

# Retromolar foramen: an anatomical study with clinical considerations

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## Abstract

The retromolar canal and foramen, an anatomical variation in the mandibular retromolar area, houses and transmits neurovascular elements that may innervate the mandibular third molar and associated tissues. These structures have been implicated in local anaesthetic failure, loss of sensation in the normal distribution of the buccal nerve, and local haemorrhage during surgery. Examination of 885 dry mandibles showed that 70 had a retromolar foramen (8%). There were no significant differences between groups according to age, sex, or ancestry. The mean (SD) distance from molar to retromolar foramen was 16.8 (5.6) mm for the mandibular second molar and 10.5 (3.8) mm for the mandibular third molar. The link between these structures and failure of local anaesthesia seems tenuous at best. Bleeding may not represent a serious complication. Although there may be a possibility of perineural spread of infective and invasive pathology, we know of no reported cases. The only clear evidence of complications associated with a confirmed retromolar foramen seems to be loss of sensation in the normal distribution of the buccal nerve. Even though the retromolar foramen does not seem to be of great clinical importance, it could be a source of anxiety for the inexperienced practitioner.

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## Introduction

The retromolar foramen is an anatomical variation in the posterior mandible, located in the retromolar area delineated by the external oblique ridge, the attachment of the pterygomandibular raphe, and the last mandibular molar. The retromolar canal runs between the inferior alveolar canal and the surface of the mandibular retromolar area carrying a neurovascular bundle. This area is often entered during mandibular third molar surgery (Fig. 1).

Authors of current publications have associated presence of the neurovascular bundle with complications such as local anaesthetic failure,<sup>1–7</sup> local haemorrhage during

procedures,<sup>1–3</sup> and postoperative loss of sensation in the normal distribution of the buccal nerve.<sup>1–4,8</sup> Surgical importance of the retromolar foramen remains unclear. Our aim was to determine the prevalence of the retromolar foramen among South Africans, measure the distances between it and the mandibular second and third molars, and shed light on surgical considerations associated with the presence of a retromolar foramen.

## Materials and Methods

All available dry mandibles in the Pretoria Bone Collection housed within the Department of Anatomy at the University of Pretoria were examined by two investigators. Only mandibles morphologically representative of typical adult mandibles were included. Mandibles of unknown sex

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Table 1

Prevalence of the retromolar foramen in the South African population. Data are number (%) except where otherwise stated.

Group	No of subjects	Mean (SD) age (years)	Number present	Left	Right	Bilateral
Black male	554	55 (15)	43 (8)	27 (63)	24 (56)	8 (19)
Black female	74	49 (15)	6 (8)	3 (50)	4 (67)	1 (17)
White male	156	69 (12)	14 (9)	7 (50)	10 (71)	3 (21)
White female	101	72 (12)	7 (7)	6 (86)	1 (14)	0
Total male	710	58 (15)	57 (8)	34 (60)	34 (60)	11 (19)
Total female	175	62 (17)	13 (7)	9 (69)	5 (38)	1 (8)
Total	885	59 (16)	70 (8)	43 (61)	39 (56)	12 (17)



Fig. 1. Neurovascular elements leaving the retromolar foramen and coursing laterally towards the external oblique ridge (asterisk).

or ancestry and those showing pathological or traumatic changes to the retromolar area were excluded.

Mandibles included in the study had clearly identifiable reference numbers, which allowed us to correlate them with demographic data in the Department of Anatomy's cadaver database. A mandible was included only if both investigators deemed the specimen suitable after the application of the exclusion criteria. If no agreement was reached, the mandible in question was excluded.

All suitable mandibles were inspected for a retromolar foramen. A foramen was considered to be a confirmed retromolar foramen only if it was present in the retromolar area and if it offered no resistance to the introduction of a non-bevelled needle 1.0 mm in diameter. The retromolar area was defined as the triangular area bounded by the external oblique ridge, the attachment of the pterygomandibular raphe, and the distal surface of the ipsilateral second or third molar (estimated in case of tooth loss). If multiple foramina were found in a single retromolar area only the largest was considered.

The presence of the retromolar foramen and its position (left, right, or bilateral) were recorded. If an ipsilateral second or third molar was present, the shortest distance between the retromolar foramen and the last mandibular molar was measured using mechanical dial callipers (Fig. 2). Independent measurements were made by two different investigators and then compared. The mean was calculated if values differed. All data collected were correlated with those in the cadaver database.

Mandibles were separated into six groups based on sex and ancestry recorded in the cadaver database: total male, total female, black male, black female, white male, and white female, to allow for comparisons between populations.



Fig. 2. Use of mechanical dial callipers to calculate the shortest distance from the last tooth to the retromolar foramen.

Table 2

Distance (mm) from last molar (left and right).

Measurement	Second molar (n = 12)	Third molar (n = 34)
Mean (SD)	16.8 (5.6)	10.5 (3.8)
Median (range)	16.9 (8.8–29.4)	10.1 (4.8–21.0)

Mandibles not from black or white populations were excluded from the study.

## Results

A total of 885 mandibles were included in the study. Groupings are shown in Table 1.

The distance from the retromolar foramen to the second mandibular molar was measured in 12 cases and to the third mandibular molar in 34 cases. No distinction between right and left was made in calculating distances. Combined left and right values are shown in Table 2.

## Discussion

The odds ratio showed that no measured variable (age, sex, or ancestry) was associated with a significant change in the presence of the retromolar foramen (Table 3). This suggests that all members of the population studied should be treated as if they had the same likelihood of having one.

The prevalence of the retromolar foramen in populations studied previously has ranged between a high of 72% in Argentinian aborigines (13 of 18)<sup>9</sup> and a low of 0 in black Africans<sup>7</sup> (specific population not further defined).

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