

Retromolar Canal and Foramen Prevalence in Dried Mandibles and Clinical Implications

Prevalencia del Foramen y Canal Retromolar en Mandíbulas Secas y sus Implicaciones Clínicas

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ABSTRACT: The retromolar foramen (RMF) and retromolar canal (RMC) are formations located in the retromolar fossa, as anatomical variations. It is important the surgical knowledge of these neurovascular elements contents. This study analyzed 294 mandibles of known sex and age, 195 male and 99 female from the Universidade Federal de São Paulo collection, between 20 and 100 years old. The prevalence of the RMF and RMC was 12.9%. We discuss about the clinical implications of these formations presence.

KEY WORDS: retromolar foramen, retromolar canal, retromolar fossa, mandible.

INTRODUCTION

The lower third molar region is an area of great importance in the dental practice, it performs most of the surgical procedures performed by the dentist in the maxillofacial surgery area (Rajasuo *et al.*, 1991; Bataineh *et al.*, 2002; Huang & Rue, 2006; Friedman, 2007; Woldenberg *et al.*, 2007). Yet its importance, this area is not described as a topographic region of the oral cavity and there are few anatomical studies published in relation to this particular region.

The lower third molar region includes the area in which this tooth, its supporting elements and the adjacent soft parts with special reference to the lingual nerve and the elements of the paralingual space. In the osseous plane, the lower third molar alveolar process ends and continue to the posterior area with a cribose triangle surface, the retromolar triangle and the retromolar fossa laterally (Suazo *et al.*, 2007). The cribose area of the retromolar triangle communicates this region with the mandibular canal, describing it via an anesthetic technique for the inferior alveolar nerve block (Suazo *et al.*, 2008, Sandoval *et al.*, 2008). Clinically, this region is covered by an elevation of mucosa of variable size and mobility called piriform

papilla or retromolar pad, of importance to the posterior seal in mucous support mandibular prosthesis (Devan, 2005; McCord *et al.*, 2002; Nissan *et al.*, 2003; Celebic *et al.*, 1995; Ogawa *et al.*, 1996).

Retromolar fossa is a depression to where it is projected into the buccionador muscle extending above the lateroalveolar canal, from a clinical point of view is important, providing a open corridor for the passage of infections arising in connection with the third molar, this is the so-called Chompret-L'Hirondel abscess (abcès migrateur de Chompret-L'Hirondel) used its path (Libersa *et al.*, 1982; Peron, 2004). On the surface of the retromolar fossa found the retromolar foramen (RMF), which creates a canal of variable depth, regarded as an anatomical variation, the RMF has a larger diameter of 2.5mm and has been described that from the RMF is created a retromolar canal (RMC), which addresses the to the mandibular canal and the zone of the third mandibular molar, carrying nerves ramus and arteries that give innervation and irrigation to the area of the third molar, the retromolar triangle and the vestibular gum of the lower molars and premolars (Kodera & Hashimoto, 1995). The knowledge

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of this variation is relevant, by the presence of anatomical structures that enter via RMF, which can be injured during surgical approaches.

Anthropological studies conducted and that included a large number of mandibles of different human groups (N = 2500) indicate that the RMF can be found in diverse populations, being more common in native populations of North America than other populations of Africa, Europe, India and Northeast Asia (Ossenberg, 1987), however, there are no studies on mandibles of Brazilian individuals.

Against this background, the purpose of this study is to analyze the prevalence of RMF and RMC in a sample of dry mandibles in Brazilian individuals.

MATERIAL AND METHOD

Were used in this study 294 adult dried mandibles of Brazilians, with registration of sex and age, belonging of the Universidade Federal de São Paulo collection. The selection criteria are set forth below:

Inclusion criteria

- Complete mandibles.
- Mandibles with complete register of sex and age.

Exclusion criteria

- Presence of fractures
- Presence of marked deformities or asymmetries.

In Table I are the characteristics of the sample analyzed according to sex and age.

By visual inspection identified the RMF and RMC resulting from it, was recorded indicating whether these were found on the right or left side or bilaterally.

Any difference in the distribution of the RMF and RMC found according to sex were analyzed using T-tests with $p < 0.05$.

RESULTS

The retromolar canal and foramen was found in 38 of 294 mandibles analyzed (12.9%), presenting in most cases unilaterally (n = 27). The details of the distribution of retromolar canal and foramen are found in Table II. With respect to sex differences, they were not significant ($p > 0.05$).

Figure 1 shows the presence of RMF bilaterally and in Figure 2 shows the detail of the RMF on the right side.

Table I. Characteristics of the sample of 294 mandibles of the Universidade Federal de São Paulo collection according to sex and age.

	N	Age			
		Minimum	Maximum	Mean	SD
Male	195	20	82	43.95	13.741
Female	99	18	100	39.15	16.892

Table II. Distribution of the retromolar canal and foramen found in a sample of 294 mandibles of Universidade Federal de São Paulo collection.

		Frecuency	Percent	Valid percent	Percent accumulated
Valids	Ausent	256	87.1	87.1	87.1
	Right side	14	4.8	4.8	91.8
	Left side	13	4.4	4.4	96.3
	Bilateral	11	3.7	3.7	100.0
	Total	294	100.0	100.0	

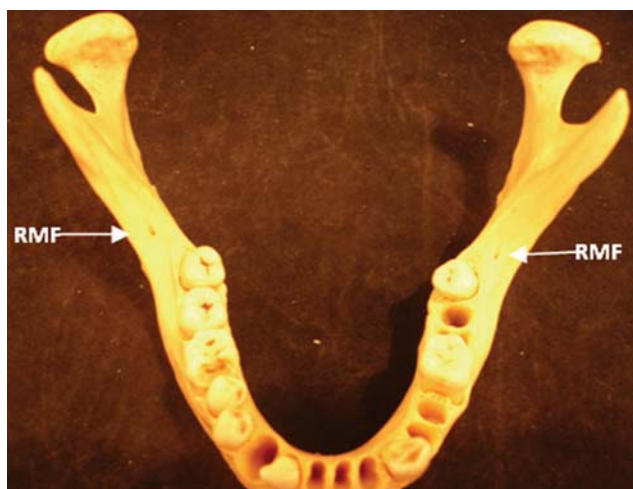


Fig. 1. Retromandibular bilateral foramen in the mandible of 48-year-old male individual. RMF: retromolar foramen.

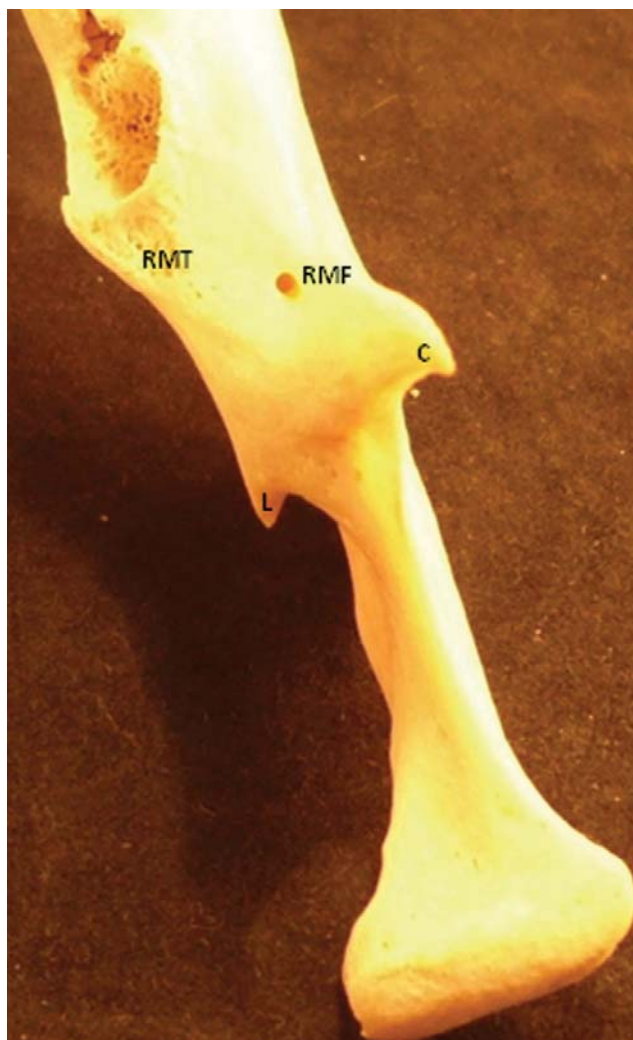


Fig. 2. Right retromandibular foramen in the mandible of 62-year-old male individual. RMF: retromolar foramen L: mandibular lingula. RT: retromolar triangle. C: coronoid.

DISCUSSION

The RMF and RMC are located in the retromolar fossa, considered an anatomical variation, its prevalence in our study was 12.9%, a result lower than what was reported by Kodera & Hashimoto, who indicated that he was 19.5% in a Japanese population sample, in both studies was not evidenced a preference for sex. Narayana *et al.* (2002) reported in the Indian population a 21.9% RMF prevalence in a sample of 242 dry human mandibles. A 10.7% of them presented the RMF on the right side, 7.1% in the left side and 4.1% bilaterally, with values higher than those reported in our study, except for the bilaterally observation of these, showing a similar percentage.

The presence of the RMF and RMC and its content, have great clinical significance in surgical procedures performed in the retromolar area, as these formations contain neurovascular packages designed to irrigate the region, and innervates the lower third molar and anatomical elements that surround him. These elements may be injured in the dieresis procedures, flap lifting, bone tissue for autologous bone grafts, osteotomy for the surgical extraction of lower third molars, placement of osseointegrated implants for orthodontic or during the division of the mandibular ramus in the sagittal split osteotomy surgery (Reyneke *et al.*, 2002).

Schejtman *et al.* (1967) performed the dissection of retromolar canal in cadavers during his autopsy, where the contents of the canal was submitted for histological examination, finding that the neurovascular elements from the retromolar canal and foramen are distributed mainly in the tendon of the temporalis muscle, in buccinator muscle, in the region of the alveolar process and in the mandibular third molar, at its distal portion. In the retromolar canal and emerging for the retromolar foramen, they found that the most constant element is a myelinated nerve (present in eight of the nine cases that were studied under a microscope). In descending order of frequency, they found one or more arterioles (six cases) and one or more venules (four cases). As to the nature of the nerve fibers of the neurovascular retromolar package, most of the fibers are probably sensory elements for the molar and bone, others could help to neurotendinous functions, especially in the temporalis muscle.

Possible vascular excessive bleeding or postoperative hematomas can be caused by damage

to the contents of the neurovascular package on this canal and foramen (Azaz & Lustmann, 1973), or the nerve injury resulting in post-anesthesia of the area if the package was injured during a surgical procedure (Petruzzelli *et al.*, 2003). Furthermore, any restoration of prostheses or implants located distally to the retromolar area can lead to pain and paresthesia (Muto & Kanazawa, 1997).

Moreover, in addition to becoming an element of risk, should be considered as potential routes for the entry of additional innervation to the lower third molar region. It has been reported that this anatomical variation provides innervation in

retromolar area, causing failure in anesthetic mandibular blocking (Boronat Lopez & Peñarrocha Diago, 2006).

Given the location and the journey that describes the retromolar canal toward the mandibular canal is possible that the radiographic observation by retroalveolar or panoramic radiography techniques was complicated, by the presence of greater bone condensation in relation to the anterior edge of the mandibular ramus and its continuation with the oblique line of mandible forming a part in the area of the temporary trajectory (Alves & Candido, 2007), suggesting further studies using tomography.

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RESUMEN: El foramen retromolar (FRM) y canal retromolar (CRM) son formaciones ubicadas en la fosa retromolar, considerados como variaciones anatómicas. Es de importancia quirúrgica el conocimiento de estas estructuras y los elementos neurovasculares contenidos. En este estudio se analizaron 294 mandíbulas de sexo y edad conocidos, pertenecientes a 195 hombres y 99 mujeres de la colección de la Universidad Federal de Sao Paulo, de entre 20 y 100 años de edad. La prevalencia del FRM y CRM fue del 12.9%. Se discute acerca de las implicancias clínicas de la presencia de estas formaciones.

PALABRAS CLAVE: foramen retromolar, canal retromolar, fosa retromolar, mandíbula.

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