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Maximum Height of Maxillary Air Sinus in Adult Bangladeshi Population

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Abstract

Background: *Size and shape of the maxillary air sinus varies from person to person and two maxillary air sinuses may have different patterns in the same individual. The study aimed at radiological measurement of maximum height of maxillary air sinus in adult Bangladeshi population. The study findings will be helpful for diagnosis and therapeutic procedures related to maxillary air sinus.*

Materials & Methods: *A cross sectional analytical type of study was carried out in the Department of Anatomy, Sir Salimullah Medical College, Dhaka from July 2019 to June 2020. The study population were 90 Bangladeshi (male 45 and female 45) attending the Radiology & Imaging Department of Sir Salimullah Medical College. The maximum height of the right and left maxillary air sinuses were measured by joining the upper and lower limit of right and left maxillary air sinuses by using "MB RULLER" software.*

Results: *The maximum height of right maxillary air sinus was significantly higher (< 0.05) than the maximum height of left maxillary air sinus in male. There was no significant difference between right and left maxillary air sinuses in female. No significant difference was observed in the maximum height of right and left maxillary air sinuses of male and female.*

Conclusion*: The maximum height of right maxillary air sinus was higher than the maximum height of left maxillary air sinus in male.*

Key words: *morphometric, dimension, maxillary air sinus, height, MB Ruller.*

Introduction

Paranasal air sinuses are complex anatomical structures situated within the frontal, maxilla, ethmoid and sphenoid bone. There are four paired paranasal air sinuses, among them maxillary air sinus is the largest one.[1] The maxillary air sinus or antrum of Highmore (Greek; antron means 'a cave') was first discovered and illustrated by Leonardo da Vinci, but the earliest attribution of its significance was given by Nathaniel Highmore in the 17th century.[2]

Maxillary air sinus is pyramidal in shape. The base is medial and forms much of the lateral wall of the nasal cavity. The floor, which often lies below the nasal floor, is formed by the alveolar process and part of the palatine process of the maxilla. The roof of the sinus forms the major part of the floor of the orbit. The lateral truncated apex of the pyramid extends into the zygomatic process of the maxilla and may reach the zygomatic bone. The facial surface of the maxilla forms its anterior wall. The posterior wall is formed by the infratemporal surface of the maxilla.[3]

After birth maxillary sinus continues to extend both laterally and inferiorly during the rapid growth period from birth to 3 years of age and from 7 to 12 years of age.[4] They reach their mature sizes at the age

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of about 20 years, when the permanent teeth fully develop.[5] During adulthood, the shape and size of the maxillary sinus change especially due to loss of teeth. After the maximum growth period, the volume of the maxillary sinus decrease in both gender.[6] The size and shape of the maxillary sinus varies amongst individuals, between genders and in various populations. [7]

A broad spectrum of disease process may involve in this region like acute and chronic sinusitis, rhinosinusitis, polyposis, mucocoele, allergic fungal sinusitis, mycetoma, mucosal thickening, retention cyst formation etc. Precise knowledge and comprehensive understanding of the anatomy of the maxillary air sinus as well as its relation with different structures of the face are important to the clinicians and radiologists for proper diagnosis of various diseases in this regions. Antral lavage, inferior meatal antrostomy, Caldwell-luc operation, transantral ethmoidectomy, functional endoscopic sinus surgery (FESS) are commonly performed by the ENT surgeons to treat a variety of diseases in this area.[8]

Different morphometric dimensions of the maxillary air sinuses can be measured by different radiological methods. Since radiological studies are carried out on living subjects, radiographic measurement of maxillary air sinuses gives more precise result compared to the measurement from dry ossified sinuses or sinuses measured from the cadaver. Living subjects provide the opportunity to record a large amount of information regarding the subject directly such as age, sex, and stature. Therefore the advantage of the radiographic technique is that the image of the sinus can be obtained directly and non-invasively.[9]

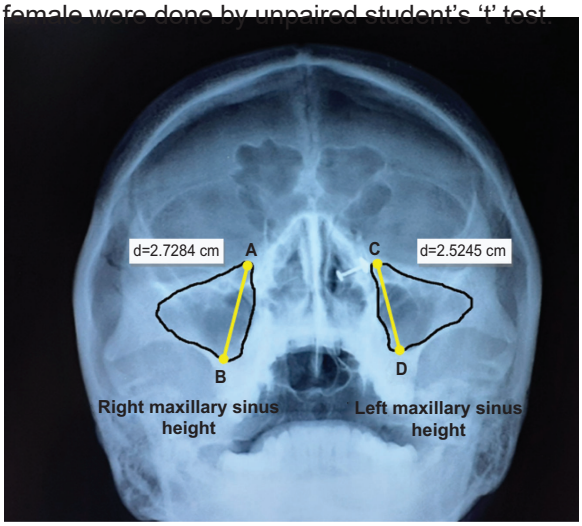
Anatomical and developmental descriptions of the maxillary sinus may be of great clinical importance. An understanding of age and sex related changes in the dimensions and volume of the normal maxillary sinus may help in the evaluation of radiographs and identification of sinus abnormalities.[10]

The value of maximum height of maxillary air sinus of adult Bangladeshi population may be helpful to the anatomists for a normative reference. For the radiologists and the head and neck surgeon the normative values may be helpful for diagnosis of diseases. The findings may play an important role in the personal identification and gender determination which is important for the forensic experts and anthropologists.

Materials and methods

A cross sectional analytical type of study was carried out in the Department of Anatomy, Sir Salimullah Medical College, Dhaka from July 2019 to June 2020. The study population were Bangladeshi male (45) and female (45) attending the Radiology & Imaging Department of Sir Salimullah Medical College and the sample was collected by convenient sampling method.

Digital radiographs of maxillary air sinus in occipito-mental and lateral view were taken in the Radiology and Imaging Department of SSMC. The softcopies of images of digital radiograph of maxillary air sinus were collected by pandrive and transferred to a computer. From these images the maximum height of the right and left maxillary air sinuses were measured by joining the most upper and lower limit of the right and left maxillary air sinuses by using “MB RULLER” software. Comparison between maximum height of maxillary air sinus of male and female were done by unpaired student’s ‘t’ test.



Photograph 1: Photograph of digital radiograph of PNS occipito-mental view showing maximum maxillary sinus height. A- highest point of the superior wall of maxillary sinus of right side, B- lowest point of the inferior wall of maxillary sinus of right side, C-highest point of the superior wall of maxillary sinus of left side, D- lowest point of the inferior wall of maxillary sinus of left side.

Ethical clearance

The study was carried out after the approval of the protocol by the ethical committee of Sir Salimullah Medical College, Dhaka.

Results

In male, the mean maximum height of right maxillary air sinus was 2.78 ± 0.21 cm. In female mean maximum height of right maxillary air sinus was 2.78 ± 0.37 cm. No significant difference (P=0.972) was observed in the maximum height of right maxillary air sinuses between male and female (Table I).

In male, the mean maximum height of left maxillary air sinus was 2.60±0.24 cm. In female mean maximum height of left maxillary air sinus was 2.66±0.39 cm. No significant difference (P=0.355) was observed in the maximum height of left maxillary air sinuses between male and female (Table I).

In male, the mean maximum height of right maxillary air sinus was 2.78 ± 0.21 cm and mean maximum height of left maxillary air sinus was 2.60±0.24 cm. The maximum height of right maxillary air sinus was significantly higher (P=0.010) than the maximum height of left maxillary air sinus in male (Table II).

In female the mean maximum height of right maxillary air sinus was 2.78 ± 0.37 cm and the mean maximum height of left maxillary air sinus was 2.66±0.39 cm. No significant difference (P=0.063) was observed in the maximum height of right and left maxillary air sinuses in female (Table II).

Table I

Comparison of right and left maximum maxillary sinus height (cm) between male and female (N=90)

Maximum maxillary sinus height (cm)	Male (n=45) Mean ± SD (Range)	Female (n=45) Mean ± SD (Range)	P value
Right	2.78 ± 0.21 (2.2-3.2)	2.78 ± 0.37 (2.1-3.6)	0.972^{ns}
Left	2.60 ± 0.24 (2.1-3.2)	2.66 ± 0.39 (1.8-3.6)	0.355^{ns}

Comparison between sex done by unpaired student's 't' test

^{ns} = Not Significant (2 tailed)

N = Total sample size

n = Sample size in each group

Table II

Comparison of right and left maximum maxillary sinus height (cm) in male and in female (N=90)

Maximum maxillary sinus height (in cm)	Right Mean ± SD (range)	Left Mean ± SD (range)	P value
Male(n=45)	2.78 ± 0.21 (2.2-3.2)	2.60 ± 0.24 (2.1-3.2)	0.010*
Female(n=45)	2.78 ± 0.37 (2.1-3.6)	2.67 ± 0.39 (1.8-3.6)	0.063^{ns}

Comparison between sex done by unpaired student's 't' test

*= Significant at P < 0.05, ^{ns} = Not Significant (2 tailed)

N = Total sample size

n = Sample size in each group

Discussion

It has been widely recognized that maxillary air sinus morphometry is influenced by the racial, gender and age factors. So each population should have their own specific standard baseline to optimize the accuracy of identification.

Results of the present study were compared with the results of other studies from different countries like India, Turkey, Egypt, Iraq, Sweden, Japan, Germany, Poland, South Africa, Iran. But so far it is known, there is no published data on morphometric dimensions of maxillary air sinus in our country. So the findings of the present study could not be compared with the results of any other previous similar studies of our country.

In the present study the maximum height of right maxillary air sinus was significantly higher (P=0.010) than the maximum height of left maxillary air sinus in male. There was no significant difference observed in the maximum height of right and left maxillary air sinuses of male and female. In agreement with the present study, no significant difference of maximum height of right and left maxillary air sinuses of both male and female were also found in Indian Madhya Pradesh by Sharma et al[11], Indian Karnataka by Urooge & Patil[7] and in Turkish people by Ekizoglu et al.[12] The mean maximum height of maxillary air sinus in both male and female of the present study were lower than that of Iraqi population[13] and Swedish population.[14]

Conclusion

The present study showed that the maximum height of right maxillary air sinus of male was significantly higher than the maximum height of left maxillary air sinus. No significant difference was observed in the maximum height of right and left maxillary air sinuses between male and female.

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