

The Study of Some Selected Facial Foramena Using Cadaver and Radiographic Methods in Nigerian Population

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Abstract

Original Research Article

Background: A comprehensive study of the human skeletal features and variations between and within populations are beneficial both for clinical applications and determination of racial characteristics of populations. This statement implies that a comprehensive study on the u-shaped bone, mandible of Nigerians is of clinical importance and allows for studies on racial differences between Nigerians and others, and equally within Nigerians. **Materials and Methods:** The study comprised twenty-seven human male cadavers obtained from the anatomy laboratories of two different universities in Nigeria. Measurements from panoramic and periapical radiographs of the mandibular foramen, mandibular canal and mental foramen. **Results and Discussions:** The position of the foramen was variable in different individuals, but the mental foramen was predominantly located below the lower second premolar tooth, and the mandibular foramen was located on the posterior surface of the ramus of mandible. **Conclusions:** The percentage distribution of the mental foramen in relation to the lower second premolar tooth was not at variance with those of other races or population groups. The mandibular foramen was present on the inner surface of the ramus of the mandible. This research work is of clinical and anatomical significance to medical practitioners for a successful inferior alveolar and mental nerve block anesthesia and the prevention of damage to the mental nerve during surgical procedures in the lower jaw.

Keywords: Mental foramen, Mandibular foramen, Mandible, Mandibular canal and Radiography.

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INTRODUCTION

A comprehensive study of the human skeletal features and variations between and within populations are beneficial both for clinical applications and determination of racial characteristics of populations. This statement implies that a comprehensive study on the u-shaped bone, mandible of Nigerians is of clinical importance and allows for studies on racial differences between Nigerians and others, and equally within Nigerians [1].

One commonest or most regulating performed nerve block in dental surgery is the inferior alveolar nerve block. The inferior alveolar nerve passes through the mandibular foramen, through the mandibular canal, to transverse through the mental foramen as mental nerve. Considering the course, the nerve runs through, it is necessary to locate the exact position of mandibular foramen, mental foramen and the distribution of the

mandibular canal [2-5]. This study is only possible to determine with a detailed cadaveric and radiographic study. The mandibular canal opens directly from the mandibular foramen and descends obliquely forwards in the body of the mandible, then horizontally forwards in the body below the alveoli, with which it communicates by small canals [2-5]. The site for inferior alveolar nerve block or anaesthesia is the mandibular foramen. This is an ovally shaped foramen, while the mental foramen is oval in some individuals and round in some others. A radiographic determination of the mandibular foramen and the mental foramen may be carried out using the following radiographic imaging technique, such as Orthopantomography, Tomography, Magnetic Resonance Imaging, Plain Radiography, Fluoroscopy, Computed Tomography, Spiral Tomography using the computed tomography to explain the process of radiography [6-10].

comprises an x-ray source for radiating an object with x-rays. An x-ray image detecting means for detecting an image of x-rays which passed through the object. A swivel for integrally swiveling of the x-ray source and the x-ray detecting means around the object. An image storing means for storing image information output from the x-ray detecting agent during the period when the swivel means operates and an image processing means on the basis of image information stored in the image storing means.

At the Maxillofacial and Dental centre, the radiographic machine used was the Gendex secondent Microprocessor. This was produced in Italy by Gendex, in December 2003 with a voltage of 230v, 60/60 Hz, 5A and an output of 65KV. This machine produce 3 kinds of x-ray films: The occlusal x-ray, periapical x-ray and bywinged (x-ray for children).

Precautions

The following precautions was employed to avoid some methodological problems:

- The use of hand gloves to avoid contamination of the skin and the burning of the skin by the caustic soda employed.
- Laboratory coat was used to prevent the splashing of chemicals used on the body and to avoid x-ray irradiation.

- A disinfectant to wash hands after every work in the laboratory to prevent contamination of the hands with gems from the cadavers.

RESULTS

The following parameters were measured:

Mental Foramen

The vertical distance between the alveolar crest of the mandible and the mental foramen, the horizontal distance between the mental foramen and the symphysis menti, the vertical distance between the inferior border of the base of mandible and the mental foramen; the posterior border of the ramus of the mandible and the mental foramen

Mandibular Foramen

The vertical distance between the mandibular foramen and the mandibular notch, the horizontal distance between the mandibular foramen and the posterior border of the ramus of the border of the mandible.

All these measurements were taken for both left and right parts. From the data obtained above, the mean values and the standard deviations were calculated.

In table-1, the result showed the parameters measured on the right and left sides.

Table-1: The Mean and Standard Deviations of Various Measurements on the Mandible

	Distance between mental foramen and symphysis menti		Distance between mental foramen and the alveolar crest of mandible		Distance between mental foramen and inferior border of the base of mandible		Distance between mental foramen and posterior border of the ramus of mandible		Distance between mandibular foramen and inferior border of the base of mandible		Distance between mandibular foramen and mandibular notch		Distance between mandibular foramen and posterior border of the ramus of mandible	
	LEF T	RIG HT	LEF T	RIG HT	LEF T	RIG HT	LEF T	RIG HT	LEF T	RIG HT	LEF T	RIG HT	LEF T	RIG HT
ME AN	2.74c m	2.76c m	1.45c m	1.47c m	1.47c m	1.46c m	7.69c m	7.74c m	2.89c m	2.92c m	2.03c m	2.07c m	1.62c m	1.59c m
S.D	0.17c m	0.19c m	0.14c m	0.16c m	0.20c m	0.19c m	0.45c m	0.56c m	0.27c m	0.25c m	0.23c m	0.23c m	0.22c m	0.23c m

In table-2, there was no significant difference in the data obtained.

Mental Foramen

The average vertical distance between the alveolar crest of mandible and the mental foramen were 1.45cm and 1.47cm on the left and right respectively.

The average vertical distance between the inferior border of the base of mandible and the mental

foramen were 1.47cm and 1.46cm on the left and right respectively.

The average horizontal distance between the mental foramen and the posterior border of the ramus of mandible were 7.69cm and 7.74cm on the left and right respectively.

The average horizontal distance between the mental foramen and the symphysis menti were 2.74cm and 2.76cm on the left and right respectively.

Table-2: The T- Calculated, T-Tabulated and P-Values to Show for Differences in Measurements on the Mandible

	Distance between mental foramen and symphysis menti	Distance between mental foramen and the alveolar crest of mandible	Distance between mental foramen and inferior border of the base of mandible	Distance between mental foramen and posterior border of the ramus of mandible	Distance between mandibular foramen and inferior border of the base of mandible	Distance between mandibular foramen and mandibular notch	Distance between mandibular foramen and posterior border of the ramus of mandible
T-calculated	0.408	0.489	0.188	0.362	0.424	0.639	0.489
T-tabulated	2.000	2.000	2.000	2.000	2.000	2.000	2.000
P-value	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P-0.05
	No significant difference	No significant difference	No significant difference	No significant difference	No significant difference	No significant difference	No significant difference

Mandibular Foramen

The average vertical distance between the mandibular foramen and the inferior border of the base of mandible were 2.89cm and 2.92cm on the left and right respectively.

The average vertical distance between the mandibular foramen and the mandibular notch were 2.03cm and 2.07cm on the left and right respectively.

The average horizontal distance between the mandibular foramen and the posterior border of the ramus of the mandible were 1.62cm and 1.59cm on the left and right respectively.

From the twenty-seven human male cadavers used, the results obtained showed that the position of the mental foramen was present below the lower second premolar tooth in 19 mandibles (70.4%), while the remaining 8, it was present between the first and the second premolars (29.6%). The shape of the mental foramen was oval in 17 mandibles (62.9%) and the remaining 10 mandibles (37.1%) it was round in shape.

Measurements Obtained from Radiographs

Only the mental foramen was visible using the panoramic radiographs and the periapical radiographs derived from the panoramic x-ray machine and the Gendex microprocessor. The following measurements were done using seven radiographic films in the mental

foramen, they include the following: distance between the mental foramen and the symphysis menti 1.4cm, distance between the mental foramen and the alveolar crest of the mandible 0.92cm; finally, average distance between the mental foramen and the inferior border of the base of mandible 0.84cm.

A total of six radiographs showed the position of mental foramen to be below the lower second premolar (85.7%) and the remaining one, was between the first and second premolar (14.3%). The shape of the mental foramen was oval in the seven (7) radiographic or x-ray films.

DISCUSSIONS

This study was done in order to investigate the exact positions of the mental foramen and the mandibular foramen is Nigerians. The following results were obtained:

The distance between mental foramen and the symphysis menti were 2.74cm and 2.76cm on the left and right respectively.

The distance between the mental foramen and the inferior border of the base of mandible on the left was 1.47cm, while on the right 1.46cm.

The distance between the mental foramen and the posterior border of the ramus of mandible were 7.69cm and 7.74cm on the left and right respectively.

The distance between the mental foramen and the alveolar crest of the mandible on the left was 1.45cm and right 1.47cm.

The distance between the mandibular foramen and the mandibular notch on the left was 2.03cm and right 2.07cm.

The distance between the mandibular foramen and the posterior border of the ramus of mandible on the left was 1.62cm and right 1.59cm.

The distance between the mandibular foramen and the inferior border of the base of mandible on the left was 2.89cm and right 2.92cm.

The results obtained showed that those from dry human male cadavers were consistent with that from the radiographs. The shape of the mental foramen from the radiographs indicated it was oval and from the cadavers, the foramen with oval structure were higher in position. Again, the position of the foramen was below the lower second premolar tooth in both cadaveric and radiographic measurements. Comparison of the results obtained from this study with those reported by previous authors in other races, showed that there were no significant differences in the result [11-15]. The result obtained from other research works on Indians, Zimbabweans, British, the Chinese and other races stated that the percentage of occurrence of the mental foramen were prevalently below the lower second premolar tooth [16-20].

CONCLUSION

The percentage distribution of the mental foramen in relation to the lower second premolar tooth was not at variance with those of other races or population groups. The mandibular foramen was present on the inner surface of the ramus of the mandible. This research work is of clinical and anatomical significance to medical practitioners for a successful inferior alveolar and mental nerve block anesthesia.

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Conflict of interest

We write to state that there is no conflict of interest.

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Author's contribution

We write to state that both authors have contributed significantly, and that all authors are in agreement with the contents of the manuscript. 'Author A' (Josiah S. Hart) designed the study and protocol, 'reviewed the design, protocol and examined the intellectual content and 'Author B' (Ezon-Ebidor I. Edibamode) wrote the first draft of the manuscript, managed the literature search and managed the analyses of the study. All authors read and approved the final manuscript.

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