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Original scientific paper

Position of the Mental Foramen in Kosovarian Population

Lumnije Kqiku[1], Andreas Weiglein[2], Blerim Kamberi[3], Veton Hoxha[3], Kastriot Meqa[3] and Peter Städtler[1]

[1] Graz Medical University, Department of Dentistry and Maxillofacial Surgery, Division of Preventive and Operative Dentistry, Endodontics, Pedodontics, and Minimally Invasive Dentistry, Graz, Austria
[2] Graz Medical University, Institute of Anatomy, Graz, Austria
[3] University of Prishtina, University Dentistry Clinical Center, Institute Department of Dental Phatology and Endodontics, Prishtina, Kosovo

A B S T R A C T

The aim of this study was to determine the position, shape, number and radiographic appearance of the mental foramen in a selected Kosovarian population. Five hundred panoramic radiographs of dental Kosovarian patients were selected and analyzed according to the mental foramen position, shape, radiographic appearance, number and symmetry. The mean distance in the horizontal plane of the mental foramen to the posterior border of the mandibular ramus was 67.5 mm and for distance from the mental foramen to symphysis menti 24.84 mm. In the vertical plane the mean distance of the mental foramen to alveolar crest was 20.38 mm and 14.68 mm for distance of the mental foramen to the lower border of mandible. The majority of mental foramen was oval in shape and the most frequent radiographic appearance was the separated type. Accessory mental foramina were detected in <1% of the cases and the mental foramen was not bilaterally symmetrical but no statistical differences were found. This study showed that the most common position of the mental foramen investigated using panoramic radiographs from a selected group in Kosovarian population was between the first and second mandibular premolars with distinct tendency to be positioned near to the second mandibular premolar.

***Key words**: anatomy, mandible, mental foramen, radiographic images, Kosovarian population*

Introduction

The mental foramen (MF) is a very important landmark for dental implants, mandibular osteotomy, dental anesthesia and any surgical procedures involving premolar and molar area of the mandible. The MF and its contents can be injured after implant placement, local anaesthesia, osteotomies, during root canal therapy and other oral and dental surgical treatment procedures in this region. Damage of the mental nerve causes the paresthesia or anesthesia of the labiomandibular region[1,2]. Differences in location and number of the mental foramina need to be considered before any surgical procedures in this region. Therefore, knowledge of the anatomy, especially the position of the MF in relation to the mandibular premolars and molars mandible teeth is essential to reduce damage of the mental nerve during implant placement, osteotomies and periapical surgery in mandibular premolar and molar region. The mental nerve is a terminal branch of the inferior alveolar nerve exiting through the mental foramen, supplying sensory innervation to the skin and mucosa of the lower lip, cheeks, and chin. Two types of the inferior dental nerve are described[3].

Type I observed in 66% of cases, displayed the alveolar inferior nerve as a single bundle that travelled toward the mental foramen, where it divided into two terminal branches at the mental foramen: the mental nerve exiting through the mental foramen and incisive nerve.

Type II 34% present, the nerve divided posteriorly into a larger mental branch and smaller dental branch.

Many studies have investigated the position of mental foramen using dried skulls[4–13] and clinical radiographs[14–22]. The mental foramen is normally single, however, more than one mental foramen may be present[13,23]. Also multi-

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ple mental foramina presence was observed on the dried Japanese mandibles[24,25] and double mental foramina with a connection to the mandibular canal were reported[22]. The location of mental foramen has been investigated in several populations[4,5,11–15,18–24,26–28] its position has been shown to vary according to race, gender or ethnic origin. However, the position of mental foramen has not investigated in Kosovarian population. The aim of this study was to determine the position, shape, number and radiographic appearance of the mental foramen in a selected Kosovarian population, it has not been reported in this population before. The results from this study can contribute the anthropological measurements of the mental foramen, compare with previous studies, by ethnic group and to provide critical and relevant data for implant placement and clinical dentistry.

Materials and Methods

Five hundred panoramic radiograph images were randomly selected from dental Kosovarian patients of Department of Dental Pathology and Endodontics, University Dentistry Clinical Center, Prishtina/Kosova. All panoramic radiograph images showed fully erupted lower premolars and first molars. Of the 500 radiograph images included in the study, 250 were from male and 250 from female patients. Age ranged from 18 to 70 years (mean 40.6; 14.5 standard deviation). Exclusion criteria for this study were poor film quality, unerupted premolar teeth or missing mandibular teeth, the patients under 18 years and with orthodontic treatment or presence of periodontal lesions in the mandibular area between 36–46 (distance from the right to the left first mandibular molar). Each radiograph images were analyzed on a radiographic light box and the measurement was performed directly from the film from one observer. The following parameters were investigated:

– Position graded as follow (Figure 1):

Position 1: In line with the long axis of the first mandibular premolar

Position 2: Between the first and second mandibular premolars

Position 3: In line with the long axis of the second mandibular premolar and

Position 4: Between the second mandibular premolar and first mandibular molar

– Shape (oval, round or irregular shape)

– The horizontal distance from the anterior border of the MF to the posterior border of the mandibular ramus (A) (distance MF-A) and from the anterior border of the MF to the symphysis menti (B) (distance MF-B)

– The vertical distance from the upper edge of the MF to the upper edge of the alveolar crest (C) (distance MF-C) and from the lover edge of the MF to the inferior border of the mandible (D) (distance MF-D). The radiologic appearance of the mental foramen was classified into four types described by Yosue & Brooks 1989a (Table 1). All calculations were performed with SPSS 16 programme and descriptive statistics were performed.

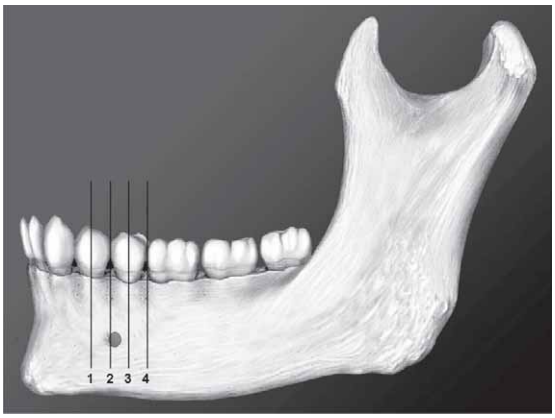

Fig. 1. Position of the mental foramen in relation to mandibular teeth graded as follow: 1 – In line with the long axis of the first mandibular premolar, 2 – Between first and second mandibular premolars, 3 – In line with the long axis of the second mandibular premolar, 4 – Between the second mandibular premolar and first mandibular molar.

TABLE 1
APPEARANCE OF MENTAL FORAMEN ON PANORAMIC RADIOGRAPH IMAGES[21]

Category	Radiograph Appearance
Continuous	Foramen has continuity with the mandibular canal
Separated	Foramen distinctly separated from the canal
Diffuse	Foramen has indistinct border
Unidentified	Foramen cannot be identified

Results

The position of the mental foramen in relation to mandibular teeth

The most common position of the mental foramen was between the first and second mandibular premolars in 44.2% for right and 44.6% for left side of mandible, followed closely by location in line with the longitudinal axis of the second mandibular premolar 42.8% for right and 43.6% for left side of the mandible (Table 2).

The anterior-posterior position of the mental foramen (symphysis menti and posterior border of the mandibular ramus)

The mean distance from the anterior border of the MF to the symphysis menti was 24.76 mm for right and 24.92 mm for left side of mandible, whereas the mean distance from the anterior border of the MF to the posterior border of the mandibular ramus was 67.2 mm for right and 67.98 mm for left side of mandible (Table 3).

TABLE 2
POSITION OF THE MENTAL FORAMEN IN RELATION TO MANDIBULAR TEETH

Position	Right (%)	Left (%)
In line with the long axis of the first mandibular premolar	4.4	4.4
Between first and second mandibular premolars	44.2	44.6
In line with the long axis of the second mandibular premolar	42.8	43.6
Between the second mandibular premolar and first mandibular molar	8.6	7.4
Total	100	100

TABLE 3
POSITION OF THE MF IN THE HORIZONTAL AND VERTICAL PLANE:

Distance projection (mm)		N	Min	Max	$\overline{X}$	SD
MF-A	Right	500	55	76	67.02	6.231
	Left	500	54	76	67.98	5.401
MF-B	Right	500	18	35	24.76	4.420
	Left	500	19	35	24.92	3.654
MF-C	Right	500	18	27	20.59	1.705
	Left	486	17	25	20.17	1.338
MF-D	Right	500	11	19	14.58	2.093
	Left	500	9	19	14.77	1.973

MF-A: distance between the anterior border of the MF and the posterior border of the mandibular ramus; MF-B: distance between the anterior border of the MF and the symphysis menti; MF-C: distance between the upper edge of the MF and the upper edge of the alveolar crest; MF-D: distance between the lover edge of the MF and inferior border of the mandible

The superior-inferior position of the mental foramen (alveolar crest and inferior border of the mandible)

The mean distance of the MF, measured from the upper edge of the alveolar crest to upper edge of the MF was 20.59 mm for right and 20.17 mm for left side of mandible and the mean distance from lover edge of the MF to the inferior border of the mandible was 14.58 mm for right and 14.77 for left side of mandible (Table 3).

The shape, radiographic appearance and number of the mental foramen

The shape of MF was oval in 66% for right and 68.4% for left side of mandible and round in 28% for right and 27.4% for left side of mandible. Other irregular shape of the mental foramen was seen in 6% for right and 4.2% for left side of mandible. The most common radiographic appearance of the MF was the separated type with prevalence of 49.2% for right and 48.6% for left side of mandible (Table 4). Accessory mental foramina were detected in <1% of the cases and the mental foramen was not bilaterally symmetrical but no statistical differences were found.

TABLE 4
SHAPE OF THE MENTAL FORAMEN (PERCENTAGE VALUES)

Shape	Right		Left	
	N	%	N	%
Round	140	28	137	27.4
Oval	330	66	342	68.4
Other	30	6	21	4.2

Discussion

In classical anatomy textbooks the location of the mental foramen is described as it is positioned between the first and second mandibular premolars. The result of this study showed that the mental foramen is most commonly positioned between the first and second mandibular premolars with distinct tendency to position near to the second mandibular premolars.

This agrees with previous studies[5,10–11,16,17,19,26] but is in contrast with other studies[4,9,14,15,18,27–29]. Several previous studies indicated ethnic and racial differences in position of the mental foramen, it is clear that in Asians, Chinese and African people, the most common position of the mental foramen is in line with the longitudinal axis of the second premolar teeth, whereas in the European population the mental foramen positioned between first and second mandibular premolars[4,9,12,14,15,28]. The most common position of mental foramen in Chinese population was essentially in line with the longitudinal axis of the second premolar tooth[14,28] and below the second premolar in the Kenyan population[4]. In Malawian population the modal position of the mental foramen was inferior

to the second premolar tooth[9]. Distinct racial differences of mental foramen position were found: in the Chinese sample mental foramen was positioned along the long axis of the second premolar, whereas in the British sample it lay between the apices of the first and second premolar[12]. The present study confirmed the conclusion from previous studies that in white population the most common position of the MF was found between first and second mandibular premolar teeth, because in white Kosovarian population the MF was most commonly positioned between the first and second lower premolars. A significant difference was found between Chinese and British population. The distance of the symphysis menti to the anterior border of the mental foramen was 27.6± 1.6 for Chinese and 25.9±2.0 for British population[12]. In Bosnian population, the mean distance from the mental foramen to the posterior border of the mandibular ramus was 64.29 mm for right and 60.67 mm for left sides[27]. The results of the present study agree with the previous study but in the Kosovarian population the mean of the MF-A distance was 67.5 mm and for MF-B projection distance was 24.84 mm for both sides of mandible. In the vertical plane the mean distance for MF-C projection was 20.38 mm and 14.68 mm for distance of MF-D, which consists with previous investigation[27].

It has been suggested that the most frequent radiographic appearance of MF was separated type[22]. The same was found in this present study, whereas the most common type appears in radiographic images of mental foramen in Jordanian population was the continuous type[30]. The majority of mental foramen was oval in shape and bilaterally symmetrical and this result is similar with the other results in several populations[9,10,15,18,20,31]. It has been previously concluded that more than one MF may be present[13,22–25]. The prevalence of the accessory mental foramina seen in this study was <1% and this is in completely accordance with the study of other[13].

Many studies have investigated the position of mental foramen using radiograph methods[32,33] multi-detector computed tomography[34] or direct observation in dissected human cadaver mandible[35]. To determine the position, shape, number and radiographic appearance of the mental foramen, conventional radiograph images were used in this study. It has been concluded that the diagnostic performance of conventional and digital panoramic images seems to be equal for the localization of mental and mandibular foramens[32].

Conclusion

The most common position of the mental foramen in Kosovarian population was between the first and second mandibular premolars in 44.4% and in line with the longitudinal axis of the second mandible premolar in 43.2% of cases.

The shape of the mental foramen was oval in majority of cases, showed as separated type in radiographic images, single and bilaterally symmetrical.

These findings are in consistence with previous results in other European populations.

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L. Kqiku

Graz Medical University, University Clinic of Dentistry and Maxillofacial Surgery, Division of Preventive and Operative Dentistry, Endodontics, Pedodontics, and Minimally Invasive Dentistry, Auenbruggerplatz 4/6, 8036 Graz, Austria
e-mail: lumnije.kqiku@medunigraz.at

SMJEŠTAJ MENTALNOG FORAMENA U KOSOVSKOJ POPULACIJI

S A Ž E T A K

Cilj je ovog istraživanja odrediti smještaj, oblik, broj te radiografsko pojavljivanje mentalnog foramena u odabranoj kosovskoj populaciji. Petsto panoramskih radiografskih snimki pacijenata odabrano je i analizirano prema smještaju, obliku, radiografskom pojavljivanju, broju i simetriji. Srednja udaljenost u horizontalnoj ravnini mentalnog foramena posteriornoj granici mandibularnog ramusa iznosila je 67,5 mm, a za udaljenost od mentalnog foramena do symphysis menti 24,84 mm. U vertikalnoj ravnini srednja udaljenost mentalnog foramena do alveolarnog grebena bila je 20,38 mm te 14,68 mm za udaljenost od mentalnog foramena do donjeg ruba mandibule. Glavnina mentalnog foramena bila je ovalnog oblika,a najučestalije radiografsko pojavljivanje bilo je odvojenog tipa. Dodatni mentalni forameni primijećeni su u <1% slučajeva gdje mentalni foramen nije bio bilateralno simetričan, no nisu nađene nikakve značajne statističke razlike. Ova studija pokazala je kako je najučestaliji smještaj mentalnog foramena istraživan na temelju panoramskih radiografskih snimki odabrane kosovske populacije između prvih i drugih mandibularnih premolara s naglašenom tendencijom pozicioniranja blizu drugog mandibularnog premolara.