ORIGINAL ARTICLE

Study of Symphyseal Height and Symphyseal Angle in Dentulous and Edentulous Mandibles

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Abstract:
Introduction: Mandible, also known as lower jaw, is the largest bone of skeleton of face. Symphysis menti is primary cartilaginous joint that ossifies completely by first year of life. The morphometric parameters of mandible are important in the diagnosis and treatment of mandibular symphyseal fractures especially in deciding size of implants. *Aim and Objectives:* The present study was undertaken to evaluate height of symphysis and symphyseal angle. *Material and Methods:* The parameters were measured in 110 macerated and dry mandibles from various medical colleges in western Maharashtra region. *Results:* In the present study, mean symphyseal height in dentulous group of mandibles was found to be 26.72 mm while in edentulous group, it was 22.22 mm. As well as, mean symphyseal angle in dentulous group of mandibles was found to be 65.02o while in edentulous group, it was 65.91o. These findings of this study will be useful to anatomists, implantologists, orthodontists, archeologists, forensic legal experts and maxillofacial surgeons.

Keywords: Mandible, mandibular symphysis, symphysis menti, symphyseal height, angle of symphysis.

Introduction:

Mandible is the largest bone of skeleton of face. It is one of the parts of the only synovial joint of face remaining all being fibrous type. It forms almost the lower half of the face. It is one of the functionally and cosmetically important structures of the face that contribute to the facial contour [1]. Embryologically it is second bone to ossify, next to clavicle. The ossification is mainly intramembranous from mesenchyme of first pharyngeal arch, only small part being cartilaginous. It ossifies in two halves that meet in midline forming mandibular symphysis. It is primary cartilaginous joint that ossifies completely by first year of life. The symphyseal morphology was found to be associated with the direction of mandibular growth, especially in male subjects with symphysis ratio having strongest relationship [2]. In general, males had greater MS measurements than females [3]. A positive correlation is also found between mandibular plane angle and symphyseal height [4]. Symphyseal / parasymphyseal fractures with are second most common fractures of the face comprising 15.6 to 29.3% of total mandibular fractures. Incisor tooth loss is also a known phenomenon [5]. Open reduction and internal fixation is mostly treatment of choice.

The morphology of mandibular symphysis is important because it serves as the primary reference for esthetics of the facial profile and is the determinant in planning of orthodontic treatment [6,7]. The assessment of morphometric parameters of mandible is an important part in the diagnosis and treatment planning especially in deciding size of implants. Studies have been conducted for parameters of dentulous mandibles. But there is hardly any data available about parameters of edentulous ones. So, the present study was undertaken to evaluate height of symphysis and symphyseal angle in dentulous as well as edentulous bones. The influence of state of dentition was also studied. The findings of this study might be useful in providing important data to anatomists, implantologists, orthodontists, archeologists, forensic legal experts and maximumillofacial surgeons.

Aim and Objectives:

1. To measure symphyseal height in dentulous and edentulous mandibles.
2. To measure symphyseal angle in dentulous and

edentulous mandibles.

3. To prepare the database useful for surgical purposes.
4. To compare the findings of present study with previous studies.

The parameters, symphyseal height and symphyseal angle were measured on 110 dry adult mandibles obtained from human unclaimed cadavers in western maharashtra region, after appropriate procedure of maceration in Department of Anatomy in Medical Colleges of Western Maharashtra region with prior permission of concerned authorities. The mandibles without any structural deformity or implants were chosen for the study. 98 dentulous (teeth >14) and 12 edentulous (without any teeth) bones were included in the present study. Height was measured with the help of flexible measuring tape.

Material and Methods:

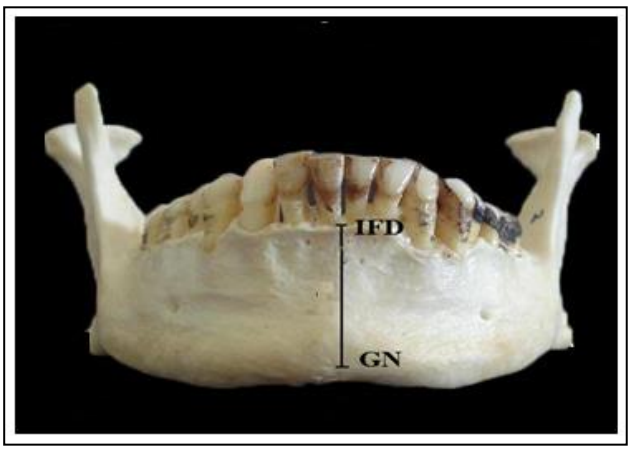

Figure 1: IFD – GN denotes symphyseal height

Figure 2: 'AS' denotes angle of symphysis

Symphyseal height: Distance between infradentale and gnathion was measured as symphyseal height (SH) as shown in figure 1. The mm was the unit. Mean value of each group was analyzed by appropriate statistical test.

Symphyseal angle: For measuring angle of symphysis, each mandible was placed on a plane paper. Outline of its base was drawn with the help of common pencil. As denoted in figure 2, long axes of right half and left half were drawn from outermost point at the level of angle of mandible i.e., gonion and most inferior point at symphysis menti i.e., gnathion. Angle between these two axes was measured as angle of symphysis (gnathio-gonial angle) as shown in figure 2. Mean value of each group was analyzed by appropriate statistical test.

Results:

After completing measurements of all the mandibles, data was arranged as follows.

Dentulous group (n=98), Edentulous group (n=12); Observations were noted as shown in following tables:

Table No.1: Symphyseal height (SH) - Present study

(mm)	Maximum	Minimum	Mean + SD
Dentulous	31.13	13.96	26.72 + 2.85
Edentulous	25.57	14.83	22.22 + 4.27

Table No. 2: Symphyseal angle (AS) - Present study

(°)	Maximum	Minimum	Mean + SD
Dentulous	78	51	65.02 + 4.25
Edentulous	68	64	65.91 + 1.38

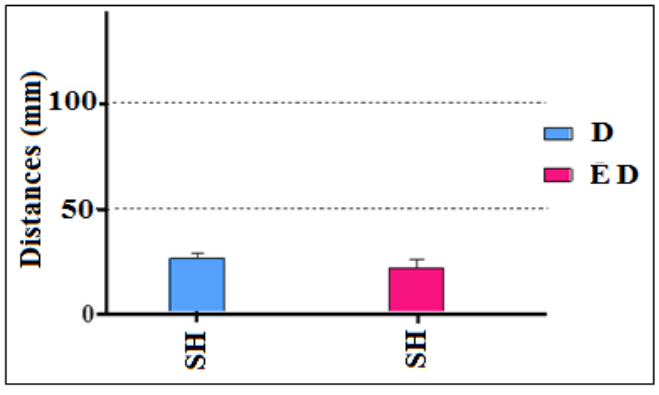

Figure 3: Symphyseal height (SH) - Present study

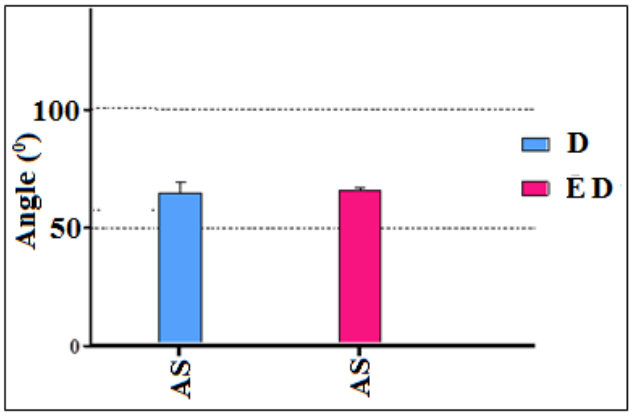

Figure 4: Symphyseal angle (AS) - Present study

Discussion:

In the present study, as shown in Table 3, mean symphyseal height in dentulous group of mandibles was found to be 26.72 mm (maximum 31.13, minimum 13.96) while in edentulous group, it was 22.22 mm (maximum 25.57, minimum 14.83). In present study, sex of the mandibles was not specified. N. Bapna et al [8] had found it 31mm in male while 26 mm in female dentulous mandibles. N. D. Mandke et al [9] had found it 25 mm and 22 mm in male and female dentulous mandibles respectively. Frank Cleaver studied in four different groups [10], Spitalfields (M32, F29), Farringdon Street (M31, F30), Punjabi (M33), Australian (M33, F31). G M Morant observed in 3 groups that in Qau population its (M34, F31) [11], in kerma population (M34, F32) and in dunstable population (M33). Eugene giles made observations in whites negros as whites (M32, F28), negros (M36, F32) [12].

In the present study, mean symphyseal angle in dentulous group of mandibles was found to be 65.02° (maximum 78, minimum 51) while in edentulous group, it was 65.91° (maximum 68, minimum 64) as shown in Table 4. In present study, sex of the mandibles was not specified. Gordon Harrower had found it 70.46° in Hokian population, 69.6° in Hylam population and 68.25° in Tamil population. While N. D [13]. Mandke et al had found 72.51° in male mandibles and 71.66° in female mandibles [9].

Probably there is significant change in height of mandible from dentulous state of the bone to edentulous one. But edentulousness does not make any significant change in angle of symphysis. This cannot be proven statistically as whole the above data was discussed in dentulous groups only as, in spite of meticulous search, no measurements were found in the literature for comparison of findings in the present study in edentulous group.

Table No. 3: Symphyseal height - Comparison with previous studies

Present study	N. Bapna		N. D. Mandke		Frank Cleaver							G M Morant					Eugene Giles			
					M				F			M			F		White		Negro	
	M	F	M	F	S	F	P	A	S	F	A	Q	K	D	Q	K	M	F	M	F
26.72	31	26	25	22	32	31	33	33	29	30	31	34	34	33	31	32	32	28	36	32

Where M- Male, F- Female, S- Spitalfields, F- Farringdon Street, P- Punjabi, A- Australian, Q- Qau, K- Kerma, D- Dunstable

Table No. 4: Symphyseal angle - Comparison with previous studies

Present study (°)	Gordon Harrower			N. D. Mandke	
	Hokian	Hylam	Tamil	Male	Female
65.02	70.46	69.6	68.25	72.51	71.66

Conclusion:

The present study is an observational study which is involved in the preparation of morphometric database of human mandibles in Western Maharashtra region population. Mean symphyseal height in dentulous group of mandibles was found to be 26.72 mm with Standard deviation (SD) of + 2.85 while in edentulous group, it was 22.22 mm with SD of 4.27. Mean symphyseal angle in dentulous group of mandibles was found to be 65.02° with SD of 4.25 while in edentulous group, it was 65.91° with SD of 1.38. The present study is the first this kind of study to prepare morphometric database of edentulous human mandibles in Western Maharashtra region population. These findings of this study will be useful to anatomists, implantologists, orthodontists, archeologists, forensic legal experts and maxillofacial surgeons. The limitation of this study is no. of edentulous mandibles (12) is very less as compared to dentulous ones (98). That is because of availability of the bones as these bones were obtained from unclaimed bodies received by Department of Anatomy in Medical colleges in Western Maharashtra region.

Conflict of Interest - Nil
Sources of Support - Nil

References

1. Anand J. Reddy, Rakhi M. More, Rajendra S. Garud. Mandibular and Mental foramen – A morphometric study in western Maharashtra. *Indian Journal of Clinical Anatomy and Physiology* 2018; 5(3): 366-372.
2. T Aki, R S Nanda, G F Currier, S K Nanda. Assessment of symphysis morphology as a predictor of the direction of mandibular growth. *American Journal of Orthodontics and Dentofacial Orthopedics* 1994; 106(1):60-69.
3. Amal I. Linjawi, Ahmed R. Afify, Hosam A. Baeshen, Dowen Birkhed, Khalid H. Zawawi. Mandibular symphysis dimensions in different sagittal and vertical skeletal relationships. *Saudi Journal of Biological Sciences* 2021; 28(1): 280 - 285.
4. R Tanaka, H Suzuki, H Maeda, K Kobayashi. Relationship between an inclination of mandibular plane and a morphology of symphysis. *The Journal of Orthodontic Society* 1989; 48(1): 7-20.
5. Amin Rahpeyma, Saeedeh Khajehahmadi, Somayeh Abdollahpour. Mandibular symphyseal / Parasymphyseal Fracture with Incisor Tooth Loss: Preventing Lower Arch Constriction. *Craniomaxillofacial Trauma and Reconstruction* 2016; 9:15-19.
6. Sandhya Jain, Prateek Puniyani, Arwa Saifee. Mandibular symphysis morphology and lower incisor angulation in different anteroposterior jaw relationships and skeletal growth patterns. *Medicine and Pharmacy Reports* 2020; 93(1): 97-104.
7. Yolanda Gomez, Veronica Garcia Sanz, Natalia Zamora, Beatriz Tarazona, Carlos Bellot Arcıs, Erik Langsjoen, et al. Associations between mandibular symphysis form and craniofacial structures. *Japanese Society for Oral and Maxillofacial Radiology* 2018 34:161–171.
8. N. Bapna, L. Mehata, N. K. Harneja. Metrical features of mandible - Rajasthan zone. *Journal of Anatomical Society of India* 1977;26:108-110.
9. N. D. Mandke. Anthropometric study of human mandible in Vidarbha region. Dissertation submitted to Nagpur University 1989.
10. Frank H. Cleaver. A Contribution to the biometric study of the human mandible. *Biometrika* 1937; 29: 80-112.
11. G. M. Morant, Margot Collett, N. K. Adyanthaya. A Biometric Study of the Human Mandible. *Biometrika* 1936; 28: 84 -122.
12. Eugene Giles. Sex determination by discriminant function analysis of the human mandible. *American Journal of Physical Anthropology* 1964; 22(2): 129-135.
13. Gordon Harrower. A Biometric study of one hundred and ten Asiatic mandibles. *Biometrika* 1928; 20B (3-4): 279-293.

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