Content available at: https://www.ipinnovative.com/open-access-journals

IP Indian Journal of Anatomy and Surgery of Head, Neck and Brain

Journal homepage: https://www.ijashnb.org/

Original Research Article

Determination of sex of the dry skull using Interstyloid distance and its Medicolegal implications in Tamil Nadu population

Sumana R[1], Shivakumar A H[2,*], Maheshkrishna B G[3], Yasodai R

[1]*Dept. of Anatomy, Velammal Medical College, Madurai, Tamil Nadu, India*
[2]*Dept. of Anatomy, J J M Medical College, Davangere, Karnataka, India*
[3]*Dept. of Forensic Medicine, elammal Medical College, Madurai, Tamil Nadu, India*

ARTICLE INFO

Article history:
Received 11-12-2021
Accepted 29-12-2021
Available online 16-01-2022

Keywords:
Styloid process
Inter styloid distance

ABSTRACT

Determination of sex using Skeletal remains is a challenging topic with so many tools being used for the sex determination of Skull in this study. The interstyloid process distance were studied in 64 Skulls and were tabulated and analysed. There is a significant difference between the distance in Female skull and Male skull, the former being lesser compared to the later. Further study in this regard may help using Interstyloid process distance as a important tool in identification of the Sex of the Skull.

1. Introduction

Determination of Sex using the Skeletal remains is a challenge which requires many aspects inorder to come to a solid conclusion. The determination of sex from skeletal remains can be done using various tools and measurements.

The accuracy of determining the sex from the skeletal remains depends on the sexual dimorphism exhibited by the human body.

In the past Many researchers have done studies on the Skeletal remains to determine the sex of the body and most of them have concluded that the sex of unknown body can be accurately determined with help of Pelvis and Skull.(Krogman & Iscan, 1986).[1]

Even though many people have done much of research work on skeletal remains using other bones like Scapula, Clavicle etc. (Rathva et al., 2012,[2] Singh et al., 2012,[3] Smith, 1996,[4] Viwatpinyo et al., 2014[5]) not many have done study on Skull taking Styloid process as a tool in determining the sex of the unknown skeletal remain, Waraporn Sakaew et al[6] 2016 have done similar study but not complete.

Hence, This study is undertaken in order to strengthen the modalities which can be used as one of the factors determining the sex of the individual with the help of Interstyloid distance at the base of the Styloid process.

The Petrous part of Temporal bone presents a bony projection cylindrical / conical in shape called the Styloid process. The Styloid process is seen in the base of the skull being present in front of the Stylomastoid foramen projecting downwards, forwards and on to the medial side. The tip of the Styloid process lies between Internal and External carotid arteries, posterolateral to the bed of the Tonsil and related laterally to the Pharyngeal wall. Hence, length of the Styloid process can always be clinically important as it is crossed by the Facial nerve before entering the Parotid gland and also gives attachment to muscles like Stylopharyngeus attached at base, Stylohyoid attached at middle part of the Styloid process and the Styloglossus muscle attached to the tip of the Styloid process along with Stylohyoid and Stylomandibular ligaments.

* *Corresponding author*.
E-mail address: drshivakumarah@gmail.com (Shivakumar A H).

https://doi.org/10.18231/j.ijashnb.2021.030

The normal length of Styloid process will approximately be 20-30mm. It is considered elongated if the length is longer than 30mm.

As in most of the Skulls in the Department of anatomy the Styloid process will be broken hence here we will not be considering the length but our focus will be on the inter Styloid distance in determining the sex of the skull accurately.

For this purpose the 2 varieties of distances are taken Inter styloid distance between the inner table at the base and outer table at the base.

The distance in the Inner table is taken in to consideration as the Interstyloid process distance.

A Total of 50 Skulls used for the purpose of study and to determine the relationship between the Interstylid distance and sex of the skull.

The inter styloid distance between the inner edge of base of styloid process and the outer distance are measured for the purspose of study.

2. Materials and Methods

A total of 65 Human skulls were taken for the purpose of study (35 Male skulls and 30 Female Skulls) from the department of Anatomy Velammal Medical College Madurai.

The Interstyloid distance of the skull between the right and left sides were measured using a Digital Vernier caliper.

Fig. 1:

The interstyloid distance of the skull both inner table distance and outer table distance were noted with help of vernier caliper.

Each measurement was taken at least 4 times and averaged measure is recorded finally. The values were statistically analyzed and the data were analyzed using the student t-test and P values less than 0.05 were accepted as statistically significant.

Fig. 2:

Each Skull were measured and tabulated according to the distance and distributed from lowest to highest with the mean distance of 71.63771 and the standard deviation (SD) 2.927967

The distances were also measured and tabulated with reference to the sex of the Skull.

3. Discussion

The identification of the sex of skeletal remains is important in the execution of the forensic anthropological examination. The information on sexual dimorphism of human skeleton is useful in terms of the morphology differences as well as the larger size of male (Krogman & Iscan).[7]

In this regard, Krogman & Iscan have stated that the sex identification with 100 % accuracy is possible when the whole skeleton is utilized, while the 98 % accuracy is possible by using the pelvis and the skull, the 95 % accuracy by the pelvis alone, and 92 % by the skull alone.

There have been studies to estimate the value for sex identification of various parts of the skeleton such as patella, mastoid process, scapula and clavicle, and first rib (Introna et al., 1998; Vasiliki et al., 2012; Kubicka & Piontek, 2016).[8,9] However, no estimation of the value has so far been done about the styloid process.

SAKAEW, W.et al[6]have done the Inter styloid process distance in their stydy in 2016 and claim that theirs was the first study to be conducted on the styloid process for sex determination and have found the statistically significant differences of the interstyloid distance at both the base with P< .05 and thus the results of their study indicate that it is possible to use the interstyloid distance at both the base and the tip of the processes for sex estimation.

In our study we have found that the Inter styloid process distance will be greater in Males than in Female and if

Table 1: Measurements were tabulated as given below:

S.No.	Distance (MM)	S.No.	Distance (MM)	S.No.	Distance (MM)
1.	60.97	26.	69.95	51.	72.95
2.	61.04	27.	69.97	52.	73.01
3.	61.79	28.	70.05	53.	73.01
4.	62.76	29.	70.07	54.	73.15
5.	63.45	30.	70.27	55.	73.17
6.	63.87	31.	70.27	56.	73.36
7.	64.72	32.	70.29	57.	73.37
8.	64.95	33.	70.35	58.	73.77
9.	65.04	34.	70.37	59.	74.03
10.	65.05	35.	70.60	60.	74.07
11.	67.10	36.	70.69	61.	74.17
12.	67.18	37.	70.72	62.	74.65
13.	67.19	38.	71.01	63.	77.5
14.	67.60	39.	71.08	64.	79.54
15.	68.77	40.	71.27		
16.	68.88	41.	71.27		
17.	68.93	42.	71.27		
18.	69.02	43.	71.45		
19.	69.13	44.	71.51		
20.	69.13	45.	71.57		
21.	69.23	46.	72.01		
22.	69.37	47.	72.04		
23.	69.43	48.	72.43		
24.	69.52	49.	72.45		
25.	69.64	50.	72.50		

Table 2: Thecomparision of the distance with reference to the sex of the skull was done

S.No.	Gender	Range
1.	Male	80.24
2.	Female	77.24

Table 3: The analysis has been detailed as below:

Range	Low	High
1	55	60
2	61	65
3	66	70
4	71	75
5	76.5	80

distance is more than 65 mm it is more likely to be belonging to Male skull as in 90% of the skulls measured by us the distance was always more than 70mm in Males and less than 68mm were Females. [3,10–12]

Our results indicate that the styloid process can be a important tool for sex identification and as there are chances of the styloid process being broken during the exhumation and transit the interstyloid distance at the base can be a very usefull. The knowledge length of the styloid process and prevalence of the elongated styloid process are important and useful to the anatomists, anthropologists, radiologists, and clinicians. [13–17]

4. Conclusion

Skelatal remains if found will be a great importance in the forensics for the identification of the unknown body and also in identification of sex of the dead. If styloid process used as an tool for identification of sex may help in leading to identity of the dead as our study has found significant difference in the distance between the interstyloid process in both males and female skulls.

Further study on this regard will be undertaken to highlighten the importance of Interstyloid distance being an important tool in identification of the Sex of the unidentified skull.

5. Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

6. Source of Funding

None.

References

1. Krogman WM, Iscan MY. Sex determination by discriminant analysis of patella measurements. In: The Human Skeleton in Forensic Medicine. 2nd Edn.. vol. 95. Springfield, Charles C. Thomas Publisher; 1986. p. 39–45.
2. Rathva A, Kubavat DM, Nagar SK. Study of Styloid Process: Anatomical Variations in Length, Angulation and Distance between the Two Styloid Processes. *Int J Recent Trends Sci Technol*. 2013;8(2):109–12.
3. Pathak RK, Singh D. Morphometric sex determination from various sternal widths of Northwest Indian sternums collected from autopsy cadavers: A comparison of sexing methods. *Egypt J Forensic Sci*. 2012;2(1):18–28.
4. Smith SL. Attribution of hand bones to sex and population groups. *J Forensic Sci*. 1996;41(3):469–77.
5. Viwatpinyo K, Case DT, Mahakkanukrauh P. Sex estimation from the navicular bone in a Thai population. *Siriraj Med J*. 2014;66(6):210–8.
6. Sakaew W, Arnanteerakul T, Somintara S, Ratanasuwon S, Uabundit N, Iamsaard S, et al. Sexual dimorphism using the interstyloid distances and clinical implication for elongated styloid process in Northeastern Thailand. *Int J Morphol*. 2016;34(4):1223–7.
7. Krogman WM, Iscan MY. The Human Skeleton in Forensic Medicine. 2nd Edn. Springfield, Charles C: Thomas Publisher; 1986.
8. Kubicka AM, Piontek J. Sex estimation from measurements of the first rib in a contemporary Polish population. *Int J Legal Med*. 2016;130(1):265–72.
9. Introna F, Vella G, Campobasso CP, Kubicka AM, Piontek J. Sex estimation from measurements of the first rib in a contemporary Polish population. *Int J Legal Med*. 2016;130(1):265–72.
10. Standring S. Gray's Anatomy. The Anatomical Basis of Clinical Practice. 40th Edn. Elsevier; 2008.
11. Babu YPR, Kanchan T, Attiku Y, Dixit PN, and MSK. Sex estimation from foramen magnum dimensions in an Indian population. *J Forensic Leg Med*. 2012;19(3):162–7. doi:10.1016/j.jflm.2011.12.019.
12. Promthale P, Chaisuksunt V, Rungruang T, Apinhasmit W, Chompoopong S. Anatomical consideration of length and angulation of the styloid process and their significances for eagle's syndrome in Thais. *Siriraj Med J*. 2012;64(1):30–3.
13. Balbuena L, Hayes D, Ramirez SG, Johnson R. Eagle's syndrome (elongated styloid process). *South Med J*. 1997;90(3):331–4.
14. Bozkir MG, Boga H, Dere F. The evaluation of elongated styloid process in panoramic radiographs in edentulous patients. *Tr J Med Sci*. 1999;29:481–6.
15. Charisi D, Eliopoulos C, Vanna V, Koilias CG, Manolis SK. Sexual dimorphism of the arm bones in a modern greek population. *J Forensic Sci*. 2011;56(1):10–8.
16. Andrade KMD, Rodrigues CA, Watanabe PC, Mazzetto MO. Styloid process elongation and calcification in subjects with tmd: clinical and radiographic aspects. *Braz Dent J*. 2012;23(4):443–50.
17. & Amonkar SSD. Eagle's syndrome: review of literature and case report. *Indian J Dent Res*. 2003;14(3):162–70.

Author biography

Sumana R, Professor and HOD

Shivakumar A H, Professor

Maheshkrishna B G, Professor and HOD

Cite this article: Sumana R, Shivakumar A H, Maheshkrishna B G, YR. Determination of sex of the dry skull using Interstyloid distance and its Medicolegal implications in Tamil Nadu population. *IP Indian J Anat Surg Head, Neck Brain* 2021;7(4):119-122.