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THE RETRO MOLAR CANAL: A BIOMETRIC STUDY ON 100 CBCTS

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KANALI RETRO MOLAR: NJË STUDIM BIOMETRIK NË 100 CBCTS

Përmbledhje

Hyrje: Kanali retro molar është një variant anatomik jo-konstant i kanalit mandibular që hapet në trekëndëshin retromolar. Ky studim synon të hetojë incidencën, morfologjinë, madhësinë, kursin dhe ndryshimet e RMC duke përdorur 100 CBCT.

Materialet dhe metodat: Pamjet sagitale, seksione të kryqëzuara dhe boshtore nga 100 CBCTs digjitale u analizuan duke përdorur programin Galileos Viewer 1.9. RMC u klasifikuan në tri grupe sipas formës së tyre. U matën lartësia, diametri, gjerësia dhe vendi i hapjes së secilit CRM.

Rezultatet: Incidenca e RMC ishte 18%. 42% kishin një kurs vertikal (tipi A), 17% kishin një kurs të lakuar (tipi B) dhe 36% kishin një kurs horizontal (tipi C). U raportuan gjithashtu disa forma atipike. Lartësia mesatare ishte 15.38 mm 3.2, diametri mesatar ishte 1.37 mm ± 0.06. Në shumicën e rasteve, RMC hapet përmes një forme të distancuar nga aspekti distal i molarit të dytë me 16.09 mm ± 2.81.

Përfundim: Incidenca e RMC thekson rëndësinë e të dhënave radiologjike, në mënyrë që të shmangen një numër i ndërlikimeve që lidhen me këtë variación anatomik.

Fjalë çelës: *retro molar, kanal, studim biometrik, 100 CBCT.*

Abstract

Introduction: The retro molar canal is an inconstant anatomical variation of the mandibular canal that opens up in retro molar trigone. This study aims to investigate the incidence, morphology, size, course and the different variations of the RMC using 100 CBCTs.

Materials and methods: Sagittal, cross-sectional and axial images from 100 digital CBCTs were analyzed using Galileos Viewer 1.9 Software. RMCs were classified into three groups according to their form. The height, the diameter, the width and the opening site of each CRM were measured.

Results: The incidence of the RMC was 18%. 42% had a vertical course (type A), 17% had a curved course (type B) and 36% had a horizontal course (type C). A few atypical forms were also reported. The mean height was 15.38 mm ± 3.2, the mean diameter was 1.37 mm ±0.06. In most cases, the RMC opens up through one foramen distanced from the distal aspect of the second molar by 16.09 mm ±2.81.

Conclusion: The incidence of the RMC emphasizes the importance of the radiological exam, in order to avoid a number of complications linked to this anatomical variation.

Keywords: *retro-molar, canal, biometric study, 100 CBCTs.*

Introduction

The RMC is an anatomical variation of the mandibular canal (MC). Branches from the MCTravels onwards and upwards Arises from the Retro Molar Foramen behind the third molar. The RMF has generally been neglected in anatomical textbooks and this has been rarely studied or reviewed in the dental literature.

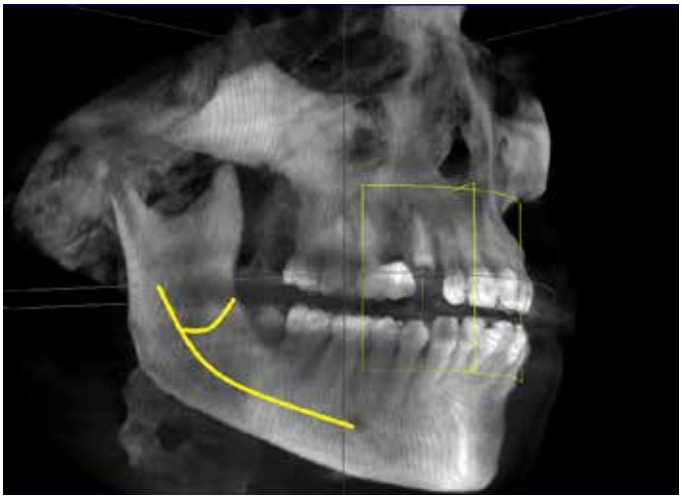

Figure 1: Typical RMC identified on a 3D reconstruction

The RMC provides the retromolar region with additional innervation and blood supply which explains its clinical importance.

This canal needs special consideration during surgical procedures involving the retromolar trigone such as the extraction of impacted third molars, osteotomies, autografts harvesting

procedures etc. (7,10) the main complications of traumatizing the retro molar neuro vascular bundle are sensory deficits and excessive bleeding during the procedure. (10)

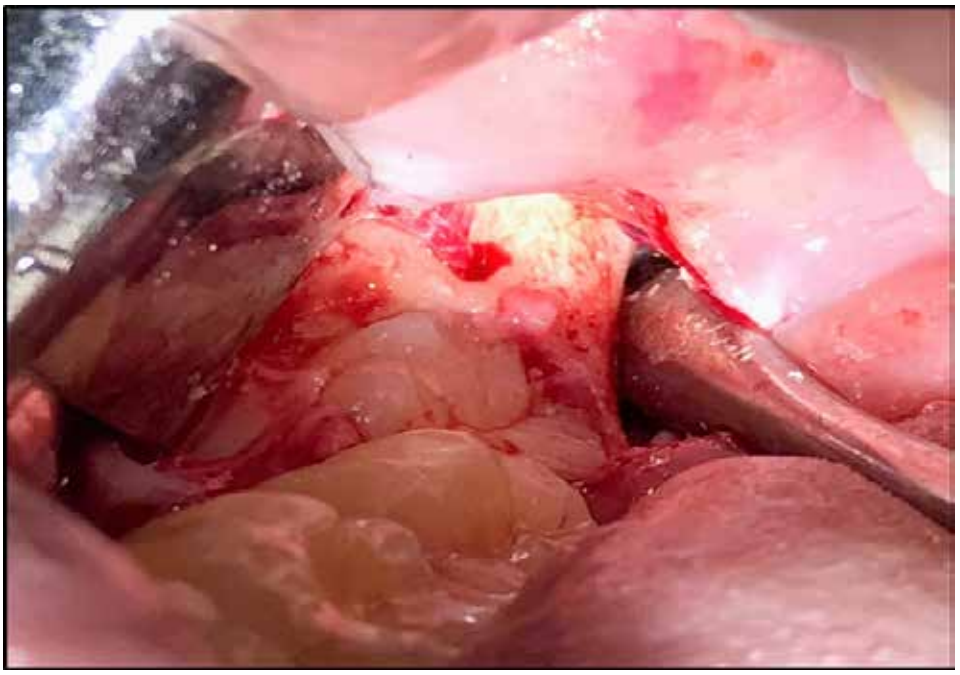

Figure 2: The retro molar neuro vascular bundle identified during impacted 3rd molar extraction

The purpose of this study is to Assess the frequency of the RMC in a Tunisian population, study its course and its morphology and describe its main clinical implications.

Materials and Methods

This retrospective study was conducted on 100 CBCTs of Tunisian patients consulting the Outpatients and Implantology Department at the Dental Clinic of Monastir (Tunisia) between April 2015 and July 2018.All patients underwent CBCT examinations bilaterally.

Inclusion criteria:

-Each patient provided a digital CBCT with a clear image of the retro molar area;

-Presence of the mandibular 2nd molar.

Non-inclusion criteria:

-History of trauma or pathology in the retro molar area.

These CBCTs were obtained by using settings Sirona Galileos unit (Sirona, Germany) and the images were analyzed using Galileos Viewer software (1.9). Scanning parameters were 85 kVp, 24 seconds, 5-7 mA, a voxel size of 0.15 mm or 0.3 mm and a field of view of 15cm×15 cm with exposure times of 6 seconds and radiation dose of 29 µSv.

Measured parameters:

1-frequency of the RMC: defined as the number of patients having a RMC divided by the total number of patients.

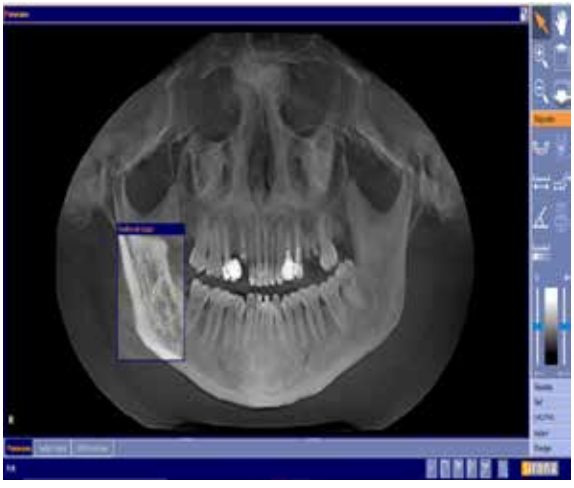

Figure 3: Apanoramic reconstruction showing the RMC on the right side

2-Type of the RMC: the classification of Von Arx was used (2011):

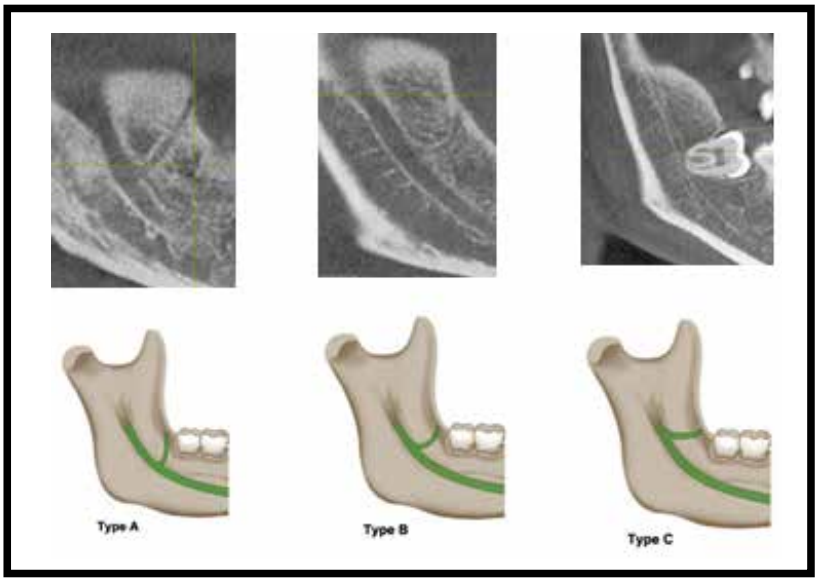

Figure 4: The Von Arx classification of the RMCs: type A: vertical course; Type B: curved course; Type C: horizontal course (32)

3- vertical measure (height of the RMC): distance between the center of the RMF and the superior border of the MC

4- horizontal measure: distance between the center of the RMF and the CEJ of the 2nd molar.

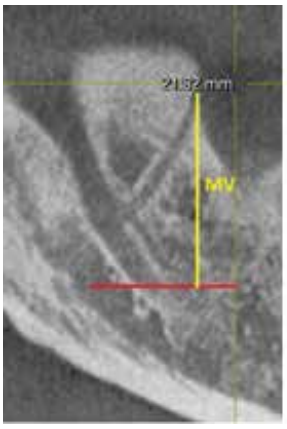

Figure 5: Vertical measure

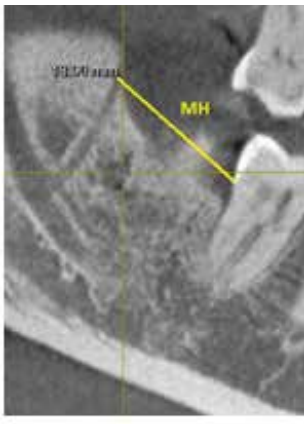

Figure 6: Horizontal measure

5-diameter of the origin of the RMC

6- diameter of the RMF

7- opening of the RMC: On the coronal slices, the RMT was divided into a buccal and a lingual

half in order to determine the opening of the RMF

8- number of RMFs: determined on axial slices

Statistical analysis was performed using SPSS v24.0. ANOVA and Chi square tests were used . A p value of <0.05 was considered statistically significant.

Results

The study sample involved the CBCT images of 56 female and 44 male patients with a mean age of 35.33 years ±12.09. Each CBCT underwent bilateral examination which corresponds to a total of 200 hemi-mandibles.

36 RMCs were observed (18%) in 34 patients. 25 were on the right side and 11 on the left side.

Depending on their course and morphology, RMCs were classified into 3 types (Von Arx): 15 had a vertical course (type A), 6 had a curved course (type B) and 13 had a horizontal course (type C).

Two particular cases were also reported: one "Y-shaped canal" (figure) and another RMC which coursed between the dental sac of the 3rd molar and the retro molar fossa. (Figure)

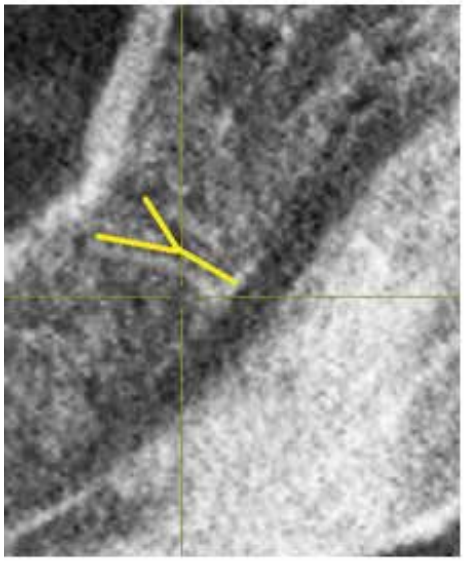

Figure 7: Y-shaped canal

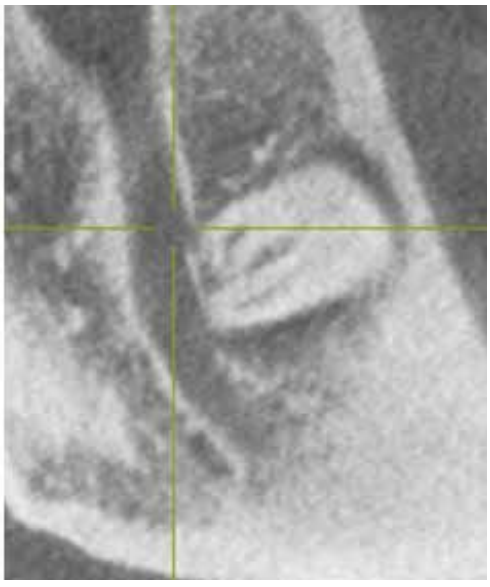

Figure 8: A RMC originating from the dental sac of the 3rd molar

In this study, the mean height of the RMC was 15.38 mm ± 3.2. As for the distance between the center of RMF and the CEJ of the 2nd molar, the mean value was 16.09 mm ±2.81 with a statistically significant difference(P= 0,026) between males (mean 17.16mm ± 2.71) and females (mean15.33 mm ± 2.68).

In addition, RMFs were significantly larger on the right side (P=0,03).

41.6% of the RMCs opened on the buccal half of the retro molar trigone, 52.7% opened on the lingual half while 5.5% had two openings, one buccally and the other lingually.

As for the number of foramens, most of the RMCs had only one foramen (86.11%), a few cases of a double foramen were also found (13.89%).

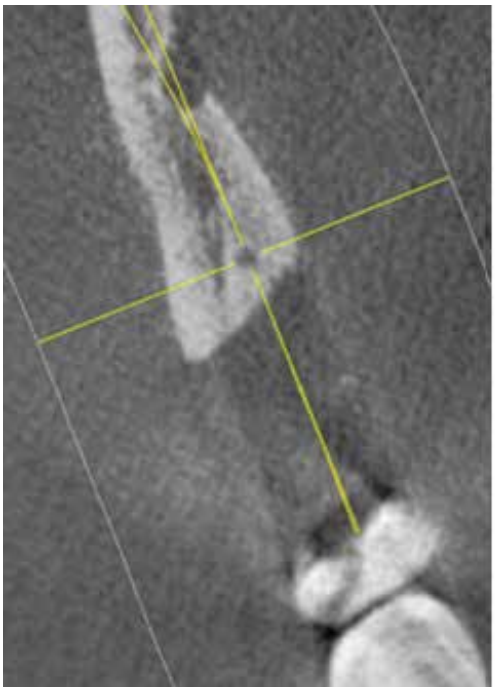

Figure 9: Axial slice of a RMC with one Foramen

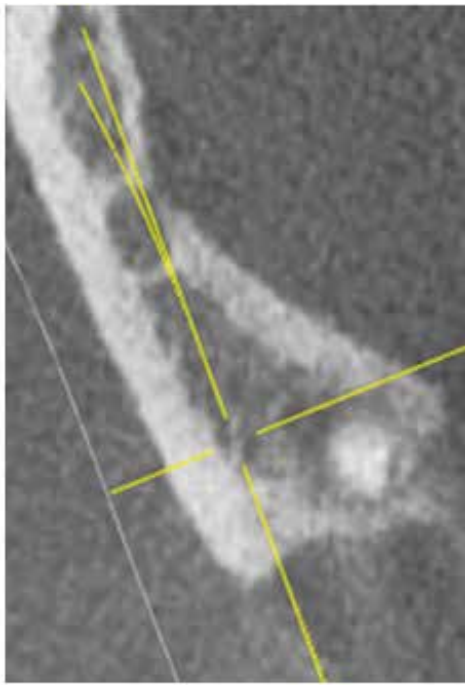

Figure 10: Axial slice of a RMC with two foramens

Discussion

In our study, the reported frequency of the RMC was 18%. According to the systematic review of Truong and al. published in 2017, the frequency of the RMC ranged from 5.4% (6) to 75.4% (12).

This important difference could be explained by ethnic differences, environmental and genetic factors and variation in sample sizes across studies (5).

In our study, RMCs were found to be higher on the right side (P=0.01), also males tend to have

higher RMCs than females without reaching statistical significance. Nevertheless, according to Von Arx, (16), Gender was found to be a significant factor with men having longer RMCs than women.

In addition, a correlation was found between the horizontal measure (from the center of the RMF and the CEJ of the 2nd molar) and gender with a superior distance in males (P=0.026).

According to the systematic review of Truong and al (15), the diameter of the RMF ranges from 0.2 to 3.29 mm. he also reported that RMCs are larger in male patients. In our study, a correlation with the side was found with larger RMCs on the right side (P=0.03).

In most cases, RMCs open up in the retro molar trigone by one foramen (86,11%). A few cases of 2 foramens were identified which is in accordance with what was reported by Alves (1) and Kikuta. (8)

The opening of RMC in the retro molar trigone can be located on the buccal or the lingual side with no predilection for one or the other. Our results were in accordance with the study of Patil et al. who reported that 37.8% of the RMCs opened buccally while 56.7% opened lingually in the retro molar trigone. (12)

Clinical implications

The clinical implications of the RMC are diverse: the failure of anaesthesia due to the additional innervation of the area (2), a retro molar complement can be used in this case (3).

Post operative sensory disorders due to any traumatic gesture towards the nerve coursing through the RMC (14) and excessive bleeding due to breeching the vascular content of the RMC (4) remain the most frequent complications.

Also, implant placement in contact with the RMC would result in pain, paresthesia and failure of osseiointegration due to less contact surface between the implant and the bone tissue.(2.13)

In removable prosthetics, especially in case of posterior extension, patients can report pain and sometimes paresthesia due to the compression of the nerve structure. (12)

In addition, the RMC can interfere with the placement of the orthodontic mini-screw especially when redressing the axis of the mesially tipped second molars. (9)

Conclusion

According to our results, a frequency of 18% of the RMC was found in a Tunisian population with no correlation with age, gender or side. In most cases, It opens with one foramen at a mean distance of 15mm from the CEJ of the second molar. Therefore, clinicians should pay close attention to this anatomical structure in order to avoid any vascular or nerve damage.

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