

EVALUATION OF MAXILLARY SINUS DIMENSIONS IN SEX AND AGE DETERMINATION AMONG a SAMPLE OF EGYPTIANS USING COMPUTED TOMOGRAPHY

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Submit Date 09-08-2021

Revise Date 05-09-2022

Accept Date 12-02-2022

ABSTRACT

Objectives; Determination of sex utilizing skeletal remains still displays a difficult issue to forensic specialists, particularly when body fragments are only found in a mass disaster, car or plane accident, fires, and even in the investigations of crimes. Sinus radiography is one of these methods that was utilized for determining the sex of a person. Consequently, the present study aimed to evaluate the reliability of the morphometric dimensions of the maxillary sinus in determining sex, and age via computed tomography (CT) scan images as paranasal sinuses still undamaged whether the skull and other bones are seriously damaged or not. **Methodology;** The present work involved 30 adult cases (15 males and 15 females) referred to the radiodiagnosis department of Beni-Suef university hospital. Determining the length, height, and width of the right and left maxillary sinuses was performed using a CT scan, and statistical analysis was performed. **Results;** there was a statistically significant ($P < 0.05$) difference in the width of the left maxillary sinus between females and males, while the other dimensions of the left and right maxillary sinuses showed an insignificant difference ($P > 0.05$). **Conclusion;** Dimensions of the maxillary sinuses alone cannot be used as an accurate diagnostic parameter for age and sex determination. We recommend doing such a study on a more significant number of people of the same sex, race, age, and who share the same food, habits, and environmental factors, to make this technique definite and attain standardizations for use in the field of forensic medicine.

Keywords: Computerized tomography; forensic identification; maxillary sinus; sex determination; radio-morphometric.

INTRODUCTION

The necessity for personal identification rises in nature during mass disasters like earthquakes, floods, and others. Moreover in unnatural disasters like a terrorist attack, bomb explosions, mass killings, and in conditions when the body is very decomposed to conceal the individual identity purposely [Modi, 2011].

The necessity to identify the dead body is evident for social and medico-legal purposes. Several methods of biological anthropology are used in the procedure of recognizing persons from the bones of the body fragments [Burns, 2007].

The main job in performing individual identification is to confirm if the skeletal remnants are human or not. If the remnants are related to a human, different anthropological methods may be utilized for dead identification. The 'big fours' of individual

identifications determine the sex, age, statures, and ethnicity. These shapes of 'tentative identifications' [Vij, 2008].

Sex determinations via skeletal remnants give a big problem to forensic specialists, mainly when the body remains are the only ones recovered [Sopher, 2011].

As evident from previous studies, the most supportive zone of the body for comparative radiography is the skull [Fernandes, 2004]. Where the cranium is the most dimorphous and simply sexed share of the skeleton, after that the pelvis, giving accuracies up to 92% [Saini et al., 2011].

The sex may be verified with 100% accuracy if the skeleton exists entirely, 98% from the pelvis as well as the skull; 95% from the pelvis, lonely or the pelvis and long bones; 90% to 95% from both skull and long bones; 80% to 90% from long bones only. Forensic

investigators receiving unknown skeletal remains agreed to use bones that remain intact bones, like the maxillary sinuses [Prabhat et al., 2016].

Maxillofacial measurements were significantly related to gender and higher in males. Also, using measurements in stature estimation calculated by regression analysis was successful [Zaghloul et al., 2019].

The maxillary sinus was undamaged despite that the skull and other bones in burned individuals were severely disfigured. As a result, the maxillary sinus can be used to make identifications [Sherif et al., 2017].

Maxillary sinuses reach their mature dimensions at 20-yrs [Prabhat et al., 2016].

Their outlines and dimensions vary throughout adulthood, mainly because of teeth loss. The dimensions of the maxillary sinus may be impacted because of environmental influences, genetic disorders, or post-infection [Karakas et al., 2005].

CT delivers a brilliant technique for testing maxillary sinuses [Divya Kanimozhi, 2018].

CT scans may be utilized for sex determination using the maxillary sinus measurements when other approaches are non-conclusive [Prabhat et al., 2016].

The current work aimed to evaluate the reliability of maxillary sinus linear measurement; heights, lengths, widths, and maxillary sinuses' volume in sex and age determination using multi-slice CT (MSCT) scanning.

MATERIALS & METHODS

1. Study design

A retrospective study was conducted on thirty cases (15 males and 15 females) referred to the radiodiagnosis department, Faculty of Medicine, Beni-Suef University, to perform MSCT images of the maxillary sinus with an age range between 25 years to 60 years old.

2. Sample Size

A sample size of 30 MSCT images was essential to determine an area under a ROC curve (AUC) of 0.70 versus a null value of 0.50, as statistically significant with 80% power and at a significance level of 0.05. The sample size has been estimated via the Medcalc program v-12.2.1.0.

3. Criteria for patient selection

Inclusion Criteria

- Images with good resolution.

- The study included MSCT images for patients between ages 25 to 60 years

Exclusion Criteria

- Known cases of maxillary pathologies like (tumors, odontogenic lesions, bone lesions, traumatic injuries).
- Cases with injuries or fractures affecting the maxillary sinus.
- Patients with idiopathic maxillary sinus pneumatization.
- Images of low-resolution quality.
- Distortion of images or presence of any artifacts.
- Patients with a history of any oral-maxillofacial surgical intervention in the maxillary sinus.

4. Radiographic examination

The MSCT images were obtained by the same clinician using the Alexion CT machine (Toshiba-16 MSCT-Japan) with a field of view 2.2 m, 120 kV, 50 mA; slice thickness 0.5mm; exposure time of 12 sec. Rotation time 0.7 sec, and slice interval 0.5mm.

Each linear measurement was recorded two times in two different measuring sessions for one week to lessen memory bias. Then the mean value of every two records was taken.

The mean and the standard deviation for each measurement on each side were calculated and compared statistically between male and female groups to determine any statistical change among the sexes. Also, mean and standard deviation were compared in patients younger and older than 45 years for age prediction. All results were tabulated.

5. Measurements

The heights of the maxillary sinuses were measured on the sagittal plane, while the length and width measurements were determined on the axial planes.

- The height was determined from the inner wall of the frontal borders of the maxillary sinus, as the longest extent between the lowest points of the bottom of the sinus to the upper point of the roof of the sinus in the sagittal section (Fig.1).

- The width was the most significant distance horizontally from the medial surface to the most lateral point of the maxillary sinus in the axial section (Fig. 2).

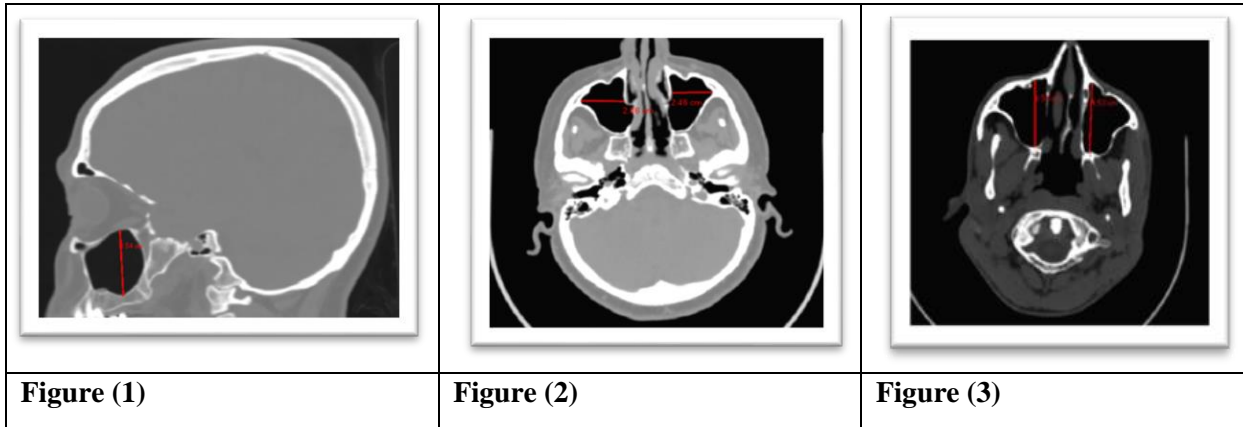
- The length (Depth) was detected in the axial section as the longest distance from the most anterior point of the medial wall to the posterior point of the maxilla sinus (Fig. 3).

-Volume was calculated as (height, length width)
 - Percentage of dimorphism of right and left maxillary sinuses were calculated depending on this equation:

$$\text{Percent of dimorphism} = \left\{ \left(\frac{XM}{Xf} \right) - 1 \right\} \times 100$$

XM: Mean of maxillary sinus dimensions in males

Xf: Mean of maxillary sinus dimensions in females.



MSCT images of the maxillary sinus were obtained using the Alexion CT machine (Toshiba-16MSCT-Japan).

6. Ethical considerations:

Administrative and ethical approvals had been sought from the responsible authorities at Beni-Suef University before collecting the data from patients' files.

7. Statistical analysis:

Collected data have been analyzed via IBM-SPSS-21 (IBM Corp, Armonk, NY, USA). Data have been presented numerically or categorically, as needed. The Kolmogorov-Smirnov testing of normality showed no significance in the variable distribution, so parametric statistics were assumed. Data have been presented as min, max, mean, standard deviation (SD), and 95% CI of the mean. Contrasts were performed among two investigated non-dependent variables of normal distribution via non-dependent sample t testing. When Levene's testing for equality of alterations was significant, Welch's t-testing was employed, an adaptation of Student's t-testing, and is more reliable when the two samples have unequal alterations and unequal sample sizes. Comparisons were performed among the two study groups dependent on normally distributed variables via a paired t-test. A bar chart with a 95% error bar graph was employed consequently. An alpha level was set to 5% with a significance level of 95%, and a beta error permitted up to 20% with a power of study of 80%.

RESULTS

Thirty adult patients consisting of 15 males and 15 females were included in the study. With an age range between 25 years to 60 years old.

Maxillary sinuses dimensions

The mean, along with the SD, was determined for all the sizes of the right and the left maxillary sinuses, explicitly height, length, and width, for males and females [Table 1, 2].

For the right maxillary sinus, the mean value of the height was 3.26±0.58cm in males and 2.96±0.42cm in females. The mean length was 3.48±0.58cm in males and 3.52±0.34cm in females. Also, the mean width was 2.51±0.59cm in males and 2.24±0.38cm in females.

For the left maxillary sinus, the mean value of the height dimension was 3.40±0.56cm in males and 3.14±0.36cm in females. The mean value of the length dimension was 3.55±0.59cm in males and 3.56±0.35cm in females. Also, the mean value of width was 2.54±0.57cm in males and 2.15±0.35m in females.

A statistically significant difference was observed in the width of the left maxillary sinuses between males and females (P < 0.05), while the other dimensions of the left and right maxillary sinuses had insignificant differences (P > 0.05).

Table (1): Comparison between males and females regarding the dimensions of right maxilla sinus:

Dimensions	Females (no=15)	Males (no=15)	P-value
Hight	2.96±0.42	3.26±0.58	0.125
Length	3.52±0.34	3.48±0.58	0.779
Width	2.24±0.38	2.51±0.59	0.150
Volume	24.05±8.17	30.16±14.83	0.173

Table (2): Comparison between males and females regarding the dimensions of the left maxillary sinus:

Dimensions	Females (no=15)	Males (no=15)	P-value
Hight	3.14±0.36	3.40±0.56	0.137
Length	3.56±0.35	3.55±0.59	0.947
Width	2.15±0.35	2.54±0.57	0.033*
Volume	24.52±7.59	32.35±15.59	0.091

A comparison was performed between the right and left dimensions of the maxillary sinus in males and females distinctly [Table 3], where the maxillary sinus dimensions exhibited a pattern of being more superb in males than in females. However, the difference was insignificant.

Regarding comparison in males, the left maxillary sinus has an imprint of being somewhat more extensive than the right maxillary sinus in its total dimensions. Correspondingly, in females, the left maxillary sinus was slightly larger in dimensions than the right maxillary sinus. Yet, this difference was insignificant (P-value > 0.05).

*P-value is significant at <0.05

Table (3): Percentage of dimorphism of right and left maxilla sinuses

Right maxillary sinus		Left maxillary sinus
10.1		8.3
-1.1		-0.3
Width	12.1	18.1
Volume	25.4	31.9

Maxillary sinuses volume

The mean with SD was determined for the volume of the right and the left maxillary sinuses for males and females [Table 1, 2].

For the right maxillary sinus, the mean volume was revealed to be 30.16±14.83 cc in males and 24.05±8.17 cc in females.

For the left maxillary sinus, the volume mean was revealed to be 32.35±15.59 cc in males and 24.52±7.59 cc in females.

A comparison has been performed among the right and left volumes of the maxillary sinus in males and females distinctly [Table 3], where the maxillary sinus volume presented a pattern of being more extensive in males than in females. However, the difference was insignificant (P-value > 0.05).

Generally, the left maxillary sinus volumes, both in males and females, were bigger than the right maxillary sinus volumes. Yet, this difference was insignificant (P-value > 0.05).

A comparison was made between younger and older cases regarding the dimensions of the right maxillary sinus where dimensions in Age≤45 showed a pattern of being more extensive than those in Age>45. However, the change was insignificant (P-value > 0.05) [Table 4].

A comparison was made between younger and older cases regarding the dimensions of the left maxillary sinus where dimensions in Age≤45 showed a pattern of being more extensive than those in Age>45; however, the change was insignificant (P-value > 0.05) [Table 5].

Table (4) Comparing between younger and older cases regarding the dimensions of the right maxillary sinus

Dimensions	Age≤45 (no=15)	Age>45 (no=15)	P-value
Height	3.13±0.49	3.09±0.55	0.816
Length	3.55±0.56	3.45±0.37	0.552
Width	2.48±0.55	2.48±0.56	0.249
Volume	29.13±14.56	25.07±9.26	0.369

Table (5): Comparison between younger and older cases regarding the dimensions of the left maxillary sinus

Dimensions	Age≤45 (no=15)	Age>45 (no=15)	P-value
Height	3.30±0.49	3.24±0.48	0.718
Length	3.64±0.58	3.47±0.36	0.361
Width	2.43±0.59	2.24±0.40	0.320
Volume	30.89±15.75	25.97±8.49	0.296

sex prediction

Using Receiver-Operator Characteristic analysis the value of the area under the ROC curve was measured for sinus lengths, widths,

heights, and volumes of the right and left maxillary air sinuses (Table 6).

The results of the right maxillary air sinus length were as follows: the value of the area under the ROC curve calculated (AUC=0.540, $p=0.712$, PPV: 63.6%; NPV: 57.9%) demonstrated a prominent precision regarding sex prediction. The study results indicated a cut-off value for the right maxillary air sinus length of 3.38 regarding sex determination, which corresponded to 46.6% sensitivity and 73.3% specificity. Thus, values less than 3.38 indicated a significant probability that the participant was female (Table 6).

Regarding the right maxillary air sinus width, revealed that the value of the area under the ROC curve was calculated (AUC=0.640, $p=0.179$, PPV: → 77.8%; NPV: → 61.9%). The data demonstrated a prominent precision regarding sex prediction. The study results indicated a cut-off value for right maxillary air sinus width of 2.68 regarding sex determination, corresponding to 46.6% sensitivity and 86.6% specificity. Thus, values less than 2.68 indicated a significant probability that the participant was female (Table 6).

Regarding the right maxillary air sinus height, revealed that the value of the area under the ROC curve was calculated (AUC=0.664, $p=0.102$, PPV: → 77.8%; NPV: → 61.9%). The data demonstrated a significant precision regarding sex prediction. The study results indicated a cut-off value for right maxillary air sinus height of 3.36 regarding sex determination, corresponding to 46.6% sensitivity and 86.6% specificity. Thus, values less than 3.36 indicated a significant probability that the participant was female (Table 6).

Regarding the right maxillary air sinus volume, revealed that the value of the area under the ROC curve was calculated (AUC=0.640, $p=0.175$, PPV: → 61.9%; NPV: → 77.8%). The data demonstrated a prominent precision regarding sex prediction. The study results indicated a cut-off value for right maxillary air sinus volume of 18.9 regarding sex determination, corresponding to 86.6% sensitivity and 46.6% specificity. Thus, values less than 18.9 indicated a significant probability that the participant was female (Table 6).

For the left maxillary air sinus width, the value of the area under the ROC curve was calculated (AUC=0.538, $p=0.730$, PPV: → 75%; NPV: → 59.1%). The data demonstrated prominent precision regarding sex prediction. The study results indicated a cut-off value for left maxillary air sinus width of 3.79 regarding sex determination, corresponding to 40% sensitivity and 86.6% specificity. Thus, values less than 3.79 indicated a prominent probability that the participant was female (Table 6).

Regarding the left maxillary air sinus length, the value of the area under the ROC curve was calculated (AUC=0.731, $p=0.015^*$, PPV: → 88.9%; NPV: → 66.7%). The data demonstrated a significant precision regarding sex prediction. The study results indicated a cut-off value for left maxillary air sinus length of 2.5 regarding sex determination, corresponding to 53.3% sensitivity and 93.3% specificity. Thus, values less than 2.5 indicated with great probability that the participant was female (Table 6).

For the left maxillary air sinus height, the value of the area under the ROC curve was calculated (AUC=0.667, $p=0.104$, PPV: → 87.5%; NPV: → 63.6%). The data demonstrated great precision regarding sex prediction. The study results indicated a cut-off value for left maxillary air sinus height of 3.48 regarding sex determination, corresponding to 46.6% sensitivity and 93.3% specificity. Thus, values less than 3.48 indicated a prominent probability that the participant was female (Table 6).

Regarding the left maxillary air sinus volume, the value of the area under the ROC curve was calculated (AUC=0.658, $p=0.125$, PPV: → 87.5%; NPV: → 63.6%). The data demonstrated a prominent precision regarding sex prediction. The study results indicated a cut-off value for left maxillary air sinus volume of 32.5 regarding sex determination, corresponding to 46.6% sensitivity and 93.3% specificity. Thus, values less than 32.5 indicated a prominent probability that the participant was female (Table 6).

Overall, the sex prediction using dimensions of both maxillary sinuses was insignificant ($P\text{-value} > 0.05$) except that obtained from the width of the left maxillary sinus was significant ($P\text{-value} < 0.05$).

Table (6): Cutoff points, sensitivity, specificity, PPV, NPV of different maxillary sinuses dimensions measured by CT for prediction of male sex

Parameters	Length of Rt sinus	Length of Lt sinus	Width of Rt sinus	Width of Lt sinus	Height of Rt sinus	Height of Lt sinus	The volume of Rt sinus	The volume of Lt sinus
Cut off	≤3.38	>3.79	>2.68	>2.5	>3.36	>3.48	>18.9	>32.5
P-value	0.712	0.730	0.179	0.015*	0.102	0.104	0.175	0.125
AUC	0.540	0.538	0.640	0.731	0.664	0.667	0.640	0.658
Sensitivity (95%CI)	46.6(21.3 - 73.4)	40.0(16.3 - 67.7)	46.6(21.3 - 73.4)	53.3(26.6 - 78.7)	46.6(21.3 - 73.4)	46.6(21.3 - 73.4)	86.6(59.5 - 98.3)	46.6(21.3 - 73.4)
Specificity (95%CI)	73.3(44.9 - 92.2)	86.6(59.5 - 98.3)	86.6(59.5 - 98.3)	93.3(68.1 - 99.8)	86.6(59.5 - 98.3)	93.3(68.1 - 99.8)	46.6(21.3 - 73.4)	93.3(68.1 - 99.8)
PPV (95%CI)	63.6(39.2 - 82.6)	75.0(41.8 - 92.6)	77.8(46.3 - 93.4)	88.9(53.2 - 98.3)	77.8(46.3 - 93.4)	87.5(49.4 - 98.0)	61.9(49.3 - 73.1)	87.5(49.4 - 98.0)
NPV (95%CI)	57.9(43.9 - 70.7)	59.1(47.7 - 69.6)	61.9(49.3 - 73.1)	66.7(53.4 - 77.7)	61.9(49.3 - 73.1)	63.6(51.7 - 74.1)	77.8(46.3 - 93.4)	63.6(51.7 - 74.1)

DISCUSSION

Determination of sex and age by morphological assessment, in forensic anthropology, has been pointed to be one of the oldest methods [Take et al., 2007]. In legal medicine, identifications of skeletal and decomposed human remnants are one of the most challenging jobs. The identification methods may vary and rely on available bones and their conditions.

Maxillary sinus radiography was utilized for identifying the skeleton remnants and determining the sex and ages; however, levels of sexual dimorphism are population-specific because of a mixture of genetic and environmental parameters. MSCT provides highly accurate linear measurements; thus, the current work was made to evaluate the dependability and accuracy of maxillary sinus dimensions measurements for sex and age determination via MSCT of 30 patient images. Findings of the present work have indicated that a statistically significant (P-value < 0.05) difference was detected in the width of the left maxillary sinuses between males and females. In contrast, the other dimensions of the left and right maxillary sinuses were statistically insignificant (P > 0.05). Moreover, an insignificant change was found among cases younger and older than 45-yrs.

Unlike the results represented by Uthman et al., 2011, who found that maxillary sinus height was the best discriminating factor that could be utilized to investigate sexual dimorphism with 71.6% total accuracy. Amin

& Hassan, 2012, concluded that height measurement of the maxillary sinus is the most reliable, with an accuracy of 70.8% in males and 62.5% in females; the present study showed that height measurements were not statistically significant values.

In the Vidya et al., 2013 study, a significant difference was detected in the right maxillary sinus volumes between males and females. It was inconsistent with the present study that showed the left maxillary sinus volumes were bigger than the right maxillary sinus volumes. But this intra-gender volume change was insignificant (P-value > 0.05).

In another study conducted by Sharma et al., 2014, maxillary sinus length was the best discriminant parameter with an overall accuracy of 69.81%, which disagreed with the present study that showed length measurements were statistically insignificant.

Furthermore, Ekizoglu et al., 2014, concluded that morphometric investigation of maxillary sinuses is supportive for sex determinations with a total accuracy rate of the maxillary sinus was 77.15%. These results coincide with those obtained by Bangi et al., 2017, who revealed that sex determinations could be performed utilizing maxillary sinus measurements with an 88% total accuracy rate. Similar results were obtained by Prabhath et al., 2016, who reported an 83.3% total rate of accuracy in predicting sex. Teke et al., 2007, revealed a significant difference in the widths, heights, and lengths of the maxillary sinuses between men and women with was 69.3%

accuracy rate. A study by **Fernandes, 2004**, concluded that the maxillary sinus of males was noticed narrower than females in Zululand and broader in men than women in European Union. In contrast, the current study showed an insignificant statistical difference between females and males.

In agreement with the present study that showed width measurements were statistically significant different values. **Ahmed et al., 2015**, revealed that the left maxillary sinus width was the best discriminating factor (61.3% total accuracy) and may be utilized effectively as an assistant instrument for determining sex.

Another study by **Siraj et al., 2020** showed statistically insignificant differences ($p > 0.05$) in the measurement of the maxillary sinus among males and females and between measurements of the maxillary sinus according to age group. In agreement with the present work that exhibited statistically insignificant differences ($p > 0.05$) in measurements of maxillary sinus between males and females and between measurements of maxillary sinus according to age group except for the width of the left maxillary sinuses between males and females showed statistically significant (P -value < 0.05) change.

Most researchers have concluded a significant change in maxillary sinus measurements between males and females. Where **Saccucci et al., 2015** reported no such differences, similar to the present results that reject the hypothesis that maxillary sinus measurements could determine sex and age and revealed insignificant change among males and females in connection to the right and the left maxillary sinus lengths, heights and volumes, and between maxillary sinus measurements and age groups.

The current findings concerning evaluating the maxillary measurement in sex and age determination are different from the results of most of the previous studies carried out in the different populations. These changes can be clarified via a mixture of several parameters as regional variations in the morphometric features between different populations universally, which can impact the outcomes of morphological investigations.

It could also be explained by variations in measurement methods, sample sizes, and different ethnic and racial groups. This difference between diverse populations can be

caused by variance in genetic traits, habits, foods, post-infection, and environmental parameters. These lead to distinct anatomic characteristics such as alterations in the stature of the body skeleton sizes, heights, and differences in osteoclastic and osteoblastic activities and pneumatization procedures of the maxillary sinus, which may impact the maxillary sinus size. Also, changes in the imaging software and various radiographic devices used in research can influence this difference as most of the literature was performed on various software and diverse CT scan devices.

CONCLUSION

We can conclude that CT delivers a brilliant technique for investigating the maxillary sinuses. The results of the current study indicated that there were statistically significant differences in the width of the left sinuses between males and females, while the other dimensions of the right and left sinuses between males and females were not statistically significant. There was also no statistically significant difference between patients under 45 years of age and patients over 45, Which led to not relying on the dimensions of the maxillary sinuses alone as objective diagnostic criteria for determining sex and age. The former recommends doing such a study on a more significant number of people of the same sex, race, age, and who share the same food, habits, and environmental factors, to make this technique definite and attain standardizations for use in the field of forensic medicine.

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الملخص العربي

تقييم أبعاد الجيوب الأنفية لتحديد الجنس والعمر بين عينة من المصريين باستخدام التصوير الطبقي المحوسب

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يتم تعريف الهوية الشخصية على أنها تحديد هوية فرد. تنشأ الحاجة إلى التعريف الشخصي في الكوارث الطبيعية الجماعية، وفي الكوارث التي من صنع الإنسان، وفي الحالات التي يكون فيها الجسد شديد التحلل أو التقطيع لإخفاء هوية الفرد عمداً وذلك للأغراض الاجتماعية والطبية القانونية.

المهمة الأولى في تحقيق الهوية الشخصية هي تحديد ما إذا كانت بقايا الهيكل العظمي بشرية أم لا. إذا كانت البقايا تخص إنساناً، فيمكن استخدام تقنيات أنثروبولوجية مختلفة لتحديد هوية الموتى. "الأربعة الكبار" في تحديد الهوية الشخصية هي تحديد العمر والجنس والمكانة والعرق. وهذه تشكل خصائص التحديد المؤقتة.

يمثل تحديد الجنس والعمر باستخدام بقايا الهيكل العظمي مشكلة كبيرة لخبراء الطب الشرعي، خاصة عند استعادة أجزاء من الجسم فقط.

يتم تحديد الجنس والعمر من خلال أجزاء مختلفة من الجسم، والجمجمة، والحوض، والعظام الطويلة مع المشاش والكردوس في الهيكل العظمي، وعملية الخشاء، وماغنوم الثقب، والجيوب الأنفية. في الانفجارات والحرب والكوارث الجماعية الأخرى مثل حوادث الطائرات، تكون الجمجمة والعظام الأخرى مشوهة بشدة، ولكن تم الإبلاغ عن بقاء الجيوب الأنفية الفكية سليمة.

تم التوصل إلى بقاء الجيوب الأنفية الفكية سليمة على الرغم من تشوه الجمجمة والعظام الأخرى بشكل سيئ في الضحايا الذين تم حرقهم. لذلك، يمكن استخدام الجيوب الأنفية الفكية لتحديد الهوية.

يوفر التصوير المقطعي (CT) طريقة ممتازة لفحص الجيوب الأنفية الفكية.

يمكن استخدام الفحص بالأشعة المقطعية لتحديد الجنس عن طريق قياس الجيوب الأنفية الفكية عندما تكون الطرق الأخرى غير حاسمة، على الرغم من أن هذه الطريقة ليست خالية من الأخطاء.

كان الهدف من الدراسة هو استخدام التصوير المقطعي المحوسب لتحديد القياسات الخطية [للارتفاع والطول والعرض] وحجم الجيوب الأنفية الفكية، وللتحقق من إمكانية استخدام هذه المعلومات لتحديد جنس وعمر الفرد لتحديد هويته الشرعية.

تم إجراء الدراسة على ثلاثين صورة أشعة مقطعية علي الجيوب الأنفية الفكية لـ 15 رجل و 15 سيدة تتراوح أعمارهم بين 25 و 60 سنة، تم اختيار جميع صور الأشعة المقطعية من قسم الأشعة التابع لكلية الطب - جامعة بني سويف.

مع الأخذ في الاعتبار أنه تم استبعاد الحالات الآتية من الدراسة لضمان دقة النتائج:-

- المرضى الذين يعانون من أمراض الفك العلوي مثل (الأورام، الأفات السنية، الأفات العظمية، الإصابات الرضحية)

- المرضى الذين يعانون من إصابات أو كسور تصيب الجيوب الأنفية الفكية.

- المرضى الذين تقل أعمارهم عن 20 عاماً بسبب ميل الجيوب الأنفية إلى الاستقرار بعد العقد الثاني من العمر.

- المرضى الذين يعانون من التهاب الجيوب الأنفية الفكية مجهول السبب.

- صور ذات جودة منخفضة الدقة.

- الصور المشوهة أو التي بها أجزاء خادعة.

- المرضى الذين لديهم تاريخ من أي تدخل جراحي في الفم والوجه والفكين في منطقة الجيوب الأنفية الفكية.

أشارت نتائج دراستنا إلى وجود فروق ذات دلالة إحصائية في عرض الجيوب الأنفية اليسرى بين الذكور والإناث بينما كانت

الأبعاد الأخرى للجيوب الأنفية اليمنى واليسرى بين الذكور والإناث ليست لها دلالة إحصائية. ولم يكن هناك أيضاً فرق ذو دلالة

إحصائية بين المرضى الذين تقل أعمارهم عن 45 عاماً والمرضى الذين تزيد أعمارهم عن 45 عاماً. مما أدى إلى عدم الاعتماد على

أبعاد الجيوب الأنفية الفكية وحدها كمعايير تشخيصية دقيقة لتحديد الجنس والعمر. مما يوصي بعمل مثل هذه الدراسة على عدد أكبر

من الأشخاص لهم نفس الجنس والعرق والعمر ويتشاركون في نفس الطعام والعادات والعوامل البيئية وذلك للتأكد من دقة هذه التقنيات

في تحديد الجنس والعمر للاستفادة منها في مجال الطب الشرعي.