Part One

Dentoalveolar and Implant Surgery

CHAPTER

1 Anatomical Considerations in Dentoalveolar Surgery

Jason Jamali, Antonia Kolokythas, and Michael Miloro

Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Illinois Chicago, Chicago, Illinois, USA

An understanding of the anatomical relations within the region of intervention is critical to minimize surgical complications. Radiographic imaging assists in the assessment of anatomical variation and allows for risk stratification and predictable treatment outcomes.

Mandible

Lingual Nerve

The lingual nerve provides sensation to the anterior two-thirds of the tongue. The lingual nerve is at risk for injury with the extraction of third molars and with procedures involving the floor of the mouth. Within the third molar region, the lingual nerve is located, on average, 3.0 mm apical to the crest of the alveolar ridge and 2.0 mm medially from the lingual cortical plate. In 17.6% of the population, the lingual nerve is at or above the crest of the alveolar bone. In 22% of the population, the lingual nerve contacts the lingual cortex adjacent to the third molar region. Within the second molar region, the lingual nerve is located, on average, 9.5 mm inferior to the cementoenamel junction (CEJ). Within the first molar and second premolar regions, the average vertical distances from the CEJ lingually are 13.0 mm and 15.0 mm, respectively. The lingual nerve begins to course toward the tongue between the first and second molar regions.

Inferior Alveolar Nerve

As the inferior alveolar nerve (IAN) descends from the base of the skull, it traverses the pterygomandibular space and enters the mandibular foramen approximately 1.5–2.0 cm inferior to the sigmoid notch. Within the corpus of the mandible, the course of the mandibular canal in the buccal-lingual dimension tends to follow one of three general patterns:

- Type 1: in the majority of the population (approximately 70%), the canal follows the lingual plate within the ramus–body region.
- Type 2: in 15% of the population, the canal initially runs within the middle of the ramus when posterior to the second molar, and then follows the lingual plate as it passes through the region of the second and first molars.
- Type 3: in 15% of the population, the canal is positioned in the middle to lingual third of the mandible along its entire course.

In addition:

- In approximately 80% of the population, the inferior alveolar artery courses above the nerve within the bony canal.
- Older patients have been shown to have less distance between the buccal cortex of the mandible and the lateral aspect of the canal.
- In relation to impacted third molars, the inferior alveolar canal is located:

  Lingual to the third molar in 49% of the population
  Buccal to the third molar in 17% of the population
  Inferior to the third molar in 19% of the population
  Interradicular in 15% of the population.

In general, the risk of exposure of the inferior alveolar canal during third molar removal is greater in patients with lingual, rather than buccal, canal positioning. Among molars in the posterior mandible, the distance from the buccal cortex to the canal tends to be greatest within the region of the second molar.

Mental Nerve

The mental foramen typically lies between the first and second premolars in line corresponding with a vertical reference from the infraorbital foramen. Variability in the vertical distance of the foramen may be problematic in edentulous mandibles with excessive alveolar bone resorption. The mental nerve courses superiorly before exiting the mental foramen. Additionally, the mental nerve commonly loops anteriorly (genu) before its exit from the mental foramen in approximately 48% of the population. The average length of the anterior loop (genu) is 0.89 mm with a range of up to 5.7 mm or more. However, only 5% of individuals have an anterior loop length longer than 3.0 mm and only 2% have an anterior loop length greater than 4.0 mm.

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Maxilla

Nasal Cavity

The palatal process of the maxilla contributes to the anterior three-fourths of the nasal floor. The posterior one-fourth of the nasal floor is comprised from the horizontal process of the palatine bone. Care must be taken during placement of anterior maxillary implants to avoid violating this region.

Maxillary Sinus

The maxillary sinus is the largest of the paranasal sinuses. It is pyramidal in shape with its apex oriented toward the zygoma. It lies within the posterior maxilla bounded by the infratemporal fossa, lateral nasal wall, and floor of the orbit. As a result of pneumatization, extensive variation exists; however, the average volume in adults is roughly 15 mL's. Additionally, the maxillary sinus cavity may occasionally be divided by septae. The maxillary sinus ostium is located along the superior aspect of the medial wall of the sinus and drains into the middle meatus of the nasal cavity.

Key Points

1. Panoramic indicators of inferior alveolar nerve proximity include darkening of the third molar root, interruption of the white line of the mandibular canal (see Figure 1.6 in Case Report 1.2), diversion or displacement of the mandibular canal (see Figure 1.3 in Case Report 1.1), abrupt deflection of the third molar roots, and abrupt narrowing of the tooth root.
2. Cone beam computed tomography (CBCT) scanners have aided greatly in the visualization and avoidance of neurovascular structures during dentoalveolar surgery and implant placement. (See Figures 1.1 and 1.2.)

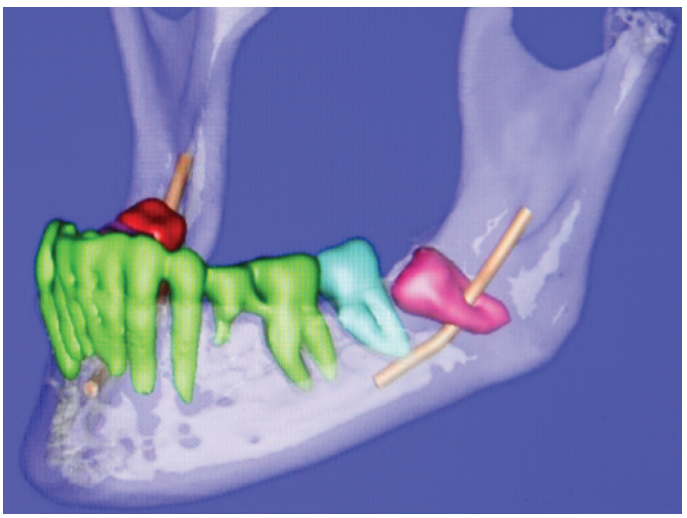

Figure 1.1. 3D image depicting the inferior alveolar nerve coursing directly through an impacted lower wisdom tooth.

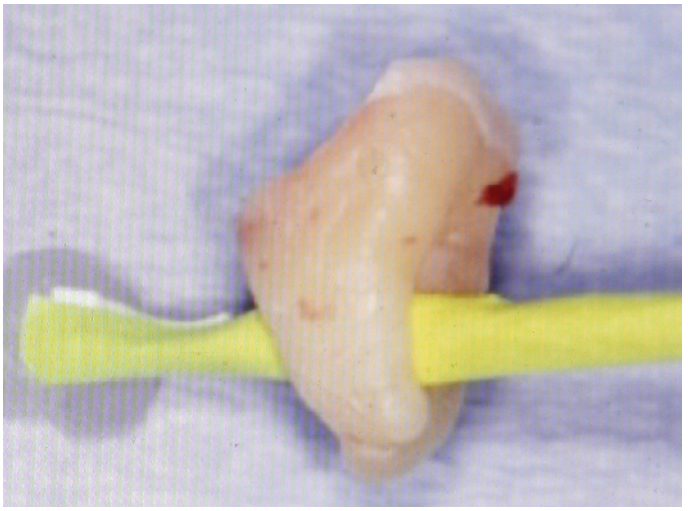

Figure 1.2. Lower wisdom tooth extracted from the patient in Figure 1.1. The yellow paper represents the location of the inferior alveolar nerve through the inferior third of the wisdom tooth.

Case Reports

Case Report 1.1. A 63-year-old patient presents with a chief complaint of pain, foul taste, persistent food impaction, and chronic localized infection to site #32. Based on the patient's age, nerve anatomy, and potential for permanent neurosensory damage, the decision was made to remove the coronal aspect (clinical crown) of the impacted tooth without extracting the root tips (i.e., a **coronectomy**). See Figures 1.3, 1.4, and 1.5.

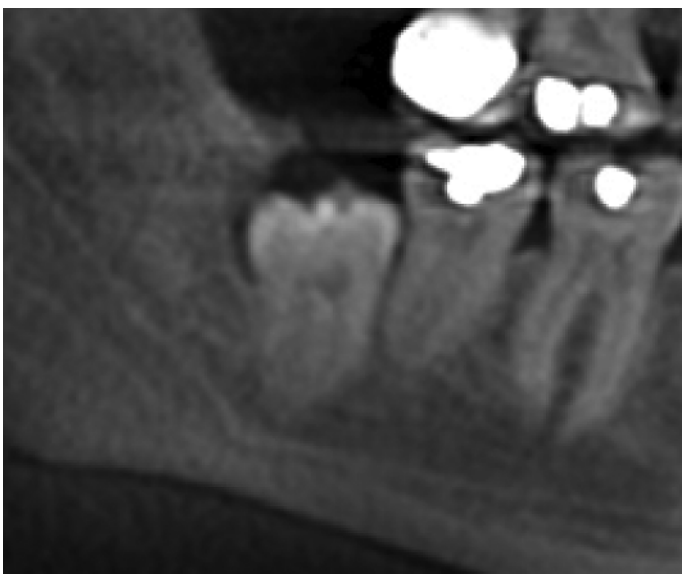

Figure 1.3. 2D film demonstrates impacted tooth #32 with diversion of the mandibular canal at the apex of the tooth.

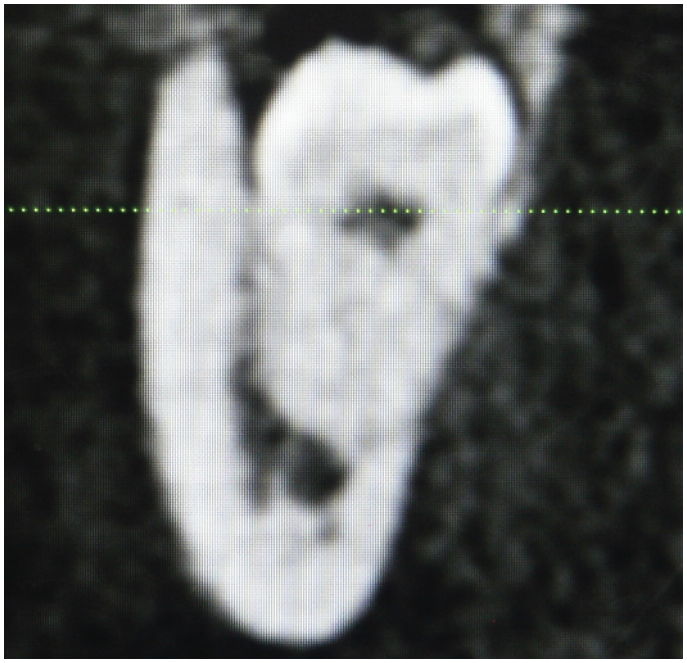

Figure 1.4. Cone beam computed tomography coronal view demonstrating the inferior alveolar nerve coursing through the apical third of tooth #32.

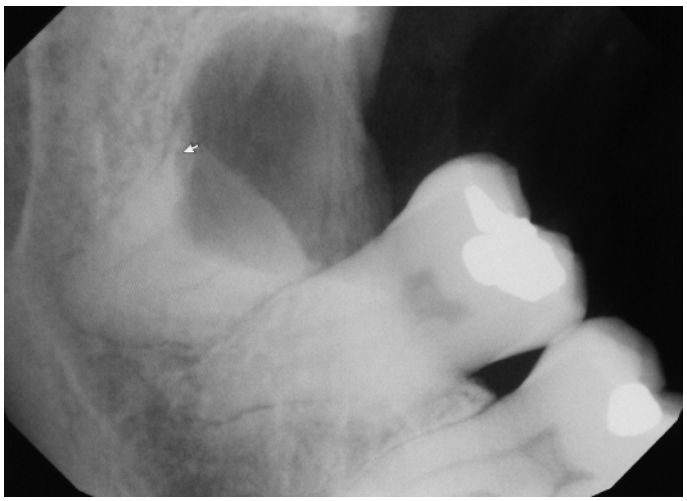

Figure 1.5. Periapical film demonstrating a coronectomy of tooth #32. Note that the entire clinical crown was removed by sectioning the tooth apical to the CEJ to ensure no residual enamel remained and the roots were trimmed 3–4 mm below the bony margin.

Case Report 1.2. A 57-year-old patient presents with a chief complaint of persistent local pain, referred pain, and documented deep probing depths to site #32. See Figures 1.6, 1.7, and 1.8.

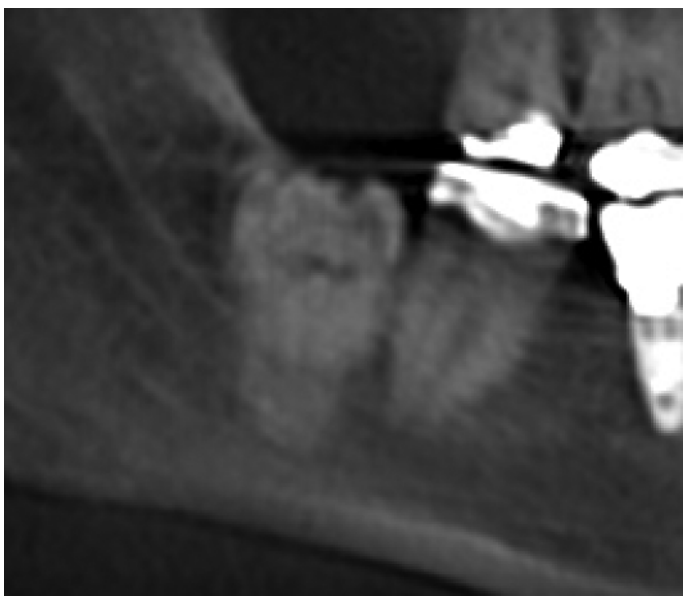

Figure 1.6. 2D film demonstrating interruption of the white lines of the mandibular canal.

Figure 1.7. Cone beam computed tomography coronal view demonstrating the inferior alveolar nerve coursing through the middle third of the third molar root.

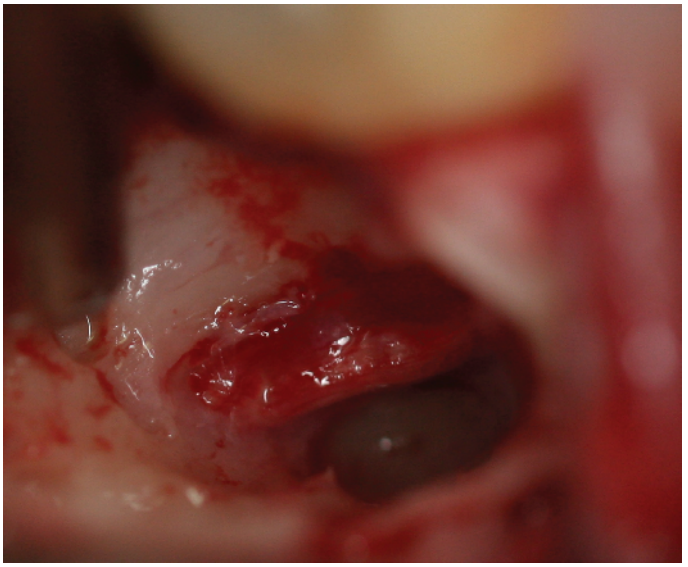

Figure 1.8. Tooth #32 extraction site demonstrating an intact inferior alveolar nerve along the lingual plate.

References

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