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Short Communications

Location of mental foramen in a southeast iranian population: a digital panoramic assessment

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Abstract

Introduction: Mental foramen is an important landmark in mandible and knowledge regarding the actual location of mental foramen is important in dentistry.

Materials &Methods: A total of 1172 digital panoramic radiographs were evaluated for assessment of the location of the mental foramen. The location was classified into six groups in relation to the apices of the premolars and first molar.

Results: In 957 of panoramic radiographs, fulfilling the inclusion criteria, the most common location of the mental foramen was at the apex of the mandibular second premolar. In 837 cases (87.5%), the mental foramen was located symmetrically on both sides of the mandible. Therefore, the apex of the second premolar was the most common symmetric location in both genders.

Conclusion: The results showed that the most common location of the mental foramen in population of southeast Iran was at the apex of the second premolar.

Keywords: Anatomic landmarks, Mandible, Panoramic radiography

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جایگاه سوراخ چانه ای در جمعیت جنوب شرقی ایران؛ ارزیابی با رادیوگرافی پانورامیکِ دیجیتال

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چکیده

مقدمه: سوراخِ چانه‌ای لندمارکی مهم در مندیبل است و دانستن جایگاه واقعی سوراخِ چانه‌ای در دندانپزشکی حائز اهمیت است.

مواد و روش ها: ۱۱۷۲رادیوگرافی پانورامیک دیجیتال جهتِ ارزیابی محلِ سوراخِ چانه‌ای بررسی شدند. محل سوراخ چانه‌ای بسته به ارتباط با اپکس پرمولرها و مولر اول مندیبل در شش گروه طبقه‌بندی شدند.

یافته ها: از ۹۵۷ رادیوگرافی که معیارهای ورود در مطالعه را داشتند، شایع‌ترین محل در ناحیه اپکس پرمولر دوم بود. در ۸۳۷ مورد (۸۷/۵٪) سوراخِ چانه‌ای به صورتِ متقارن در دو طرفِ مندیبل قرار داشت. از این منظر، اپکس پرمولر دوم مجدداً شایع‌ترین محل تقارن در هر دو جنس بود.

نتیجه گیری: نتایج این مطالعه نشان می‌دهد شایع‌ترین محل سوراخ چانه‌ای در جمعیت جنوب شرقی ایران در ناحیه اپکس پرمولر دوم مندیبل است.

واژگان کلیدی: لندمارک های آناتومیک، فک پایین، رادیوگرافی پانورامیک

Introduction

The mental foramen is an anatomic landmark located on the anterolateral aspect of the buccal cortex of the mandibular bone at approximately the same distance from the upper and lower borders of the mandible. [1] It is crucial to identify the location of mental foramen for proper mental nerve block in endodontic treatment, periapical surgery, maxillofacial surgery and implant placement. There is a high risk of damage to vessels and nerves that stem from mental foramen after endodontic surgery, bone fracture fixation and removal of tooth roots, cysts or tumors. [1] Numerous atraumatic methods have so far been applied to identify the exact location of the mental foramen, such as palpation, periapical radiographs, panoramic radiographs, and cone-beam computed tomography (CBCT).

However, each of these techniques has certain weaknesses such as inappropriate magnification, radiation and extra cost. [2] Numerous studies have been conducted on the exact location of the mental foramen in different populations. The location of mental foramen in most studies is reported to be at the apex of the mandibular second premolar [3, 4] or in the area between the first and second premolars. [5,6] Considering the clinical importance of detecting the location of mental foramen and limited relevant studies focusing on the population residing in southeast Iran, this study attempted to assess the location of mental foramen on digital panoramic radiographs.

Materials & Methods

This retrospective study assessed 1172 digital panoramic radiographs during 2013-2014. Patients' age was 14-72 years old (with average of 42 years old). All radiographs had been taken with Soredex Panoramic X-ray(Tuusula, Finland) with exposure settings of 70 kVp and 12 mA and 12s time , and were then processed by a digitizer. The exclusion criteria were as follows:

- Presence of a radiolucent mandibular lesion from the right first molar to the left first molar,
- Absence of mental foramen bilaterally on radiograph,
- Incomplete growth of permanent teeth,
- Absence of posterior teeth(premolars and first molar)
- Presence of artifacts in the area under study.

After excluding the radiographs meeting the above criteria, the remaining radiographs were examined by an endodontist and oral maxillofacial radiologist separately on a view box. The inter-rater reliability was calculated through Kappa. To classify the results obtained on Kappa, categories were used: k<0.40 low, k=0.41-0.60 moderate, k=0.61-0.8 good and k>0.81 very good. The site of the mental foramen on radiographs was recorded according to the following categories:

Position 1: Anterior to the first premolar.
Position 2: In line with the vertical axis of first premolar.
Position 3: Between the first and second premolars.
Position 4: In line with the vertical axis of second premolar.

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Position 5: Between the second premolar and first molar.
Position 6: In line with the longitudinal axis of first molar.

Then, the bilateral location of the mental foramen with respect to gender was recorded in a table and analyzed using SPSS version 20. P<0.05 was statistically considered significant level. Independent t-test was used to compare symmetry of the foramen between genders.

Results

Amoung all 957 panoramic radiographs fulfilling the inclusion criteria, 459 radiographs belonged to men and 498 belonged to women. The Kappa revealed a very good inter-rater reliability between two examiners (k=0.82). The most common location of the mental foramen was at the apex of the mandibular second premolar (48.9%), followed by the area between the two premolars (42%) (Table 1). The apex of the second premolar in both genders and on both sides of the mandible had a higher prevalence than other areas . In 0.1% of the cases, the mental foramen was located anterior to the first premolar. In 837 cases (87.5%), the mental foramen was located symmetrically on both sides of the mandible. There was no symmetry in the anterior region of the anterior first premolar. Moreover, there was no statistically significant difference between men and women in terms of symmetry and asymmetry. Moreover, there was no statistically significant difference between men and women in terms of symmetry and asymmetry.

Table 1. Frequency of mental foramen location in relation to the apices of mandibular teeth on 957 panoramic radiographs and a total 1914 sides (left and right sides)

	Male		Female		Total
	Right	Left	Right	Left	
Position 1	-	1	-	1	2 (0.1%)
Position 2	1	2	6	3	12 (0.6%)
Position 3	181	189	208	227	805 (42%)
Position 4	231	224	247	234	936 (48.9%)
Position 5	44	40	33	30	147 (7.8%)
Position 6	2	3	4	3	12 (0.6%)

Discussion

Numerous studies have been done on detection of mental foramen locations in different populations. Correct mental nerve block injection provides effective numbness to alleviate dental pain. In this study, the most common location of the mental foramen was at the apex of the mandibular second premolar and then the area between the two premolars. This finding was consistent with those obtained in many studies in other populations. However, some studies have reported the region between the apex of mandibular first and second premolars is the most common location of the mental foramen. [5,6] Different populations from countries such as China, Iran, Turkey, India, Britain, Brazil, Jordan, Saudi Arabia, Austria, Austria, Zimbabwe, Nigeria and Bosnia have been examined to determine the exact location of the mental foramen. [7]

In Iran, two studies have been conducted, one in the north of the country (Babol) [8] and the other in the center and south of the country (Shiraz)[9], each reporting a different location for the mental foramen. The difference between the present study and two previous studies is that the panoramic radiographs were obtained from a wide range of population residing in southeast and east using digital radiography. In fact, this population of 957 patients can be a reflection of the Iranian population across the east and southeast regions.

Unlike the study of Haghanifar and Rokouei [8] indicating differences in the common location of mental foramen on the left and right sides in males and females, the current study demonstrated that the most common location of the mental foramen was identical on both sides of mandible in both genders as well as in the apex of the second premolar, which is consistent with the findings of Khojastehpour et al .[9] Although Haghanifar and Rokouei did not find the foramen anterior to the first premolar on radiographs and reported only one case with mental foramen at the axis of first molar, the present study with a larger sample size, detected mental foramina in both of these positions. However, the mental foramen was observed in the anterior first premolar and axis of the first molar on both sides of the mandible in less than 1% of our cases, which is similar to the study of Haghanifar and Rokouei.

Regarding the symmetrical location of the mental foramen, our study in which 87.5% of the patients had mental foramina at the same location on both sides of the mandible is very similar to that of Haghanifar and Rokouei (85.7% of the cases indicated symmetry). The present study indicated that the most common location of mental foramina was at the apex of the second premolar, while it was between the apex of two

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premolars in the study of Haghanifar and Rokouei. The discrepancy in the results of the studies on the location of mental foramina in one country was previously found in studies on various regions of Turkey and India. Perhaps, the best explanation for such variations in the results is "broad diversity in the population and races of a country" as suggested by Laher et al, in 2015. [7]

In addition to the explanation above, another major reason behind such discrepancy in location of mental foramina of different studies might be adoption of different methods for examining the anatomic variations. [2] The most common methods include panoramic and CBCT scans. However, studies such as the current one, which applied the panoramic radiographs to detect the location of mental foramina, are not free from the limitations. Maybe, one of the main limitations is 20 to 36% magnification of radiography, which may distort the location of the mental foramen from its actual clinical location. In addition, one study indicated that panoramic radiography revealed the actual location of mental foramen in less than 50% of cases. [10]

Moreover, the effect of compression on image quality of panoramic radiographs has been recently studied. Despite these limitations, panoramic radiographs bring about benefits such as low cost, less-harm, low radiation dose and the possibility to examine both sides for anatomical variations, making it suitable for use in epidemiological studies.

Conclusion

The results of this study illustrated that the most common location of the mental foramen on panoramic radiographs obtained from the population residing in east and southeast regions of Iran was at the apex of the second premolar. This is consistent with the findings of many other studies conducted in other countries. In most cases, the location of mental foramina was symmetrically the same on both sides of the mandible.

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Conflict of Interest: We declare that the authors have no conflict interests.

Authors' contributions

The study design, Analysis of data, drafting of the manuscript and critical revision of the manuscript for important intellectual content were performed by Eshaghali Saberi. Clinical studies were conducted by Farnaz Alidadiani and study data were collected by Abbas Mohammadi. The literature search and manuscript preparation were done by Reza Kazemian. Edit and review of manuscript was done by Narges Farhadmollashahi.

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