

HOSTED BY



ELSEVIER

Contents lists available at ScienceDirect

# Egyptian Journal of Forensic Sciences

journal homepage: [www.ejfs.org](http://www.ejfs.org)

Original article

## Sex determination from the piriform aperture using multi slice computed tomography: Discriminant function analysis of Egyptian population in Minia Governorate

Shereen Abdelhakim Abdelaleem\*, Rehab H.A. Younis, Moustafa Abdel Kader

Minia University, Faculty of Medicine, Egypt

## ARTICLE INFO

## Article history:

Received 11 July 2016

Revised 6 September 2016

Accepted 2 November 2016

Available online xxx

## Keywords:

Piriform aperture

Sex determination

Computed tomography

Discriminant function

## ABSTRACT

**[Objective]:** Sex determination from fragmentary remains is one of the most important tasks of a forensic expert. Since several studies have demonstrated that discriminant function equations used to determine the sex of a skeleton are population specific, the purpose of the present study was to determine whether the piriform aperture is a useful criterion for sex determination in fragmented skulls and derive an equation for the dimensions of the piriform aperture.

**[Subjects & Methods]:** 3D-MSCT was done to 250 patients with non-rhinologic problems (150 male & 100 female). The maximal length (height), maximal width and area of piriform aperture were measured to demonstrate the difference according to sex. Data were analyzed by SPSS version 16. Results: all measurements showed significant sexual differences. The maximal width showed the highest percentage of accuracy in sex determination followed by maximal length and area. The percentage of accuracy of maximal width was 86.2% in females and 64.5% in males.

**[Conclusion]:** Finally, it is concluded that the dimensions of the piriform aperture can be used as a useful tool for sex determination.

© 2016 The International Association of Law and Forensic Sciences (IALFS). Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### 1. Introduction

Sex identification using human skeletal parts is of paramount importance not only for the archeologically- oriented anthropologist, but also in forensic medicine and above all in the identification of individuals.<sup>1</sup> There are many studies that have investigated the use of parts of human skulls in sex determination.<sup>2</sup> The nasal bone is an important structure, which determines the shape of nose, and is the most common fracture site in the face.<sup>3</sup> Accordingly, in cases of nasal bone fractures, sex determination will be difficult due to alterations in the anticipated measured parameters of the nasal bone.<sup>4</sup>

The piriform aperture (PA) is the skeletal aperture located in the middle part of the face and limited by the frontal processes of the maxillary bones, the nasal bones, and the anterior nasal spine. It

corresponds to the anterior limit of the skeletal nose, and a major component of the size of the nose.<sup>5,6</sup>

PA is one of the upper respiratory passages, involved in warming, filtration and moistening of the incoming air.<sup>3</sup> In addition to forensic implications, the knowledge of PA and nasal bones variations is fundamentally significant in Anthropology and Otolaryngology.<sup>7</sup>

Forensic anthropologists frequently employ morphologic and metric methods for sex identification of human remains. The use of imaging techniques in forensic anthropology research has facilitated to derive as well as revise the available population.<sup>8</sup>

Advances in technologies such as Computed Tomography (CT) Scanning, Magnetic Resonance Imaging (MRI), computer based anthropometry and biochemical analyses are answering questions that could not have been answered 10 years ago, and are significantly improving the accuracy of skeletal analyses especially in sex identification.<sup>9</sup>

The use of multi-slice computed tomography (MSCT) is an effective technique in forensic identification. The potential benefits of the CT scan include: facilitation of the identification of unknown deceased individuals, avoidance of time consuming maceration procedures, non-invasive nature of the procedure, and availability

Peer review under responsibility of The International Association of Law and Forensic Sciences (IALFS).

\* Corresponding author.

E-mail addresses: [shereen\\_hakim1978@yahoo.com](mailto:shereen_hakim1978@yahoo.com), [shery\\_ft1978@yahoo.com](mailto:shery_ft1978@yahoo.com) (S.A. Abdelaleem), [hosni.rehab@yahoo.com](mailto:hosni.rehab@yahoo.com) (R.H.A. Younis), [moustafa18\\_1970@yahoo.com](mailto:moustafa18_1970@yahoo.com) (M.A. Kader).

<http://dx.doi.org/10.1016/j.ejfs.2016.11.003>

2090-536X/© 2016 The International Association of Law and Forensic Sciences (IALFS). Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

of large data sets of recent samples from various living populations.<sup>10</sup>

Discriminant function analysis has become important in forensic anthropology. If a measurement on a bone is suspected to be sexually dimorphic, discriminant function analysis can be done.<sup>11</sup> To our knowledge, after serving all available search engines, there is no single study that could determine sex in Egyptian population from PA dimensions; therefore, the aim of this study was to determine whether PA and its dimensions constitute a useful tool for sex identification by three dimensional facial CT scan in Egyptian population sample.

## 2. Subjects and methods

### 2.1. Subjects

Two hundred and fifty Egyptian patients in Minia Governorate (It is a city that's located in Northern Upper Egypt) who needed high resolution CT for non- rhinologic problems e.g. stroke, pulmonary embolism or exploration of laryngeal carcinomas were included in this study. Imaging studies were done as a part of clinical work; all subjects recruited for this study have signed a full informed consent about the nature of the research. This study has been approved by the human ethical committee council of our university. All the work performed in this study has been carried out in accordance to the code of ethics of the world medical association (declaration of Helsinki). There was no age limit to be excluded in this study

One hundred and fifty males (age range: 19–78 year) and one hundred females (age range 21:65 year) were included in this study. Patients with deviated nasal septum, nasal congenital anomalies, nasal trauma or previous surgical operation of the nasal region and nasal tumors were excluded from the study.

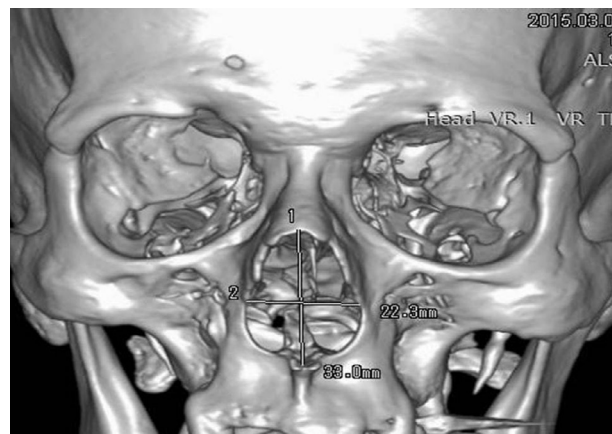
### 2.2. CT protocol

All patients underwent MSCT using 16-slice multi-detector computed tomography (MDCT) machine (GE bright speed, GE healthcare, Waukesha, WI, USA) with the same examination protocol using  $64 \times 0.5$  mm Collimation Scanner with a gantry rotation speed of 400 ms/rotation, range of box 450–500, image thickness 0.5 mm, standard pitch factor of 0.641, reconstruction interval 0.5 mm and a total exposure time 6.949. Each scan was obtained with a tube voltage of 120KV and 250mAs. Images were transferred to a separate advanced workstation (General electric, Advantage Workstation 4.4) with commercially available software (Microsoft Excel v. 12.0 software) beside the main apparatus that allows measurements.

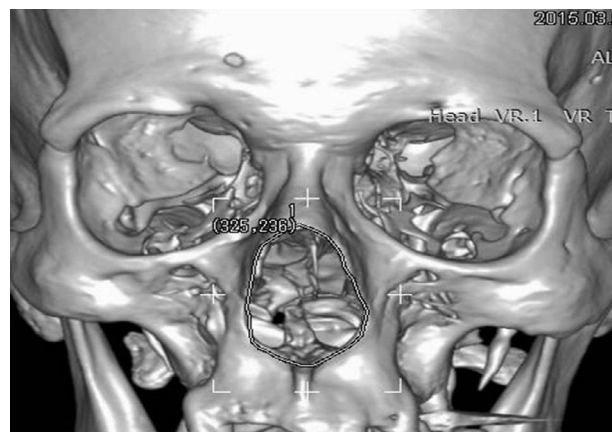
### 2.3. Measurements

Axial cuts were taken on the face and then reconstructed coronal and sagittal images were generated as well as 3D reformatted images.

1. Maximal length (height) of PA was measured from the rhinion superiorly to the nasal spine inferiorly in millimeters (mm) (Fig. 1).
2. Maximal width of PA was measured as the widest distance between the right and left lateral piriform boundaries in millimeters (mm) (Fig. 1).
3. 3-Area of nasal aperture was measured by drawing a continuous ellipse line beginning from the rhinion and encircles the aperture to end into the rhinion and reflected in square millimeters (mm<sup>2</sup>). The outline of PA was traced manually then



**Figure 1.** Photograph of 3D-MSCT of Piriform Aperture (PA) shows maximal length of PA (1), and maximal width (2).



**Figure 2.** Photograph of 3D-MSCT of Piriform Aperture (PA) shows area of PA (1).

the measure was driven automatically (Fig. 2). This measure was taken at the same level of measuring the length and the width of PA on the 3D image.

### 2.4. Statistical analysis

The data were analyzed using SPSS statistical package version 20. All measurements were repeated on 20 (10 males & 10 females) to assess the inter & intraobserver error & repeatability. The repeatability of the technique was evaluated using the concordance correlation coefficient of reproducibility. Means and standard deviations were obtained for each measurement. After using a student *-t* test to establish that a significance difference exists ( $P \leq 0.05$ ) between the male and female measurements, discriminant function analysis was performed. From these analyses, coefficients and constants were obtained for derivation of discriminant function scores & equations.

## 3. Results

The results of repeatability test showed that the range of values for the concordance correlation coefficient of reproducibility obtained in this study fell within the international standard of 0.90–0.99, as suggested by Cameron<sup>12</sup> (Table 1). This indicates that the measuring technique in this study was satisfactory.

Download English Version:

<https://daneshyari.com/en/article/7531188>

Download Persian Version:

<https://daneshyari.com/article/7531188>

[Daneshyari.com](https://daneshyari.com)