

GENDER DETERMINATION BY PANTOMOGRAPHIC (OPG) ANALYSIS OF MENTAL FORAMEN IN NORTH GUJARAT POPULATION- A RETROSPECTIVE STUDY

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Abstract-

Aim-

To determine the gender using mental foramen as landmark on a panoramic radiographs in selected North Gujarat population.

Objective-

1. To evaluate and compare the superior border of mental foramen to lower border of mandible(S-L) and inferior border of mental foramen to lower border of mandible(I-L) value in males and females bilaterally.
2. To compare the S-L and I-L between right and left side in males and female
3. To utilize above measurements for gender determination.

Materials and Method-

Sixty panoramic radiographs were selected for the analysis of mental foramen. Tangents were drawn through the superior and inferior borders of the foramen (S-L and I-L respectively) and perpendicular from the tangents to the lower border of the mandible bilaterally. Digital vernier caliper was used for the distance measurement from S-L and I-L. The data obtained was tabulated and subjected to statistical analysis.

Result-

The analyzed data of study showed that the mean values of comparison of S-L as well as I-L in males and females were significantly higher in males as compared to females. The comparison of SL and IL on right and left side in the same patient was without any significant difference.

Conclusion-

The results of present study concluded a definite sexual dimorphism in the position of the mental foramen from the base of the mandible; this method can applied in mass disaster where the fragments of mandible are available.

Introduction:

Analyzing the morphological characteristics of bone is a common approach used by anthropologists and forensic dentists in individual determination¹. Many anatomical landmarks like frontal bone, orbital bone, maxillary sinus, tooth and jaws in human skull² can be used in forensic science for individual identification or for determination of sex or age of the person.

Mandible is the strongest bone in the human body and persists in a well-preserved state longer than any other bone³, thus is important in the field of physical and forensic anthropology.

Few of the morphological characteristics of mandible that shows sexual dimorphism are:

1. Angle of the mandible which is more prominent in males when compared to females,
2. Inter canine distance which is more in males,
3. Symphysis menti which is squarish and/or lobulated in males⁴

Mental foramen is one such landmark on the mandible which is stable³. It is located on the buccal cortex of the mandibular bone and lies near the apices of the premolars on either side⁵. The mental foramen morphology, in terms of position, varies not only according to age, sex and ethnicity but even within the same race, in different geographic regions and within the inhabitants of the same geographic area⁶.

The panoramic radiography (OPG) provides the ability to view the entire body of the mandible and allows a more accurate location of the mental foramen in both

horizontal as well as in vertical dimensions². Instead of advance imaging, panoramic radiographs can be used to study the mandible because of less radiation exposure, low cost and easy availability⁷.

The present study was designed for evaluation of mental foramen as a landmark on OPG for gender determination in North Gujarat population

Materials and Method:

OPG of 60 dentulous patients from the archives of the Department of Oral Medicine and Radiology were selected for the study. The age of the selected radiographs ranged from 18-55 years. All the radiographs were taken using the Codac 8000c machine with tube potential 70 KV, tube current 12 mA, total filtration 2.5 mm, focal spot 0.5, and time 13.9 s.

Only high quality radiographs with clearly seen mental foramen and border of mandible were included in the study. The exclusion criteria for the radiographs were: Distortion of images, presence of artifacts, surgical interventions, presence of any pathology and non visualisation of mental foramen.

The selected OPGs were digitalised, mental foramen was identified clearly and marked. The tangents were drawn through the superior and inferior borders of the foramen and perpendicular lines were drawn from tangents to the lower border of the mandible using photoshop. Digital vernier calliper was used to measure the distance from superior border of mental foramen to lower border of mandible (S-L) and inferior border of mental foramen to the lower border of mandible (I-L) bilaterally (Fig-1).



Figure 1 showing the distance measurement from superior border of mental foramen to the lower border of mandible

The measurements were tabulated on an excel sheet and analyzed for mean value in males and females on both the right and left sides. Confidence interval, t-test between group comparison and P values were calculated.

Results:

The mean distance of S-L on right side in males was 16.866 mm, whereas it was

14.433 mm in females. On the left side, it was 15.233 mm in males and 12.966 mm in females. The comparison of S-L between males and females showed a very high significant difference on both the right ($p = 0.002$) and the left sides ($p = 0.001$). [Table-1]

Table- 1. Comparison of S-L in Males and Females

	Males		Females		p value
	Mean (S.D) (mm)	CI (95%) (mm)	Mean (S.D) (mm)	CI (95%) (mm)	
Right	16.86(2.23)	16.03-17.69	14.43(2.62)	13.85-15.91	0.002
Left	15.23(2.32)	14.37-16.09	12.96(2.02)	12.91-13.71	0.001
Combine	16.05(2.40)	14.64-16.67	13.90(2.50)	13.56-14.80	0.001

$p < 0.05 =$ Singnificant

The mean distance of I-L on the right side in males was 13.35 mm, whereas it was 11.293 mm in females. On the left side, it was

11.816 mm in males and 10.051 mm in females. The comparison of I-L between males and females suggested a highly

significant difference on both right (0.003) and left (0.009) sides. [Table-2]

Table-2. Comparison I-L in Males and Females

	Males		Females		p value
	Mean (S.D) (mm)	CI (95%) (mm)	Mean (S.D) (mm)	CI (95%) (mm)	
Right	13.35(2.51)	12.41-14.29	11.29(2.60)	10.30-12.28	0.003
Left	11.81(2.28)	10.96-12.66	10.05(2.14)	9.24-10.86	0.009
Combine	12.58(2.50)	11.54-13.22	10.68(2.41)	10.06-11.70	0.001

$p < 0.05 = \text{Significant}$

The comparison of S-L ($P = 0.58$) and I-L ($P = 0.72$) between the right and the left sides in males described a non-significant difference. In the same way, the comparison

of S-L ($P = 0.64$), I-L ($P = 0.83$) between the right and left sides in females also showed a non-significant difference. [Table-3]

Table.3 Comparison of S-L, I-L between right and left sides

	Male (p value)	Female (p value)
S-L	0.58	0.64
I-L	0.72	0.83

$p < 0.05 = \text{Significant}$

Discussion:

The mandible is the strongest bone in the human body and persists in a well-preserved state longer than any other bone. Therefore, mandibular characteristics are extremely useful for personal identification³.

Panoramic radiography is a curved plane tomographic radiography used to depict the body of the mandible, maxilla and the lower one-half of the maxillary sinuses on a single image. The ability to view the entire body of the mandible allows a more accurate location of the mental foramen in both a horizontal and a vertical dimension on OPG³.

In 1974, Wical and Swoope described that despite the alveolar bone resorption above the mental foramen, the distance from the foramen to the inferior border of the

mandible remains relatively constant throughout life⁸. Lindh et al and Guler et al also suggested that the stability of mental foramen to the lower border of mandible does not depend on resorption of alveolar process². Agthonget al. in 2005 analyzed the position of the mental foramen in several populations by using panoramic radiography⁹.

Chandra A et al³, Sura A. Rashid in 2011¹⁰ and Moni Thakur et al¹ in their study found the mean values of S-L and I-L to be significantly high in males as compared with females.

Similarly the present study also showed that the mean values of comparison of S-L as well as I-L in males and females were significantly higher in males as compared to females.[Table-1,2]

Yousue & Brooks¹¹ and Amorimet al¹² found that there was significant difference in the location and position of the mental foramen according to gender and that the measurements related to the vertical position of the mental foramen were higher in male⁵. On the contrary, Vodanovic et al found that the mean value of I-L does not exhibit sexual dimorphism. The difference may be due to racial diversity of the study population¹³.

The study showed the comparison of SL and IL on right and left side in the same patient was without any significant difference. ($p > 0.05$) [Table-3]. This suggests that the technique can be applied for sex determination of individual, even if half the mandible or part of mandible with mental foramen and intact lower border of mandible is available for identification.

Chandra et al suggested that a distance above 16.92mm for S-L and 11.944mm for I-L on OPG; in 95% of cases the gender will be male. Similarly S-L less than 17.032mm and IL less than 12.38mm; in 95% cases, the gender will be female¹. The results of the study conducted on a south Indian population by Mahima et al. in 2009, described that if a distance above 1.7 cm is obtained for S-L and 1.48 cm for I-L, the gender is male in 99% of the cases. In the same way, if a distance is less than 1.69 cm for S-L and 1.3 cm for I-L, the gender is female¹⁴.

Similarly, the results of the present study suggest that if the S-L is > 14.64 mm and I-L > 11.54 mm on OPG, the individual is likely to be male in 95% cases. If the S-L is < 14.80 mm and I-L is < 11.70 mm, the individual is likely to be female in 95% cases.

The results obtained from different studies suggests that there is a variation in the position of mental foramen among different geographic location. If this technique is to

be applied the criteria has to be defined for the geographic location. The results of the present study suggest the morphometric criteria of mental foramen in north Gujarat population.

There are several other studies done using advance technique like CT and CBCT for determination of sexual dimorphism using mandible and other bones in the skull. But studies done using routine methods (OPG) are still useful as it is less expensive and can be easily performed during mass disaster management.

Conclusion:

The results of present study showed a definite sexual dimorphism in the position of the mental foramen from the base of the mandible, This method can be applied in mass disaster where the fragments of mandible are available.

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References

- [1]. Thakur M. Reddy KV. Sivaranjani Y. Khaja S, Gender Determination by Mental Foramen and Height of the Body of the Mandible in Dentulous Patients A Radiographic Study, J Indian Acad Forensic Med, Vol.36, Number.1, 2014, pp.13-18.
- [2]. Matamala DAZ. Galdames ICS. Smith RL, Sexual Dimorphism Determination from the Lineal Dimensions of Skulls, Int. J. Morphol, Vol.27, Number.1, 2009, pp.133-137.
- [3]. Chandra A. Singh A. Badni M. Jaiswal R. Agnihotri A, Determination of sex by radiographic analysis of mental foramen in North Indian population, Journal of forensic dental sciences, Vol.5, Number.1, 2013, pp.52-55.
- [4]. <http://google:sexchanges> in mandiblewiki

- [5]. Haghanifar S. Rokouei M, Radiographic evaluation of the mental foramen in a selected Iranian population, *Indian J Dent Res*, Vol.20, Number.2, 2009, pp.249-53.
- [6]. Pokhrel R. Bhatnagar R, Position and number of mental foramen in dry human mandibles: Comparison with respect to sides and sexes. *OA Anatomy*, Vol.1, Number.4, 2013, pp.1-6.
- [7]. Jamdade AS. Yadav S. Bhayana R. Khare V. Pardhe N. Mathur N, Radiographic localization of mental foramen in a selected Indian population, *Innovative Journal of Medical and Health Science*, Vol.3, Number.5, 2013, pp.249 - 253.
- [8]. Wical KE. Swoope CC, Studies of residual ridge resorption. Part 1. Use of panoramic radiographs for evaluation and classification of mandibular resorption. *J Prosthet Dent*, Vol.32, Number.8, 1974, pp.7-12.
- [9]. Agthong S. Huanmanop T. Chentanez V, Anatomical variations of the supraorbital, infraorbital and mental foramina related to gender and size. *J Oral Maxillofac Surg*, Vol.63, Number.12, 2005, pp.800-4.
- [10]. Rashid SA. Ali J, Sex determination using linear measurements related to the mental and mandibular foramina vertical positions on digital panoramic images, *J Bagh College Dentistry*, Vol. 23, 2011, pp.1-6.
- [11]. Yosue T. Brooks SL, The appearance of mental foramina on panoramic radiographs. Evaluation of patients. *Oral Surg Oral Med Oral Pathol*, Vol.68, Number.8, 1989, 360-4.
- [12]. Amorim MM. Borini CB. Haiter-Neto F. Caria PHF, Morphological description of mandibular canal in panoramic radiographs of Brazilian subjects: Association between anatomic characteristic and clinical procedures. *Int J Morphol*, Vol.27, Number.23, 2003, pp.1243-8.
- [13]. Vodanovic M. Dumancic J. Demo Z. Mihelic D, Determination of sex by discriminant functional analysis of mandibles from two Croatian archeological sites. *Acta Stomatol Croat*, Vol.40, Number.2, 2006, pp.263-77.
- [14]. Mahima VG, Mental foramen for gender determination; A panoramic radiographic study, *Medicolegal update*, Vol.9, Number.32, 2009, pp.33-5
- [15]. Agarwal D. Gupta SB, Morphometric Analysis of Mental Foramen in Human Mandibles of South Gujarat, *People's Journal of Scientific Research*, Vol.4, Number.1, 2011, pp.138-45.
- [16]. Marinescu M. Panaitescu V. Rosu M. Maru N. Punga A, Sexual dimorphism of crania in a Romanian population: Discriminant function analysis approach for sex estimation, 2014 Romanian Society of Legal Medicine, *Rom J Leg Med*, Vol.22, Number.23, 2014, pp.21-26.
- [17]. Singh R. Srivastav AK, Study of Position, Shape, Size and Incidence of Mental Foramen and Accessory Mental Foramen in Indian Adult Human Skulls, *Int. J. Morphol.*, Vol.28, Number.4, 2010, pp.1141-1146.
- [18]. Przygocka A. Podgorski M. Topol M. Polguy M, The location of infraorbital foramen in human skulls, to be used as new anthropometric landmarks as a useful method for maxillofacial surgery, *Folia Morphol*, Vol.71, Number.3, 2004, pp.198-204