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## Radiographic Assessment of Patterns of Entry of Mental Nerve into Mental Foramen in Palestinian Population

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#### ABSTRACT

An important presurgical landmark in the mandibular premolar region is the pattern of entry of mental nerve into the mental foramen after its emergence from the inferior alveolar nerve bundle. Different patterns of entry of mental nerve have been identified. As panoramic radiographs are routinely used in presurgical evaluation, the present study was undertaken to evaluate the various entry patterns of mental nerve into the mental foramen. Total five hundred sixty-four panoramic radiographs taken for routine diagnostic purposes were selected for the study. The radiographs were assessed for the position and the entry pattern of the mental nerve on the left and right side. The entry patterns recorded were categorized as anterior loop, straight, or perpendicular. The study revealed that the most common pattern of entry of mental nerve was a straight one accounting for 42.2% in the right and 39.5% on left side, followed by the presence of an anterior loop in 30% on right side and 33.7 % on left side of the total radiographs examined, and the least common was the perpendicular pattern.

**Conclusion:** Identifying the presence of anterior loop in the preoperative planning stage of surgical procedures in the mandibular premolar region using panoramic radiography may not be a very reliable imaging modality. Cone beam CT, is another modality which can be used for better visualization of the area.

### INTRODUCTION

The inferior alveolar nerve and artery, after traveling through the mandibular foramen, exit at the mental foramen as the mental nerves and vessels which innervate the lower teeth, lip, gingiva and lower face <sup>[1]</sup>. The mental nerve (MN) may also extend beyond the mental foramen (MF) boundary as an intraosseous anterior loop (AL). The anterior loop refers to "an extension of the inferior alveolar nerve, anterior to the mental foramen, prior to exiting the canal <sup>[2]</sup>. It has also been referred to as the anterior loop of the mental nerve <sup>[3]</sup>.

Other authors <sup>[4,5]</sup>, described the anterior loop as the mental neurovascular bundle traversing inferiorly and anteriorly to the mental foramen, which then doubles or loops back to exit the mental foramen.

Neurosensory alterations in the chin and lower lip which can occur during implant placement in anterior mandible is one of the most difficult but usually inadvertently complication. This complication can occur if important vital structures such as (MF) and anterior mental loop are not properly identified and protected <sup>6</sup>. Consequently, exact localization of the anatomical structures should be identified prior to surgery using appropriate radiographic techniques to avoid damage to these vital structures <sup>[7,8]</sup>.

A variety of diagnostic methods for detection and measurement of the anterior loop was attempted using: panoramic films of markers in dried skulls and cadaver mandibles, periapical films of cadaver jaws, panoramic films of patients, and CT scans of patients and surgical cadaver dissections. Since panoramic radiographs are routinely used to locate anatomic landmarks for planning surgical procedures, this study has been undertaken to determine if a panoramic radiograph is sufficient to identify the presence of anterior loop and other patterns of entry of mental nerve or is there a need for using advanced imaging techniques for the same.

## MATERIALS AND METHODS

Six hundred panoramic radiograph images were randomly selected from the records of dental Palestinian patients attending three dental private services in Northern region. Due to the nature of the study (random selection of panoramic radiographs taken over many years from multiple centers), the radiographic systems and criteria used and the exposure time all varied among the radiographs studied. However, all radiographs were taken according to the manufacturer's operation manuals and were all considered to be of optimal viewing qualities.

Exclusion criteria for this study were poor film quality, 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), radiographs showing supernumerary teeth in the mental foramen region, radiographs showing radiolucent or radiopaque lesions in the mental foramen region of mandible, and radiographs showing processing or exposure errors and artifacts obscuring visibility of structures in the mandible.

Patterns observed in the study other than the presence of an anterior loop (AL) were a straight (S) and a perpendicular (P) path of entry of mental nerve into the mental foramen. The observations thus made were recorded as AL, S, or P and the total numbers of patterns observed on both sides were recorded.

## RESULTS

Of the six hundred panoramic images, five hundred sixty-four were included. Each radiograph images were analyzed and the measurement was performed directly from the film from one observer. All calculations were performed with SPSS 16 programme and descriptive statistics were performed.

The most commonly observed pattern of entry of mental nerve was the straight pattern accounting for 42.2% on right side and 39.5% on left side, followed by the presence of an anterior loop in 30% on right side and 33.7% on left side, and a perpendicular pattern in 27.8% on right side and 26.8% on left side of the total radiographs examined (**Table 1**).

**Table 1.** Pattern of entry of mental nerve into the mental foramen: anterior loop (AL); a straight (S); and a perpendicular (Perp).

Pattern Entry	Right		Left	
	N	%	N	%
Anterior Loop	169	30	190	33.7
Straight Pattern	238	42.2	223	39.5
Perpendicular Pattern	157	27.8	151	26.8
Total	564	100	564	100

## DISCUSSION

Dental implants treatment modality became accepted and demanded by patients widely. The careful application of this treatment modality needs preparation and evaluation of the surgical site for vital structures before implant placement by dentist. Of these structures are the inferior alveolar nerve and its path of entry into mental foramen. This study evaluated the patterns of entry of the inferior alveolar nerve into the mental foramen among Palestinian population from digital panoramic radiographs taken for routine dental treatment. It is important to detect the path of nerve in the bone before osteotomy for proper implant placement and to prevent nerve damage. In this study, straight entry pattern was found to be in 42.2% in the right and 39.5% on left side, followed by the presence of an anterior loop in 30% on right side and 33.7% on left side. These results coincide with a study [9] conducted on Indian population by which revealed that the straight pattern was the most common pattern followed by the anterior loop pattern and the least pattern was the perpendicular one. However, one of the limitations of the panoramic radiographs is that it is two-dimensional view of the clinical picture; also patient head position and exposure amount and time may affect the outcome and clarity of the radiograph, but it is still a valuable tool for patterns detection whenever no advanced diagnostic tools such as CBCT are available. A comparison between digital radiographs and CBCT should be conducted to measure the reliability of digital panoramic radiographs in detecting the different patterns of entry into the mental foramen.

## CONCLUSION

Panoramic radiography may not be a very reliable imaging modality for identifying the presence of anterior loop which needs to be determined for preoperative planning of surgical procedures in the mandibular premolar region. Other modalities, such as cone beam CT, can be used for better visualization of the area.

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