

A Study on Genial Tubercles in Human Dry Mandible**Rani Nallathamby¹, Boban Babu²**¹Associate Professor, Dept of Anatomy, Azeezia Institute of Medical Sciences, Kollam, Kerala.²Associate Professor, Department of Forensic Medicine, Azeezia Institute of Medical Sciences, Kollam, Kerala

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Conflict of interest: Nil

Abstract:

Background: The Mandible on its lingual surface presents small bony eminences termed as Genial tubercles. They are usually 4 in number, 2 above known as superior genial tubercles and 2 below, known as inferior genial tubercles. Genial tubercles are also known as mental spines or genial apophysis the superior genial tubercle (SGT) gives attachment to the muscle Genioglossus and the inferior genial tubercle (IGT) gives attachment to the muscle Geniohyoid. These two muscles play key roles in speech and deglutition and thence making the knowledge about these small sharp bony projections extremely significant.

Aim: To conduct a study on genial tubercles and describe its various presentations and analyse them morphometrically

Materials and Methods: Study was conducted in 100 human mandibles and the incidence of pattern of presentation was done by observational method and basic dimensional analysis of the tubercles was done with vernier calipers and comparison made with previous studies in different regional population.

Results: Type 2 pattern showed predominance in the study. The mean genial tubercle height (GTH) measured was 1.6 mm, the mean width (GTW) was 1.3 mm. The average distance from the upper border of the SGT to the menton was 12.4 mm. The mean distance from the lower border of the IGT to the menton was 8.2 mm.

Keywords: genial tubercles, obstructive sleep apnea

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Introduction

Even though anatomy literatures describes Genial tubercles as 2 pairs, one pair above and one pair below, studies shows many variations in their position, number and patterns of presentation. Knowledge of them is crucial in the fields of dentistry, radiology and maxillofacial surgeries.

The genial tubercles are involved in various types of mandibular fractures of the symphysis menti region. In atrophic edentulous mandibles, these structures seem to be prominent and get affected in spontaneous fractures.

Genioglossus advancement is one of the effective surgical procedures in the treatment of Obstructive sleep apnea which requires the identifying and isolating the attachment of genioglossus to Mandible where the anatomy of these tubercles is very significant. [1]

The main aim of this study is to identify the various patterns of presentation of genial tubercles, [2] to evaluate their dimensions and distance between the Menton with corresponding upper and lower margins of SGT.

Material and Methods:Nallathamby *et al.*

This study was done in 100 dry human mandibles from Osteology section of Anatomy department. Edentulous damaged Mandibles were excluded and measurements were taken using vernier calipers and repeated 3 times to prevent errors. Significant patterns photographed and statistical evaluation of the measurements was done.

The genial tubercles presented in 5 different patterns/types as follows:

- Pattern 1-classical pattern-2 tubercles superiorly and 2 tubercles inferiorly.
- Pattern 2-2 tubercles superiorly and a median ridge representing the fused inferior tubercles inferiorly.
- Pattern 3-2 tubercles superiorly and a rough impression inferiorly
- Pattern 4-A single median eminence by fusion of all 4 tubercles
- Pattern 5-Total absence of genial tubercles.

The following morphometric assessments were also made:

- The distance between the upper margin of SGT and Menton.

- The distance between the lower margin of SGT and Menton.
- Height of the GT
- Width of the GT

All the measurements were tabulated and statistically analysed.

Results:

Type - I pattern were seen in 4%, type - II in 51 %, type - III in 27% and type - IV in 18% and type – V in 0 % of the total mandibles examined. In majority of the cases, 2 superior tubercles with a fused median inferior ridge was noted (type 2) followed by 2 superior tubercles with a rough impression below (type 3) . The pattern of distribution of the genial tubercles was tabulated in Table 1:

Table 1: Various patterns of genial tubercles with its distribution

Pattern	Number Of Mandibles Showing The Pattern	Percentage Of Distribution
1	4	4%
2	51	51%
3	27	27%
4	18	18%
5	0	0

Type 1:

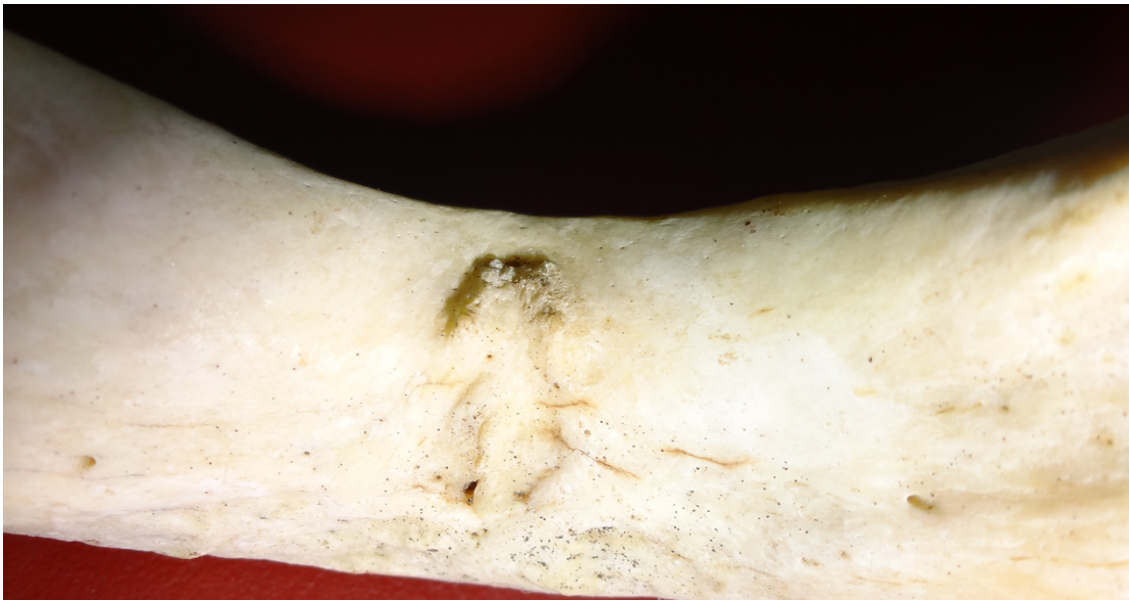


Figure 1:

Type 2:



Figure 2:

Type 3:



Figure 3:

Type 4:

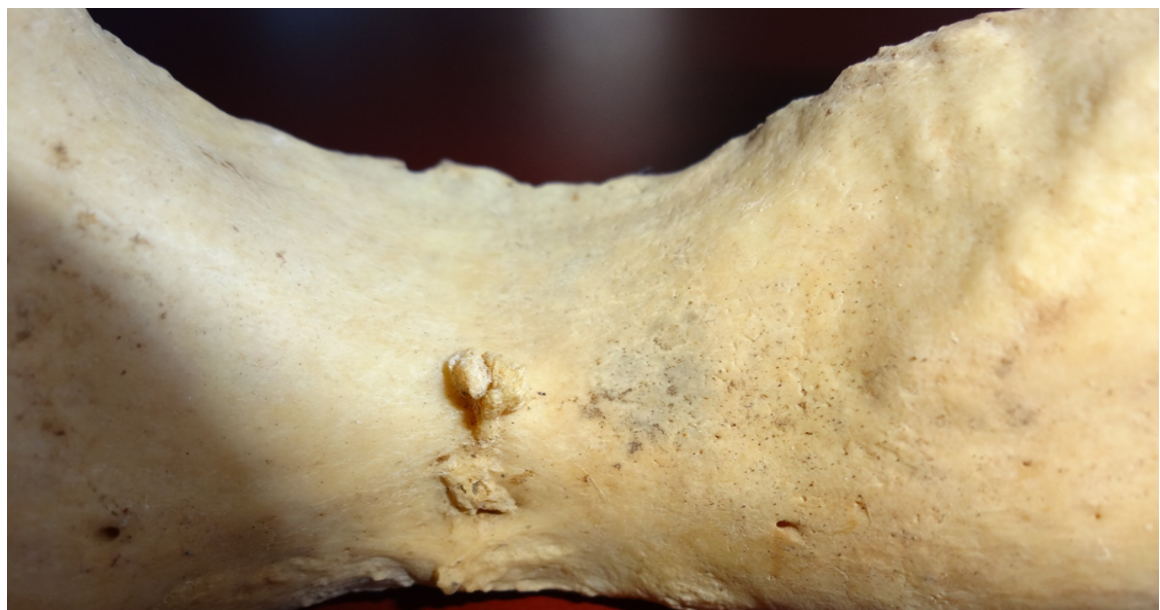


Figure 4:

The mean genial tubercle height (GTH) measured was 1.6 mm, the mean width (GTW) was 1.3 mm. The average distance from the upper border of the SGT to the menton was 12.4 mm. The mean distance from the lower border of the IGT to the menton was 8.2 mm.

Table 2: Morphometric values of genial tubercles

Parameter Measured	Minimum Value Obtained (Mm)	Maximum Value Obtained (Mm)	Mean (Mm)
Distance Between Menton And Upper Margin of SGT	9.9	21.1	12.4
Distance Between Menton And Lower Margin of SGT	5.8	16.5	8.2
Height of The Tubercle	1.7	6.4	1.6
Width of The Tubercle	0.4	3.1	1.3

Discussion

Obstructive sleep apnea is a complex syndrome plaguing the modern world where multifactorial etiology comes into play. Genioglossus advancement (GA) surgery effectively addresses the problem of retrolingual airway narrowing with minimal surgical intervention. [1] Precise localization of genial tubercle is an important step during this procedure. Studies had proved that GT is a clinically reliable and useful landmark for the evaluation of mandibular asymmetry on Cone Beam CT images. [3]

V. Singh [10] has studied the patterns of the mental spines and mental foramina and has classified the patterns into type I to type V. In his study he found type II pattern of distribution of genial tubercles to be more followed by type III. The present work is comparable to this study in terms of the morphology of the genial tubercles. Izhar Shohat et al has reported that enlarged genial tubercle acts as a frequent site of fracture in Mandibular dentures.[5]

Hueman EM, has done both cadaveric study for anatomical analysis and radiographic study using cone beam CT to determine the location of the genial tubercles. His results show the accuracy of the 3D cone beam CT in the anatomic location of the genial tubercle. [6] Selvamuthukumar et al has reported incidental finding of an enlarged genial tubercle in case of oral carcinoma. [7]

Padmavathi et al studied 60 Mandibles in India and got the following results. Type I, type II patterns were noted in 23.33% and 35%, type III and type IV in 26.67 % and 13.33 %. GT was absent in 1.67% of the mandibles examined. The mean height and width of GT was 6.3 ± 2.9 mm and 5.6 ± 1.6 mm. Mean distance from superior genial tubercle to the apices of lower incisors was 15.4 ± 4.1 mm. Mean distance from the menton to the upper and lower margins of superior genial tubercles were 14.6 ± 2.3 mm and 8.5 ± 3.3 mm.

The present study on 100 Mandibles could be considered as an extended version of the study of Padmavathi et al. [2]

Conclusion

The findings of the present study could help to calculate more precise dimensions for mandibular osteotomies to offer the greatest possible amount of muscular advancement in OSA procedures.

It will also guide the otolaryngologists to avoid complications such as mandibular incisor apex injury, muscle injury and mandibular fractures in various maxillo-facial surgeries.(2)It also important in cone beam radiological assessment for

Mandibular asymmetry. This study adds knowledge in the fields of Anatomy, Radiology, Dentistry and Maxillofacial surgery.

Abbreviations Used:

GT-genial tubercles, SGT-superior genial tubercle, IGT-inferior genial tubercle, OSA-obstructive sleep apnea.

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