

## **Bony and Cadaveric Study of Retromolar Region**

**\*S.A. Athavale, M. Vijaywargia, R. Deopujari, \*S. Kotgirwar**

Department of Anatomy, \*All India Institute of Medical Sciences, Bhopal & People's College of Medical Sciences & Research Institute, Bhopal-462037

(Received April, 2013)

(Accepted June, 2013)

### **Abstract:**

Retromolar area in the mandible has considerable surgical importance for dental surgeons. The anatomy of this area has not received much attention in standard texts of Anatomy. A variant foramen called retromolar foramen has been described in the literature. This foramen transmits a neurovascular bundle. Presence of this neurovascular bundle poses a risk in the surgical procedures carried out for impacted lower third molar tooth extraction. The dental surgeon should also be aware of occasional presence of this neurovascular bundle in retromolar area while infiltrating local anesthetic agents.

The present study was conducted on 71 dry mandibles and 10 cadaveric specimens. In dry mandibles, the boundaries and dimensions of retromolar trigone were studied. Prevalence of retromolar foramen was recorded. The distance of retromolar foramen, if present was recorded from posterior border of socket for third molar and second molar teeth respectively. In cadavers, retromolar areas were dissected and structures related were observed.

**Key Words:** Ramus of mandible, Retromolar foramen, Temporal crest, Third molar.

### **Introduction:**

Retromolar area is in the form of a triangular depression, which can be seen between the temporal crest medially and the anterior border of ramus of mandible laterally. This is called as a retromolar fossa (Berkovitz, 2005).

A variant foramen called retromolar foramen (RMF) present in retromolar area, has also been described in literature (Ossenberg, 1987; Sawyer & Kiely, 1991). This foramen transmits a neurovascular bundle consisting of an artery, vein and a nerve. Knowledge of presence of this neurovascular bundle is very important for surgical procedures involving the retromolar area like impacted third molar tooth extraction (Schejtman et al, 1967; Koderá & Hashimoto, 1995). The occasional nerve present in this area provides additional supply to the mandibular molars. While infiltrating local anesthetic agents in the region of third molar, this fact should be borne in mind (Koderá & Hashimoto, 1995). Carcinoma in the mucosa of the retromolar trigone may require resection and radical dissection. Such surgery can put important structures at risk (McGregor & MacDonald, 1988; Goldie et al, 2006; Ayad et al, 2009).

### **Material and Methods:**

In this study, 71 dry, fully ossified adult mandibles and 10 adult cadavers were included.

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**Corresponding Author:** Dr. Sunita Athavale  
C-166, Emerald Park City, Bagsewania, Bhopal - 462024  
**Phone No.:** 0755-2970166  
**E-mail :** sunita.anatomy@aiimsbhopal.edu.in

Mandibles and cadavers with any congenital / acquired deformity of the region of interest were excluded. The edentulous mandibles and mandible with extracted third molar and resorbed third molar socket were excluded from the study. In dry mandibles, the boundaries and dimensions of retromolar fossa were demarcated with a pencil and measured with thread and a vernier caliper. Prevalence of retromolar foramen was documented. The minimum distance of retromolar foramen was recorded from posterior border of socket for third molar and second molar teeth respectively with the help of a digital vernier caliper. Retromolar areas was dissected and structures related to it were observed in cadavers.

### **Observations:**

The retromolar region in the dry mandibles was a triangular area bounded by temporal crest on the medial side, anterior border of ramus on the lateral side and base posterior to the socket for the third molar. Table I shows the dimensions of boundaries of retromolar trigone. Temporal crest formed the longest boundary.

Retromolar foramen was observed in 10 mandibles out of 71 studied (14.08 %). In 4 mandibles the foramen was observed on the right side and in 4 it was on the left side. In 2 mandibles it was observed bilaterally, in both these mandibles bilateral unerupted third molar teeth were also observed. The RMF was mostly located near the lower half of the temporal crest (Fig. I & II).

The minimum distance of RMF from the posterior border of third and second molars respectively

Table I: Showing dimensions of boundaries of retromolar trigone.

	Temporal Crest		Anterior Border of Ramus		Base	
	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT
Average	38.8mm	40.1mm	35.5mm	35.7mm	12.9mm	13 mm
Maximum	53mm	52.7mm	51mm	49.6mm	19mm	17.7mm
Minimum	22mm	22.1mm	21.5mm	19.2mm	08.4mm	07mm

Table II: Showing minimum distance of RMF from 2<sup>nd</sup> & 3<sup>rd</sup> molar tooth

	Minimum distance of RMF from the posterior border of third molar		Minimum distance of RMF from the posterior border of second molar	
	RIGHT	LEFT	RIGHT	LEFT
Average	08.7 mm	08.3 mm	18.7 mm	17.1 mm
Range	03.12- 13.07 mm.	03.31 -14.92mm.	11.09 -22.38mm.	10.81- 24.96mm.

Table III: Showing comparisons of present study with other studies.

Researcher	Region of Population	Sample Size	Retromolar Foramen (%)				Distance of foramen from 3 <sup>rd</sup> molar socket (mm)	
			Rt.	Lt.	Bilat.	Total	Rt.	Lt.
Sawyer & Kiely, 1991	-	234	-	-	-	7.7	-	-
Kodera & Hashimoto, 1995	Japan	41	-	-	-	19.51	-	-
Narayana et al, 2002	India Karnataka	242	10.7	7.1	4.1	21.9	-	-
Suazo et al, 2008	Brazil	294	-	-	-	12.9	-	-
Senthil Kumar & Kesavi, 2010	India	150	5.3	4	8	17.3	4.5	4
Present study 2011-12	India	71 & 10 cadavers	5.63	5.63	2.81	14.08	8.76	8.37

is shown in Table II. It was observed that when present the RMF was within a centimeter of the posterior border of third molar tooth. However, very closely placed RMF (3mm) were also observed.

On dissection, it was observed that the lateral boundary of retromolar triangle in its upper 1/3<sup>rd</sup> provided attachment to superficial fibers of temporalis muscle. The medial boundary of the triangle in its upper 2/3<sup>rd</sup> provided attachment to deeper fibers of temporalis muscle, especially those arising from anterior wall of temporal fossa (Fig. III). The medial border near its lower end was crossed by lingual nerve and in its middle was crossed by buccal nerve and artery (Fig. IV, V). Deep to the medial border, medial pterygoid muscle was seen. Along anterior border of medial pterygoid

and anteromedial to the triangle, pterygomandibular raphe, gave attachment to buccinator anteriorly and superior constrictor muscle posteriorly. The raphe itself was attached to the posterior edge of third molar socket (Fig. VI). In these 10 cadaveric dissections (total 20 sides, 10 right & 10 left ) no retromolar foramen could be seen.

**Discussion:**

Many dry bone studies documenting the prevalence of retromolar foramen have been carried out in India (Narayana et al, 2002; Senthil Kumar & Kesavi, 2010) and around the world (Ossenberg, 1987; Sawyer & Kiely, 1991; Kodera & Hashimoto, 1995; Bilecenoglu & Tuncer, 2006; Suazo et al, 2008;



Fig. I: Mandible with retromolar region demarcated, showing presence of retromolar foramen in proximity to temporal crest.

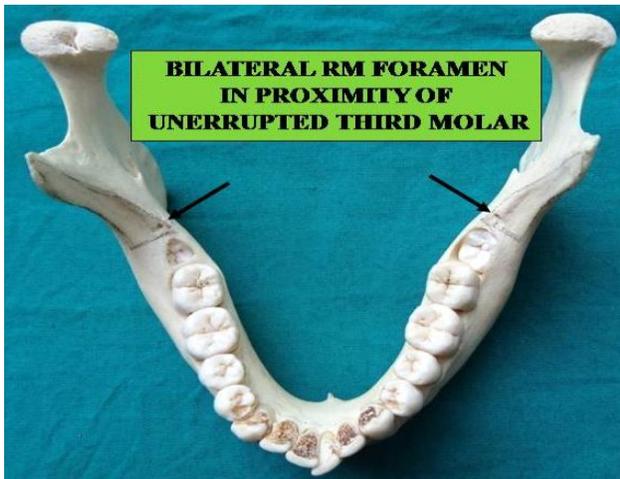


Fig. II: Mandible with bilateral retromolar foramina (arrows) and unerupted third molar teeth.

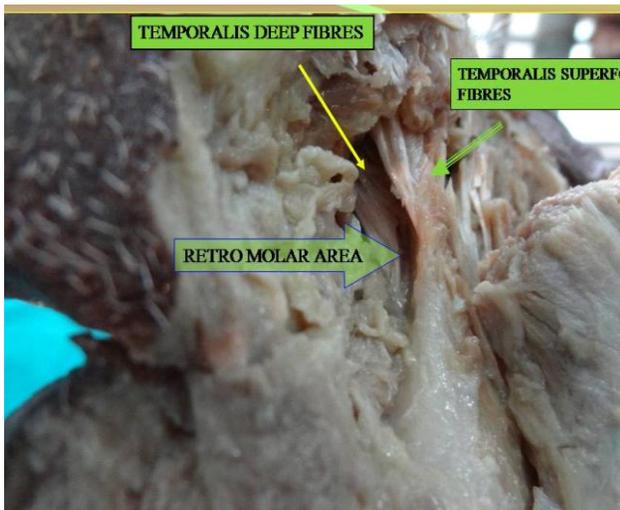


Fig. III: Lateral view of jaw showing attachment of superficial and deep fibers of temporalis muscle to the lateral and medial boundaries of the retromolar area respectively.



Fig. IV: Lateral view of jaw showing relations of Buccal nerve and artery to the medial boundary of the retromolar fossa.

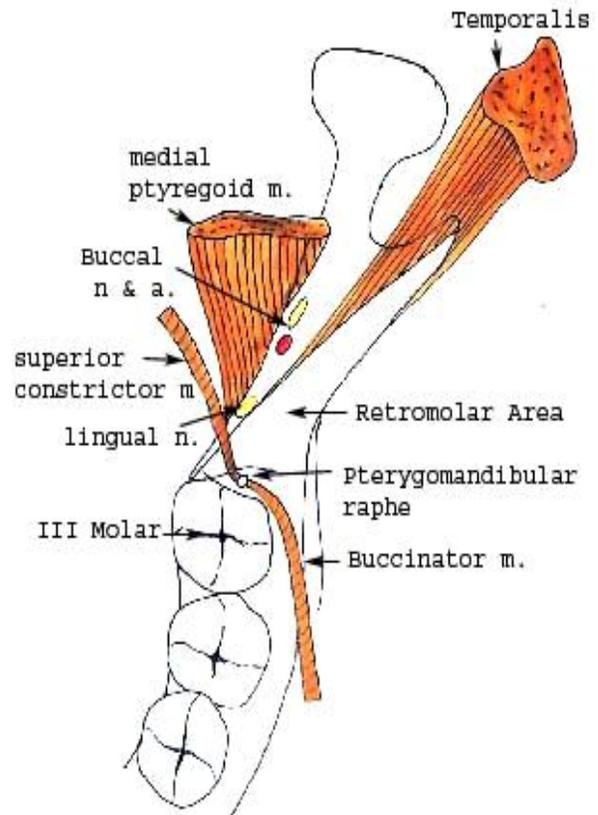


Fig. V: Showing a schematic view of the retromolar area and its relations

von Arx et al, 2011). Considering the importance of this region in operative procedures, the present study, besides documenting the prevalence of retromolar foramen, focused on the study of comprehensive anatomy of retromolar region in dry mandibles and cadavers.

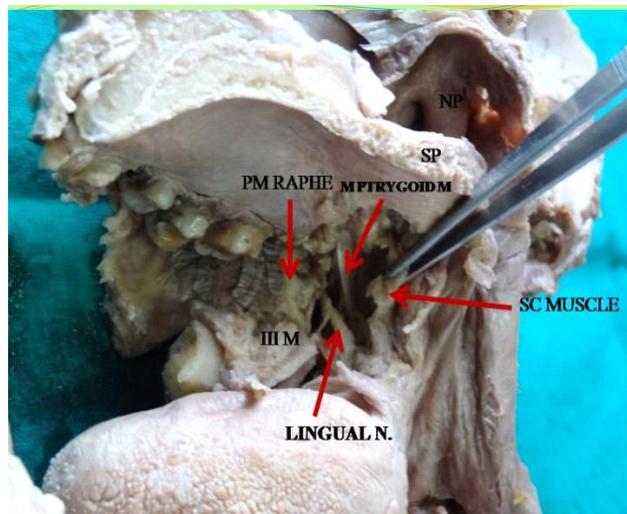


Fig. VI: shows structures seen from medial aspect (oral side) of retromolar region. The pterygomandibular raphe (PM raphe) is seen just posterior to the III molar tooth (III M) giving attachment to the buccinator muscle anteriorly and superior constrictor (SC MUSCLE) posteriorly (cut and held in forceps). The retromolar region is lateral to the area shown. M PTERYGOID M = Medial pterygoid muscle; NP= Nasopharynx; SP= Soft palate.

The prevalence of the foramen ranges from 8-23% as documented by various studies around the world (Table III). The fact that bilateral foramina were observed in association with unerupted third molar teeth is noteworthy and has not been reported earlier. Further studies are needed to substantiate this finding. It also calls for a cautious approach in case of intervention for unerupted third molar.

Although the cadaveric study did not document the presence of retromolar foramen and its contents in the specimen studied, the findings for the first time very vividly describe the anatomy of this region. It can be deduced from the relations of the region that: i) when present, the retromolar foramen would transmit the misplaced fibres of inferior alveolar nerve, travelling with either lingual or buccal nerves (all three being the branches of mandibular nerve) to their destination or viceversa and ii) it may transmit first branch of inferior alveolar artery and nerve destined to supply the posterior most molars.

Authors believe that the retromolar region being outside the oral cavity, with oral mucosa and superior constrictor muscle intervening, the contents of the retromolar foramen will not be at risk until the superior constrictor is disturbed. However, the canal, as has been documented by von Arx et al (2011) closely abuts the posterior border of third molar and can be at risk in procedures involving the third molar.

## Conclusion:

Retromolar foramen was observed in 10 out of 71 mandibles studied i.e. 14.08%. In 2 mandibles it was observed bilaterally, and in both these impacted third molar teeth were also observed. Cautious approach is advisable in cases of unerupted third molar teeth owing to close proximity of the foramen in such cases.

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**Source of Support** : Nil.

**Conflict of Interest**: None declared.