imagine an innovative X-ray tube with a two-year tube guarantee that doesn't require warm-up or cool-down. For improved departmental efficiency, anticipate short training periods and fewer exam repetitions. Your self-assurance and competence will put you at the forefront of patient care. It's Innovation CT.^[4]

This study can be used for the estimation of gender by measurement of sinuses using computed tomography for the forensic evaluation of gender in cases when only the head of the body is present.

Personal identification of the patient could be easily possible using the frontal sinus. The method is usually less time consuming and simpler.^[5]

MATERIALS & METHOD

This study was the prospective observational type which was conducted at the Department of Radiology, Teerthanker Mahaveer Hospital (TMU) Moradabad UP. The study duration was 20 March 2022 to 21 March 2023. The study population was Western UP. The source of data was the patients that were referred to the radiology department for examination of CT head and PNS. The total sample size was 140 of which 120 patients were included of which 66 were male and 54 females. The patients who were normal and ranging between 20 -60 of both genders were included in the study. the patient below 20 years and age more than 60 years, having sinusitis, Incomplete growth of sinuses, Unable to visualize sinuses, and Congenital anomalies were excluded from the study. The study was conducted after ethical clearance. NCCT head and PNS scans were performed using Philips 128-slice ingenuity computed tomography scanner. The scan type was helical and by using MPR the axial and coronal images were assessed. For the measurement of the frontal sinus, the following dimension was used:-

- A. transverse length of Frontal sinus (width) at Point A
- B. Anteroposterior length of Frontal sinus (depth), Point B
- C. The frontal sinus's height is Point C.
- D. The separation between the highest points of the two sinuses, or Point D.

For statistical analysis Data were gathered, coded, and entered into SPSS version 26.0, a statistical program. statistical analysis including both analytical & descriptive were used for the data set including and two-tailed t-tests also an alpha error of 0.05. A statistical significance was observed for a P value of 0.05.

RESULT

In this study, there are 120 patients (66 males and 54 females), where the mean age was 39.4 years (range 20 to 60) and the maximum frequency of 37 subjects in the age group of 20-30, and the minimum frequency of 24 subjects in the age group of 51-60. The males and females show a frequency of 66 and 54 respectively. Among males, there was a difference in the depth of the frontal sinus and coronal height between the left and right sides. Also, within females, coronal height exhibited a difference between the right and left sides. The right width of the frontal sinus was wider in males than in females ranging from 27.9 to 26.1 respectively. Males had a wider left side than females did, measuring 28.1 in comparison to 27.3 in females. Males had a right depth range of 10.1, which was substantially bigger than that of females, ranging from 9.0 in females. Males had a left depth that was substantially greater than that of females, 10.5 in comparison to 9.2 in females. Males had a right height range of 18.2 in comparison to 15.2 in females, which was significantly greater. Males had a left height range of 20.1 in comparison to 17.1 in females, making them noticeably taller. The difference in heights between males and girls in the coronal plane ranged from 10.4 to 12.0, which was statistically significant.

DISCUSSION

Altat Hussain Chalkoo et al. in their research investigated that Males had considerably longer mean Left depth, Left width, Left height, and Right width measurements than females. In our study, the height differences in the coronal plane are larger in females than males which were not significant sides but in our result mean of the right width, left depth, left height and distance between heights in the coronal plane is also greater in males than females.^[6]

Ertugrultatlisumak et al. Males had significantly greater dimensions than females across the board and On the left, all dimensions tended to be greater. As per our study, both males and females showed a considerable variation in height and width, as well as the lengths of the right and left

sides' AP. In our study, we have seen a significant difference in males and females in which males have a larger measurement of axial width.^[7]

Chetan Belaldavar et al. 147 men and 142 women were present in their study but in our study 66 men and 54 females are present. Whereas in our study males have higher mean values for the area, height, and width of the frontal sinus in our study we have found the same result.^[8]

Bhakti A. Soman et al. in their study concluded that the males have greater average frontal sinus length, width, and area than their female counterparts & the frontal sinus area shows growth with gradual increase in age except 45 years males. Concerning gender, it was discovered that the left breadth, left area, and bilateral asymmetries were statistically significant. But in our study, there was a difference in the depth of the frontal sinus between both sides within the age of 20-30 years. Also, a difference in left and right side of the coronal height was exhibited with in the patients ranging from 31-40, 41-50, and 51- 60 years.^[9]

Naima Abd El-Halim Sherif et al. in their study investigated that Males had considerably longer average frontal sinus Rt depth, Lt depth, and Lt height measurements than females. Similarly in our study, the same result was attained.^[10]

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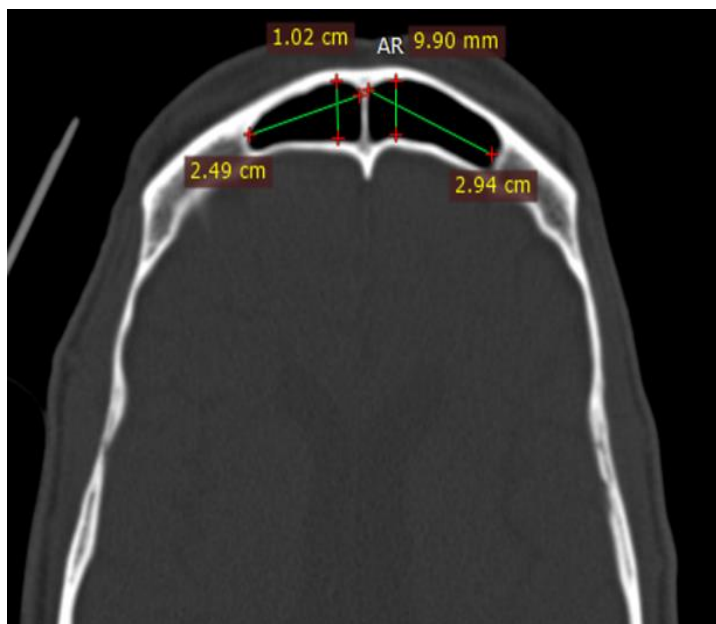


Fig.1.1 Measurement of point A and point B in Axial view of CT- SCAN.

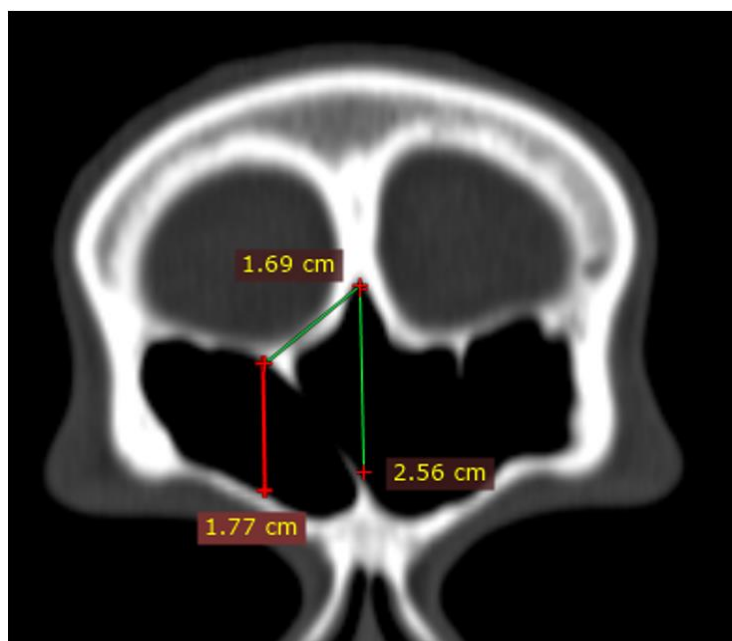


Fig.1.2 Measurement of point C and point D in Coronal view of CT-scan

Table 1.1: A Comparison chart of age, axial width, depth of frontal sinus, coronal height, and distance according to gender

		Male		Female		"t"	p-value
		Mean	S.D.	Mean	S.D.		
Age		37.9	11.3	41.4	12.1	-1.63	0.106
Axial width	Right	27.9	6.9	26.1	7.9	1.298	0.197
	Left	28.1	8.0	27.3	8.6	0.516	0.607
Depth of frontal sinus	Right	10.0	2.1	9.0	2.8	2.191	0.030*
	Left	10.5	2.1	9.2	2.2	3.416	0.001*
Coronal height	Right	18.2	5.9	15.2	4.6	3.091	0.002*
	Left	20.1	6.0	17.1	5.8	2.744	0.007*
Distance		12.0	3.3	10.4	3.2	2.689	0.008*

Table 1.2: A Comparison table of axial width, depth of frontal sinus, and coronal height between right and left side within each age group

		Right		Left		"t"	p-value
		Mean	S.D.	Mean	S.D.		
Axial width	20-30	26.7	6.2	29.1	8.1	-1.763	0.086
	31-40	29.2	8.3	27.5	7.1	1.116	0.274
	41-50	25.8	7.3	28.1	8.4	-1.372	0.180
	51-60	26.9	8.1	25.5	9.5	0.756	0.458
Depth of frontal sinus	20-30	9.2	2.5	9.7	2.2	-2.054	0.047*
	31-40	9.7	2.4	10.4	2.2	-1.650	0.110
	41-50	9.6	2.1	10.0	2.3	-1.330	0.194
	51-60	9.7	3.0	9.5	2.1	0.377	0.710
Coronal height	20-30	17.5	7.2	18.1	6.4	-0.616	0.542
	31-40	16.5	4.2	19.5	5.5	-2.817	0.009*
	41-50	16.9	5.1	19.0	6.2	-2.802	0.009*
	51-60	16.1	4.6	18.5	6.4	-2.150	0.042*