Comparison between Digital Periapical Radiography and Cone-Beam Computed Tomography for the Localization of the Mental Foramen and Mandibular canal

Thesis
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بسم الله الرحمن الرحيم

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم الحكيم

صدق الله العظيم

سورة البقرة الآية: ٣٢

Dedication

To My parents

Who made me what I am today,
Thank you for already being here

To My Dear Husband & My Sweet daughters

For giving me all the support that I needed

To my sweet sister

The best gift from my God

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First of all, thanks to **"God"** *without his help, this work could not be accomplished.*

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LIST OF ABBREVIATIONS

2D	Two Dimensional
3D	Three Dimensional
ADC	Analog to digital converter
AL	Anterior loop
ALARA	As Low As Reasonably Achieved
AMF	Accessory mental foraminae
CBCT	Cone beam computed tomography
CBVT	Cone beam volumetric tomography
CC	Cranio-Caudal
CCD	Charge coupled device
CMOS	Complementary metal oxide semiconductor
CR	Computed radiography
CT	Computed tomography
DDR	Direct digital radiography
DR	Direct imaging
DSR	Digital subtraction radiography
EJS	External jaw surface
FOV	Field of view
FPD	Flat panel detector
GP	Gutta Percha
HU	Hounsfield Units

IAN	Inferior alveolar nerve
IANB	Inferior alveolar neurovascular bundle
IDR	Indirect digital radiography
IP	Image plate
Lp/mm	Line pair per mm
MC	Mandibular canal
MDCT	Multi detector computed tomography
MF	Mental foramen
MIC	Mandibular incisive canal
MIP	Maximum intensity projection
MN	Mental nerve
MPR	Multiplanar reformation
MRI	Magnetic resonance imaging
MSCT	Multi scanner computed tomography
PSL	Photostimulted luminescence
PSP	Photostimulable phosphor imaging plate
ROI	Region of interest
SPS	Storage phosphor screen
TFT	Thin film transistor
TMJ	Temporo-mandibular joint

INTRODUCTION AND REVIEW OF LITERATURE

Essential to surgical treatment is the knowledge of the anatomical relationships between vital structures in order to better ensure a favourable treatment outcome. For most of history, determining these relationships has relied upon the knowledge and experienced surgical skills of the operators to offset the lack of transparency of the human body and any unforeseen surgical difficulties encountered had to be managed in real time ***(Danforth and Chenin, 2009)***.

However, with the discovery of x-rays and the subsequent development of conventional tomographic imaging, computed tomography (CT) and magnetic resonance imaging (MRI), the human body became transparent and interpretation and treatment planning entered into the third dimension ***(Danforth and Chenin, 2009)***.

Anatomy of the Mental Foramen:

Shape and size of the mental foramen (MF):

The MF can be round or oval. Its diameter ranges from 2.5 to 5.5 mm ***(Juodzbalys and Wang, 2010)***. **Neiva et al., (2004)** found that the mean height of the MF was 3.47 ± 0.71 mm (range

2.5 to 5.5 mm) and the mean width was 3.59 ± 0.8 mm (range 2 to 5.5 mm) after measuring 22 Caucasian skulls.

Apinhasmit et al., (2006) examined 106 Thai adult skulls and found that mean MF width was 2.80 ± 0.70 mm. **Gershenson et al., (1986)** studied 525 dry mandibles and 50 cadaver dissections and found that MF shape was round in 34.48% of cases with an average diameter of 1.68 mm and oval in 65.52% with an average long diameter of 2.37 mm.

Yosue and Brooks, (1989) studied the appearance of the MF on panoramic radiographs and classified it as a continuous, separated, diffuse, or unidentified type. This is illustrated in **Fig. (1)**.

Type I, a continuous type in which the mental canal was connected to the mandibular canal; Type II, a separated type in which the mental canal does not show continuity with the mandibular canal; Type III, a diffuse type in which the foramina could be identified but with indistinct borders; Type IV, an unidentified type in which the mental foramina could not be identified on the panoramic radiographs ***(Kuzmanovic et al., 2003)***.

In a sample of 297 patients, the most frequent appearance was separated (43%), followed by diffuse (24%), continuous (21%), and unidentified (12%). The mean diameter of the foramen was stated at 3.5 mm width ***(Juodzbalys et al., 2010)***.

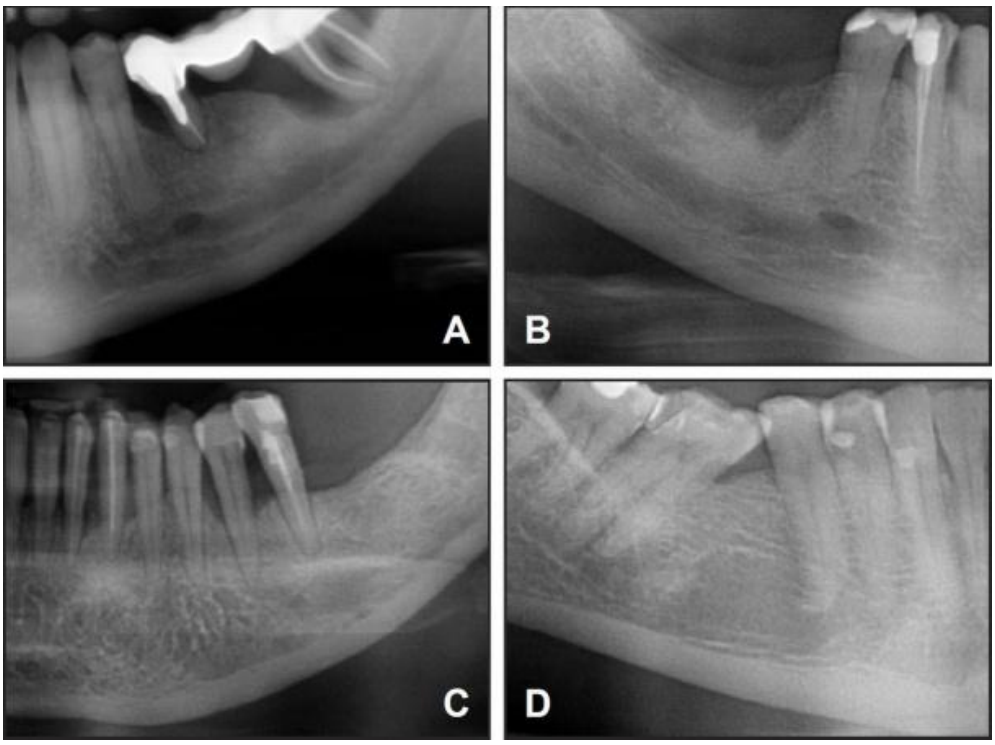

Fig. (1): The appearance of the mental foramen on panoramic radiographs. **A** = continuous; **B** = separated; **C** = diffuse; **D** = unidentified type ***(Juodzbalys et al., 2010)***.

Mbajiorgu et al., (1998) found different shapes of the MF in 32 mandibles of adult Black Zimbabweans. They found 14 mandibles out of 32 were round (43.8%) and 18 mandibles out of the same 32 were oval (56.3%). **Igbigbi and Lebona, (2005)** from study on 70 Malawian mandibles concluded that the majority of MF was oval in shape.

In black Tanzanian individuals, the shape of the MF was oval in 54% and rounded in 46%. In Jordanian population, the majority of foramina were round in shape ***(Juodzbalys et al., 2010)***.