

Research

The surgical relevance of the anatomic position of the extraosseous mental nerve in a Kenyan population

Poonamjeet Kaur Loyal^{1,*}, Fawzia Butt¹, Julius Alexander Ogeng'o¹

¹Department of Human Anatomy, University of Nairobi, Nairobi, Kenya

*Corresponding author: Poonamjeet Kaur Loyal, Department of Human Anatomy, University of Nairobi, Nairobi, Kenya

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Abstract

Introduction: Precise location of the mental nerve is important in implant surgery, administration of mental nerve block anaesthesia, and for osteotomy procedures. The position is known to show inter-population differences but data from sub-saharan region is scarce. **Methods:** The point of emergence of 64 nerves was studied and data analyzed with Microsoft Excel 2010 and differences in side means compared using the paired one tailed student's *t* test. **Results:** The location of left mental nerve was 2.85 (± 0.38) cm, 1.42 (± 0.33) cm, 1.77 (± 0.46) cm while the right was 2.91 (± 0.47) cm, 1.38 ($\pm 0.3.1$) cm, 1.71 (± 0.46) cm from the mental symphysis, inferior border of mandible and cemento-enamel junction respectively. The differences in position between the right and left sides were not statistically significant ($p < 0.05$ CI: 95%). It emerged inferior to but in line with the 2nd premolar in 57.8% of the cases, 2nd premolar-1st molar (25%) and inter-premolar junction (9.4%). Unique to this study, was the location of the MN at the canine (3.1%), and 1st molar (4.7%) positions. **Conclusion:** The aberrant position of the mental nerve seen in 42%, is an important consideration for tooth implants and placement of mandibular reconstruction plates.

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Introduction

The mental nerve (MN) is the terminal branch of the inferior alveolar nerve. It exits the mental foramen (MF) near the 2nd premolar [1] and divides into three branches to innervate the skin of chin, lower lip and gingivae. Most commonly, it lies below the midpoint of the distance between the lower border of the mandible and the alveolar margin. In the horizontal plane, it is approximately one quarter of the distance from the mental symphysis to the posterior border of the ramus of the mandible [2].

Anatomy of the extraosseous MN displays variations in position. The location of MF shifts from the near the lower border in a child to midway between the upper and lower borders of the mandible in an adult and then closer to the upper margin in the edentulous jaw of old age [3]. This position can be more accurately described in the vertical and horizontal planes for each age group [2,4]. In adults, the MF lies below the midpoint of the distance between the lower border of the mandible and the alveolar margin and approximately one quarter of the distance from the MS to the posterior border of the ramus of the mandible [2]. This position is however, not conserved among the different populations and data for the Kenyan populace is lacking. The position can further be determined using teeth levels. Variant tooth levels of the MN include the 1st premolar, interpremolar junction, junction of the 2nd premolar and molar [5-7]. These parameters are important in locating the MN during surgical procedures involving the chin but such data is still not available for Kenyan patients. Precise location of the MN is important in placement of tooth implants, reconstructive surgery of the mandible and in avoiding iatrogenic injury during administration of anesthesia.

Methods

This was a cadaveric dissection study of sample size 32 cadavers at the Department of Human Anatomy, University of Nairobi. Specimens from both sexes and of adult age group were studied. All the specimens were of indigenous Kenyan descent and of adult age group.

The MN was systematically exposed with three skin incisions and lateral reflection of the skin flap. A midline incision extended from the midpoint of the superior border of the lower lip to the midpoint of the inferior border of the MS. A lateral incision extended about 7cm from the angle of the lip on either side. An inferior incision was made along the lower border of the mandible from the MS till the lateral extent of the lateral incision. Using blunt dissection, the flap was detached from the bone and reflected laterally until the mental nerve was seen to exit from the mental foramen. The position was determined with respect to the MS, the cemento-enamel junction (CEJ) and the inferior border of the mandible using a Haco® ruler in centimeters, inextensible string and a pair of dividers. The position with respect to the tooth level was also noted.

Data collected was analysed using Microsoft Excel 2007. The frequencies, means, percentages and standard deviations of the morphometric data were calculated and frequencies and percentages were determined. The statistical significance of side differences was determined using the paired one tailed student's *t* test. A p-value of

Results

The MN was on average, 2.89 (± 0.42) cm, 1.40 (± 0.38) cm and 1.75 (± 0.38) cm from the MS, inferior border of mandible and CEJ respectively. The location of left mental nerve was 2.85 cm, 1.42cm, 1.77cm while the right mental nerve was 2.91cm, 1.38cm, 1.71cm from the MS, inferior border of mandible and CEJ respectively. The results, although, were not statistically significant, the left MN was observed to be closer to MS while the right was closer to the inferior border of the body of the mandible and the CEJ. In 57.2%, the MN was coincident with the 2nd premolar. The second most common tooth position was observed in 25.9%, in line with the junction between 2nd premolar and 1st molar. Less frequently, it was also seen to emerge at the level of inter- premolar junction in 9.4%, the 1st molar in 4.7% and canine in 1.8% of the cadavers.

Discussion

The MN was on average, 2.89 (± 0.42), 1.40 (± 0.38) and 1.75 (± 0.38) cm from the MS, inferior border of mandible and CEJ respectively. The average distance of the MN from the MS and the inferior border of the mandible is similar to that reported by previous studies (**Table 1**). The distance from the tooth is, however at variance compared to that reported for the Thai and Sri Lankan population [8, 9]. This may be due to the differences in the superior landmarks used i.e. whereas the current study employed the cemento-enamel junction, the Thai study used the tip of the buccal cusp of the 2nd premolar as the superior boundary.

The location of left mental nerve was 2.85 cm, 1.42cm, 1.77cm while the right mental nerve was 2.91cm, 1.38cm, 1.71cm from the MS, inferior border of mandible and CEJ respectively. The discrepancies between results of the current study and those reported in previous studies [10-12] (**Table 2**), could be attributed to differences in sample sizes, intraobserver errors while measuring and differences in the landmarks used. The measurements for previous studies were done using the MF but the current study used boundaries of the MN as landmarks. Furthermore, the superior boundaries also differed with previous studies using the alveolar margin and the current study using the CEJ.

The MN is difficult to localize as there are no absolute landmarks. These distances, therefore, are relevant in approximating the position of the MN during the placement of mandibular reconstruction plates, tooth implants, and harvesting bone from the MS which will be used to fill for craniofacial defects. The location of the MN is also important to an anesthetist when performing a MN block so as to achieve effective anesthesia and at the same time avoid iatrogenic injury to the nerve. These distances are especially important when teeth are missing or mal-positioned and hence cannot be used to approximate the position of the MN

The most common tooth position for the MN was in line with the 2nd premolar (57.2%). This is consistent with results of previous studies [7, 13, 14] that have reported the prevalence of 45-68.6% for locating the MN at 2nd premolar (**Table 3**). The second most common position was between the junction of the 2nd premolar and the 1st molar, which was noted in 25.9%. This was similar to other studies from East Africa done on dry mandibles [7,13]. It was, however, at variance with the studies from Nigeria [15] and India [14] that have reported the interpremolar junction as the 2nd most common position for locating the MN. Unique to this study, was the aberrant position of the MN at the level of the canine. These

discrepancies in the prevalence might be as a result of differences in the sample sizes used by these studies.

The tooth position is a quick landmark for locating the MN. Whereas, surgeons should be aware that the most common location for the MN is at the 2nd premolar, this however, should not be the sole guidance, since in 41.8% the MN may have an aberrant tooth position. Location of the MN at an aberrant tooth position could also help in explaining cases of failed anesthesia, when it is targeted at the 2nd premolar region. In such cases the junction of the 2nd premolar and 1st molar should be considered as a potential alternative site for the MN.

Conclusion

The position of the mental nerve which was on average, 2.89 (± 0.42) cm, 1.40 (± 0.38) cm and 1.75 (± 0.38) cm from the mental symphysis, inferior border of mandible and cemento-enamel junction respectively, is an important consideration for tooth implants and placement of mandibular reconstruction plates. In 42%, it occurred at an aberrant tooth position which may explain the occurrence of failed anaesthesia.

Competing interests

The authors declare competing interests.

Authors' contributions

Each author of this manuscript, made the following contributions: Poonamjeet Kaur Loyal: substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data ; Fawzia Butt: drafting the article or revising it critically for important intellectual content and Julius Alexander Ogeng'o: final approval of the version to be published.

Tables

Table 1: Position of the mental nerve in different populations

Table 2: Comparison of the position of the mental nerve with previous studies

Table 3: Prevalence of the different tooth positions amongst populations

References

1. Oguz O, Bozkir MG. Evaluation of location of mandibular and mental foramina in dry, young, adult human male, dentulous mandibles. *West Indian Med J.* 2002; 51(1):14-16. **PubMed | Google Scholar**
2. Mbajiorgu EF, Mawera G, Asala SA, Zivanovic S. Position of the mental foramen in adult black Zimbabwean mandibles: a clinical anatomical study. *Cent Afr J Med.* 1998; 44(2): 24-30. **PubMed | Google Scholar**
3. Hasan T, Mahmood F, Hasan D. Bilateral absence of mental foramen-a rare variation. *Int J Anat Variat.* 2010; 3:167-169. **PubMed | Google Scholar**
4. Wang TM, Shih C, Liu JC, Kuo, KJ. A clinical and anatomical study of the location of the mental foramen in adult Chinese mandibles. *Acta Anat (Basel).* 1986; 126(1):29-33. **PubMed | Google Scholar**
5. Greenstein G, Tarnow D. the mental foramen and nerve: clinical and anatomical factors related to dental implant placement: a literature review. *J Periodontol.* 2006; 77(12):1933-1943. **PubMed | Google Scholar**
6. Liverdos F, Delantoni A, Delantoni-Papadimitriou P. A radiological study concerning the anterior loop of the mandibular canal and the location of the mental foramen in a Greek population. *Balk J Stom.* 2007; 11(2):105-110. **PubMed | Google Scholar**
7. Fabian FM. Position, shape and direction of opening of the mental foramen in dry mandibles of Tanzanian adult black males. *Ital J Anat Embryol.* 2007; 112(3):169-177. **PubMed | Google Scholar**
8. Apinhasmit W, Methathrathip D, Chompoopong S, Sangvichien. Mental foramen in Thais: an anatomical variation related to gender and side. *Surg Radiol Anat.* 2006; 28(5):529-533. **PubMed | Google Scholar**
9. Prabodha LBL, Nanayakkara BG. The position, dimensions and morphological variations of mental foramen in mandibles. *Galle Med J.* 2006; 11(1):13-15. **PubMed | Google Scholar**
10. Agarwal DR, Gupta SB. morphometric analysis of mental foramen in human mandibles of south gujarat. *Peoples J Sci Res.* 2011; 4(1): 12-14. **PubMed | Google Scholar**
11. Igbigbi PS, Lebona S. The position and dimensions of the mental foramen in adult Malawian mandibles. *WAJM.* 2005; 24(3): 184-19. **PubMed | Google Scholar**
12. Yesilyurt H, Aydinlioglu A, Kavakli A, Ekinci N, Eroglu C, Hacialiogullan M, Diyarbakirli S. Local differences in the position of the mental foramen. *Folia Morphol (Warsz).* 2008; 67(1):32-35. **PubMed | Google Scholar**
13. Mwaniki DL, Hassanali J. The position of mandibular and mental foramina in Kenyan African mandibles. *East Afr Med J.* 1992; 69(4):210-3. **PubMed | Google Scholar**
14. 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.* 2010; 28(4):1141-1146. **PubMed | Google Scholar**
15. Kekere-Ekun TA. Antero-posterior location of the mental foramen in Nigerians. *Afr Dent J.* 1989; 3(2):2-8. **PubMed | Google Scholar**

Study	Population	n	MS (cm)	CEJ/buccal cusp of 2 nd premolar (cm)	Inferior border of mandible (cm)
Current study, 2012	Kenyan	64	2.89	1.75	1.40
Apinhasmit et al., 2006	Thai	138	2.883	2.427	1.488
Prabodha and Nanayakkara, 2006	Sri Lanka	48	2.652	-	1.225

	Study population	Side	Landmark		
			MS (cm)	Superior boundary (cm)	Inferior border (cm)
Current Study (n=64)	Kenyan	Left	2.85 ±0.38	1.77 ±0.46	1.42 ±0.33
		Right	2.91 ±0.47	1.71±0.46	1.38 ±0.31
Igbigbi and <i>Lebona et al.</i> , (2005) (n=149)	Malawian	Left	2.631±0.431	1.296±0.343	1.349±0.355
		Right	2.649±0.463	1.377±0.355	1.324±0.283
<i>Agarwal and Gupta</i> , 2011 (n=100)	Indian	Left	2.505±0.507	1.382±0.306	1.211±0.311
		Right	2.555±0.507	1.405±0.305	1.216±0.304
<i>Yesilyurt et al.</i> , 2008 (n=140)	Turkish	Left	1.937±1.133	1.064	0.946±0.5877
		Right	1.918±1.119	1.050	0.944±0.5837

Study (n)	Population	Tooth Position					
		2 nd Premolar	Junction:2 nd premolar and 1 st molar	Interpremolar	1 st Molar	Canine	Mesial to 1 st premolar
Current study, 2012 (64)	Kenyan	57.8	25.9	9.4	4.7	3.1	-
<i>Singh and Srivastav</i>, 2010 (100)	Indian	68.6	11.5	17.8	-	-	-
<i>Fabian</i>, 2007 (100)	Tanzanian	45	35	12	8	-	-
<i>Mwaniki and Hassanali</i>, 1992 (100)	Kenyan	56.1	31.1	12.8	-	-	-
<i>Kekere-Ekun</i>, 1989 (604)	Nigerian	55.63	12.3	26.99	3.3	-	0.17