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Osteometric analysis of distance between individual tooth and base of the mandible in South Indian dry skulls

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Abstract

Background: Mandible is the strongest bone of the face and also the largest bone of the face. It is durable because of the presence of a dense layer of compact bones and remains well preserved than many other bones. Age of an individual can be estimated by mandibular dentition by the eruption of mandibular teeth.

Aim: The aim of the study was osteometric analysis of distance between individual tooth and base of mandible.

Materials and methods: This study was carried out with 30 mandible specimens. In 30 mandibles the distance between the individual tooth and base of the mandible was measured. The data were collected and entered in google docs and then entered in MS Excel and the results were analysed by using t-test calculator in graph pad.

Results: In the left side of the mandible the distance between the individual tooth and base of the mandible was higher than that of the distance between individual tooth and base of the mandible in the right side of the mandible.

Conclusion: This study provides data on the distance between individual teeth and base of the mandible and also provides information on a comparative aspect between the right and left side of the distance between individual tooth and base mandible.

Keywords: Osteometric analysis, mandible, individual tooth

Introduction

Mandible is the strongest and largest bone of the face. It is an ossified bone and it is horse shoe shaped. Presence of a dense layer of compact bone makes it very durable and hence, remains well preserved than many other bones. Mandibular dentition helps in estimating the age of an individual depending on the eruption of the mandibular teeth.(1,2). Mandible identification is important in medico-legal and anthropological work. The teeth along with the skull are the best preserved part of human remains. Mandible next to the pelvis in human remains will help in the identification of the age, sex and race(3,4). The mandibular condyles are smaller in females.(5,6).

Growth of the mandibular condyle not only increases the mandibular size, but also to the anteroinferior displacement (transposition) of the mandible. In individuals with low angles, mandibular growth is characterized by anterosuperior growth of the condyle. In contrast, individuals with high angles show posterosuperior growth of the condyle(7,8). The mandibular condyle is the rounded protuberance that articulates with the mandibular fossa to form the temporomandibular joint(9). The shape of the mandibular condyle may be classified according to five basic shapes that are flattened, convex, angled, rounded and concave.(10,11).

It is contributing for the formation of the lower jaw, the body of the mandible, which bears the lower jaw teeth and quadrilateral bony plate which is known as the ramus, which projects posterior and superior to the body(3). The ramus of the mandible has anterior, posterior, superior and inferior borders and two surfaces, namely, the lateral and medial surfaces(12). The mandibular foramen is an irregular foramen on the medial surface of the ramus, which is located near the center. (10,13).

Mandible is the hardest and most durable bone of the skull exhibiting a high degree of sexual dimorphism(14). Especially the ramus of the mandible is subjected to greater stress than any other bone of the skull because of the process of mastication (15,16). The distance between the individual tooth and base of the mandible has been estimated in this study and it also provides a comparative study between the right and left side of the distance between the individual tooth and base of the mandible(17). The aim of the present study was to analyze the distance between individual teeth and base of the mandible through morphometry.

Materials and methods

This prospective study was carried out with 30 mandible specimens. Osteometric analysis of distance between individual teeth and base of the mandible was measured using vernier callipers (Figure 1-3). In 30 mandibles the distance between the individual tooth and base of the mandible was measured which also gives comparison between the right and left side of the mandible.The datas were collected and entered in the google docs and the data were analysed statistically by using t-test calculator in Graph pad

Results:

The mean distance between the lower left third molar (38) and the lower right third molar (48) to the base of the mandible are 24.38 mm and 24.05 and it shows no significant difference was observed at $p<.05$, the p value is 0.5945. The mean distance between the lower left second molar (37) and the lower right second molar (47) to the base of the mandible are 22.51 and 22.49 which shows no significance at $p<.05$, the p value is 0.5514. The mean distance between the first left lower molar (36) and the first lower right molar (46) are 21.61 and 21.44 was observed and there were no significant differences at $p<.05$, the p value is 0.2163. The mean distance between the second lower left premolar (35) and second lower right premolar (45) to the base of the mandible are 21.08 and 20.54 respectively, which shows is significant at $p<0.05$, the p value is 0.0001 (Graph 1).

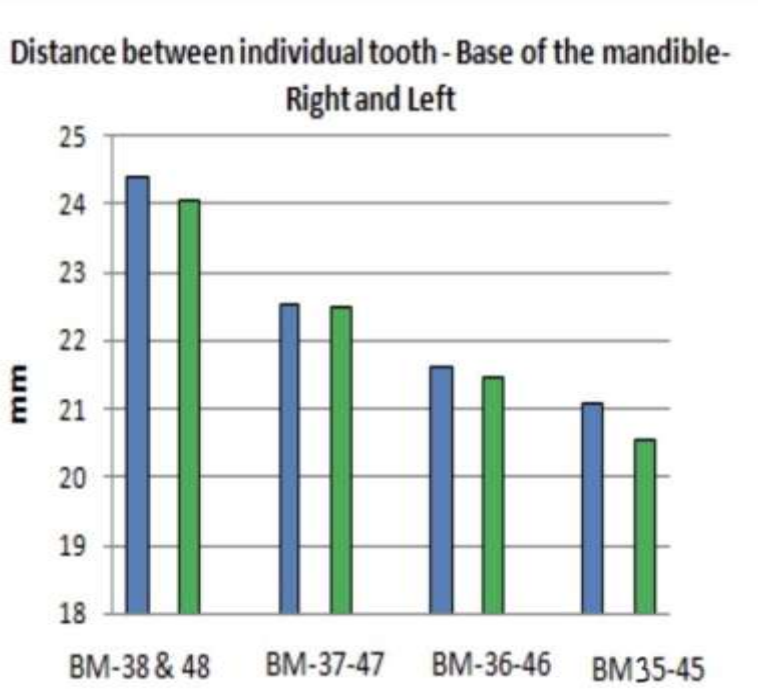
The mean distance between the first lower left premolar (34) and first lower right premolar (44) to the base of the mandible are 26.13 and 26.02 which shows is not significant at $p<0.05$, the value of p is 0.6763. The mean distance between the lower left canine (33) and lower right canine (43) to the base of the mandible are 25.25 and 25.04, which shows significance at $p<0.05$, the value of p is 0.0001. The mean distance between the lower left lateral incisor (32) and lower right lateral

incisor (42) to the base of the mandible are 22.2 and 22.14, which shows significance at $p<0.05$, the value of p is 0.00139. The mean distance between the central lower left incisor (31) and lower right central incisor (41) to the base of the mandible are 20.43 and 20.21, which shows is not significant at $p<0.05$, the value of p is 0.0957. In this study there were no significant differences observed between the right and left side by using a t-test analyser. The two tailed p value is 0.7461 with 95% confidence interval (Graph 2).

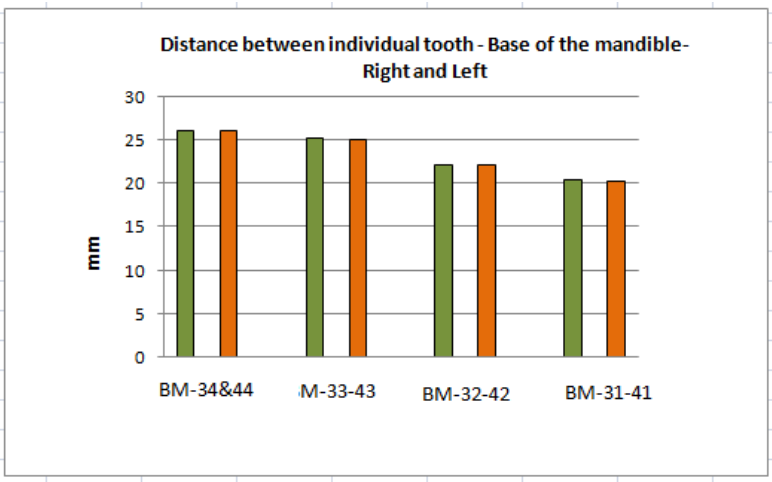
Figure 1 depicts the osteometric analysis of distance between the tooth 36 (mandibular left first molar) and to the base of the mandible. It is measured using a vernier caliper.

Figure 2 depicts the osteometric analysis of distance between the tooth 32 (mandibular left lateral incisor) and to the base of the mandible. It is measured using a vernier caliper.

Figure 3 depicts the osteometric analysis of distance between the tooth 44 (mandibular right 1st premolar) and to the base of the mandible. It is measured using a vernier caliper.



Graph 1: It depicts the distance between the tooth to the base mandible - Right and left. X-axis represents tooth position and Y-axis represents measurements in mm. By comparing teeth 38 and 48 , 37 and 47 , 36 and 46 , 35 and 45, it shows that the left side of the mandible (denoted in blue) is greater than the right side of the mandible (denoted in green). The mean distance between the second lower left premolar (35) and second lower right premolar (45) to the base of the mandible shows significance, at $p<0.05$, the p value is 0.0001 and all other measurements were not significant (Graph 1).



Graph 2: It depicts the distance between the tooth to the base mandible - Right and left. X-axis represents tooth position and Y-axis represents measurements in mm. By comparing teeth 34 and 44 , 33 and 43 , 32 and 42 , 31 and 41, it shows that the left side of the mandible (denoted in green) is greater than the right side of the mandible (denoted in orange). The mean distance between lower left lateral incisor (32) and lower right lateral incisor (42) to the base of the mandible shows significance at $p<0.05$, the value of p is 0.00139 and all other parameters were not significant (Graph 2).

Discussion :

Mandible is the individual bone containing teeth forming the lower jaw and it is the only bone articulating with cranium forming temporomandibular joint(10,18,19). So many studies dealt

with various aspects of morphometric analysis such as distance between mandibular foramen and other parts of the mandible (10,18). Similarly the present study also measured the distance between the base of the mandible to various teeth on the right and left sides. The study states the sex determination of human mandible using metrical parameters. Other studies state the various osteometric parameters of the human mandible in adult and elderly age groups(20,21). This present study also shows the difference in the right and left side of the mandible between the distance of the individual tooth and to the base of the mandible. (5,22)

Though the present study has observed the distance between various and base of the mandible, some shows significant difference between right and left side. The distance between the second lower left premolar (35) and second lower right premolar (45), between the lower left canine (33) and lower right canine (43), the lower left lateral incisor (32) and lower right lateral incisor (42) to the base of the mandible at $p<0.05$ were showing statistically significant.

It is very interesting that with respect to mandibles even small bits and pieces of it also are useful to determine its age, gender, etc.(23) The mandibular condyles, ramus, position of the mandibular foramen and length of the body of the mandible are also considered to be important bony parts for analysing the above mentioned parameters(15,24–27). The limitation of the study was sample size and the future research should be done with a larger sample size. Further the study plans to analyse large sample for various findings such as determination of sex, age, ethnicity, etc.(28,29)

Conclusion:

From this study it was observed that the study analysed the mean distance between base of the mandible to individual mandibular teeth. These measurements may help in mandibular reconstruction surgeries, anthropological studies, etc. Thus the present study concluded that this kind of morphometrical studies is of utmost importance in biological and clinical studies.

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Conflict of interest:

None to declare

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