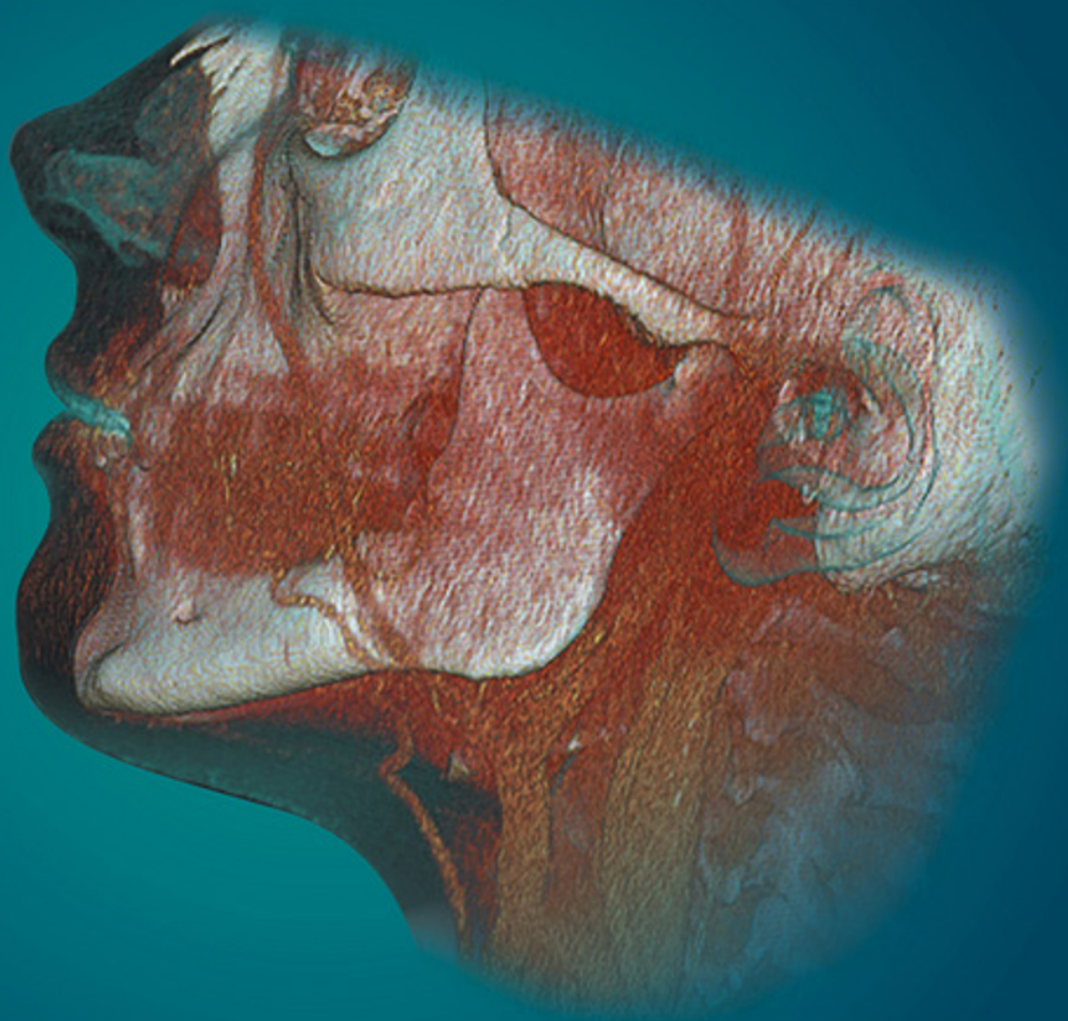
Atlas of Oral and Maxillofacial Radiology

BERNARD KOONG



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Preface

Radiological interpretation of anomalies affecting the jaws is primarily based upon an understanding of the pathophysiology, including how a lesion behaves within a specific anatomical constraint. While an understanding of anatomy and pathology is essential, the knowledge of key radiological features and the ability to identify and weight these features is critical in interpretation.

The impetus for this atlas came from colleagues, students and audiences at speaking engagements. The request was for a radiological atlas dedicated to conditions affecting the jaws and teeth which would assist them in daily practice. They wanted an atlas that is easy to use and based upon tried and true key radiological features that are used in my daily radiological practice.

This problem-solving-style atlas fulfils the wishes of these clinicians, radiologists, surgeons and students. It is much more than a summary of radiological features that have been identified in the published literature. This atlas highlights the key features of jaw lesions which have been learnt, identified, analysed, validated and weighted over the course of personally reporting over 200 000 radiological examinations of the jaws. Multiple examples of common conditions are demonstrated with a variety of techniques to demonstrate the variation in the radiological features and also assist the reader in the application of the optimal modality. There is a focus on conditions where diagnostic imaging often substantially contributes to diagnosis. Less common and many rare conditions are also covered. The 'differential diagnosis' sections highlight radiological features which assist in differentiating the lesion in question from conditions which may otherwise appear similar. A summarised description of every condition focuses on the clinically important points.

This atlas includes a chapter dedicated to the temporomandibular joint. Panoramic radiograph and orofacial cone beam CT radiological anatomy are also covered in detail. The nasal cavity, paranasal sinuses, upper aerodigestive tract morphological alterations, base of skull and cervical spine are often seen in dentofacial imaging, especially cone beam CT. These are also covered in specific chapters.

Students of dentistry, radiology and surgery have also been very much kept in mind in the writing of this atlas. While nothing is better than one-to-one hands-on training in a clinical–radiology environment, I believe that a thorough study of this atlas would substantially improve a student's interpretive skill set and also prepare them well for any examination.

I would like to acknowledge the training I received from Dr Michael Pharoah of the University of Toronto, which started my journey in interpretive radiology. I am also extremely thankful to the contributing authors. These highly respected and experienced full-time radiologists have substantially contributed to making this a truly clinically relevant atlas.

I sincerely hope that you will find this atlas relevant and useful. Ultimately, it is my hope that the use or study of this atlas will contribute positively to your patients' wellbeing.

Bernard Koong

Acknowledgements

This atlas is dedicated to Seok Leng, Swee Yen, Angelina, Chrysten and Danielle. You are my strength and my inspiration.

A sincere thank you to all my colleagues in dentistry and medicine. Your trust in me over many years to care for the radiological needs of your patients has allowed me to continually grow and develop, culminating in the writing of this atlas.

A special thank you to all my colleagues at Envision Medical Imaging, Australia. You are the most wonderful team of people I have ever had the pleasure to work with.

A heartfelt thank you to Dr Michael Pharoah. Your generosity, kindness and contribution to my career in radiology will never be forgotten.

Bernard Koong

How to Use This Atlas

- As a book for the study of radiological interpretation:
  - A study of this entire atlas would prepare any student of dentistry, radiology and surgery well for any examination on interpretive diagnostic imaging of the jaws and related structures.
- As a reference atlas for lesions affecting the jaws:
  - Using the 'problem solving' method:
    1. Go to the relevant 'problem solving' page(s) in Chapter 1, depending on whether the lesion is considered to be opaque/largely opaque, lucent or demonstrates mixed density internal appearances.
       - It should be noted that some conditions can present differently depending on the modality employed. For example, a lesion which presents as a unilocular lucency on a panoramic radiograph may demonstrate internal opacities on a CBCT or MDCT scan. In these instances, the reader is encouraged to refer to more than one 'problem solving' page.
    2. Check the lists of possible conditions, beginning with the common conditions. Also refer to the diagrams which identify conditions that have a predilection for a specific region of the jaw.
    3. Refer to the relevant section for a description of the possible condition and images highlighting the key features.
  - The more experienced reader may wish to go directly to the relevant chapters or refer to specific conditions listed in the index.
- For conditions affecting the temporomandibular joint, sinonasal structures, upper aerodigestive tract morphology, skull base and cervical spine, refer to the specific chapters.

CHAPTER 1

Problem Solving Diagrams

1.1 Opaque and largely opaque conditions related to the jaws

For conditions affecting the temporomandibular joint (TMJ), nasal cavity, paranasal sinuses, upper airway morphology, skull base and cervical spine, please refer to the dedicated chapters.

On plain films, including panoramic and cephalometric radiographs, soft tissue calcifications may be projected over the jaws (see Chapter 16).

Common conditions

- Reactive sclerosis related to a periapical inflammatory lesion (see section 5.1)
- Bone island (see section 7.4)
- Exostoses (see section 7.3)
- Torus palatinus (see section 7.1)
- Torus mandibularis (see section 7.2)
- Ectopic teeth (see section 3.4)
- Chronic pericoronitis (see section 5.3)
- Supernumerary teeth (see section 3.1)
- Cemento-osseous dysplasia including periapical osseous dysplasia (see section 9.2)
- Pulp stones (see section 3.21)
- Hypercementosis (see section 3.22)
- Odontoma (see section 10.3)
- Dens invaginatus (see section 3.11)
- Fibrous dysplasia (see section 9.1)
- Enamel pearl (see section 3.9)
- Talon cusp (see section 3.10)

Less common conditions

- Osteoma (see section 10.10)
- Malignant lesions including metastatic disease (see sections 11.1–11.3)
- Chronic osteomyelitis (see section 5.4)
- Ossifying fibroma (see section 9.3)
- Cementoblastoma (see section 10.9)
- Osteoblastoma (see section 10.14)
- Osteoid osteoma (see section 10.15)
- Paget disease of bone (see section 13.5)
- Osteopetrosis (see section 15.2)

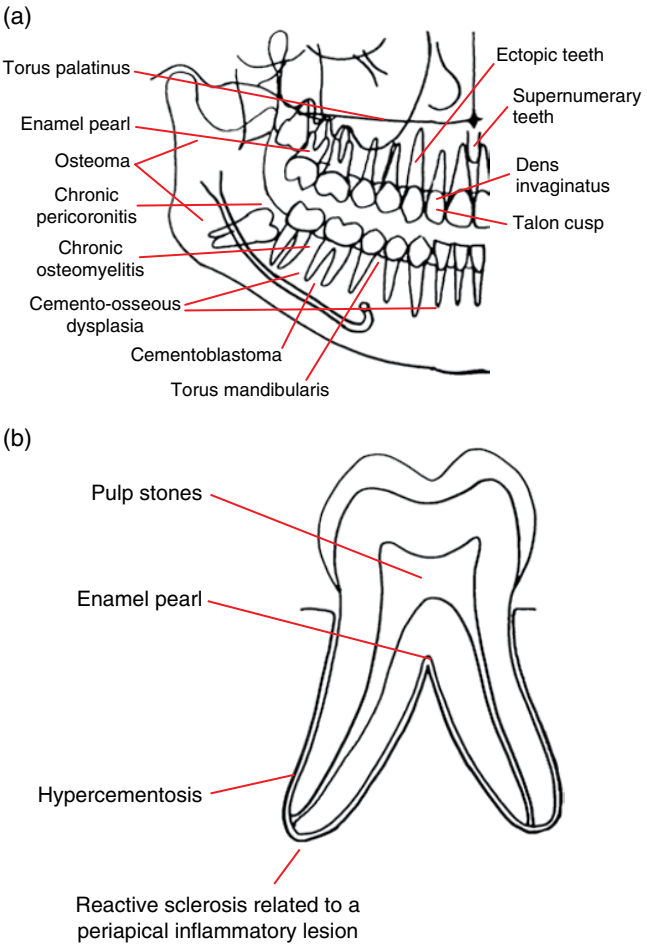


Figure 1.1 (a) Representation of the jaws and teeth and (b) larger representation of the fully erupted tooth. Conditions that have a predilection for certain regions of the jaws and teeth are shown. Note: (1) These lesions are not necessarily more common than other conditions. See the text for lists of common and less common conditions. (2) Most of these lesions also occur elsewhere within the jaws. (3) The pointers identify a region, not a specific site.

Atlas of Oral and Maxillofacial Radiology, First Edition. Bernard Koong.

1.2 Lucent lesions of the jaws

For conditions affecting the TMJ, nasal cavity, paranasal sinuses, upper airway morphology, skull base and cervical spine, please refer to the dedicated chapters.

Common conditions

- Caries (see section 4.1)
- Periodontal bone loss (see section 5.2)
- Tooth abrasion (see section 4.3)
- Periapical inflammatory lesion (see section 5.1)
- Root resorption (see sections 4.5–4.6)
- Radicular cyst (see section 8.1)
- Dentigerous cyst (see section 8.3)
- Stafne defect (see section 14.4)
- Simple bone cyst (see section 8.9)
- Keratocystic odontogenic tumour (see section 8.5)
- Nasopalatine duct cyst (see section 8.10)
- Residual cyst (see section 8.2)
- Cemento-osseous dysplasia (see section 9.2)

Less common conditions

- Osteoradionecrosis (see section 6.1)
- Osteonecrosis of the jaws (see section 6.2)
- Buccal bifurcation cyst (see section 8.4)
- Lateral periodontal cyst (see section 8.7)
- Osteomyelitis (see section 5.4)
- Malignant lesions including metastatic disease (see sections 11.1–11.3)
- Vascular anomalies (see sections 12.1–12.4)
- Cleft lip and palate (see section 14.5)
- Ameloblastoma (see section 10.1)
- Schwannoma (see section 10.13)
- Langerhans cell histiocytosis (see section 13.4)
- Nasolabial cyst (see section 8.11)
- Glandular odontogenic cyst (see section 8.8)
- Ameloblastic fibroma (see section 10.4)

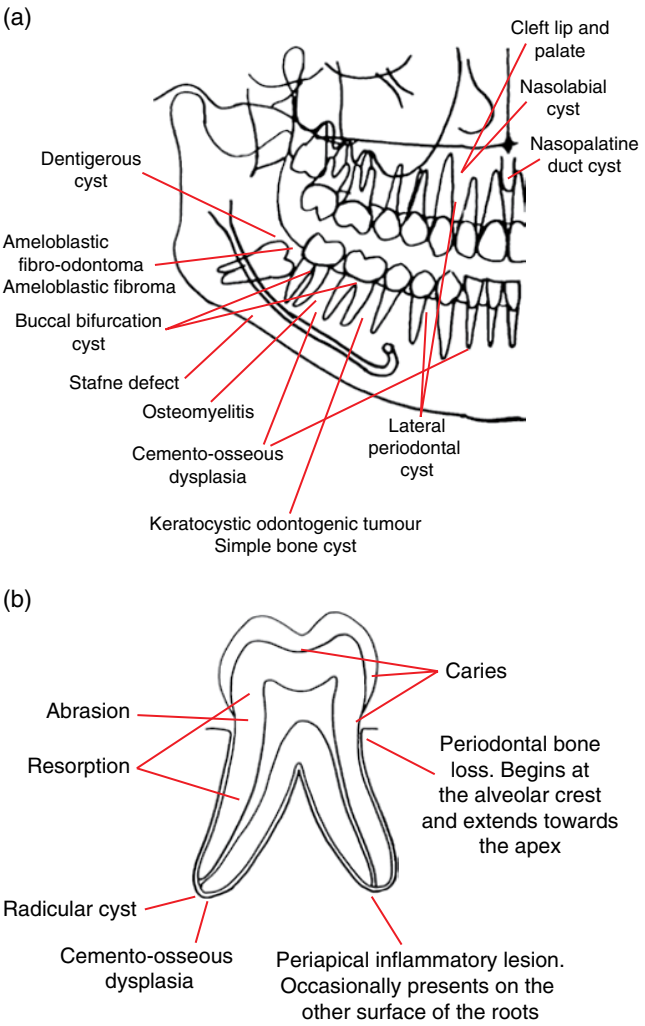


Figure 1.2 (a) Representation of the jaws and teeth and (b) larger representation of the fully erupted tooth. Conditions that have a predilection for certain regions of the jaws are shown. Note: (1) These lesions are not necessarily more common than other conditions. Refer to the text for lists of common and less common conditions. (2) Most of these lesions also occur elsewhere within the jaws. (3) The pointers identify a region, not a specific site.

1.3 Mixed density lesions of the jaws

For conditions affecting the TMJ, nasal cavity, paranasal sinuses, upper airway morphology, skull base and cervical spine, please refer to the dedicated chapters.

Common conditions

- Chronic pericoronitis (see section 5.3)
- Cemento-osseous dysplasia (see section 9.2)
- Odontoma (see section 10.3)
- Fibrous dysplasia (see section 9.1)

Less common conditions

- Osteoradionecrosis (see section 6.1)
- Osteonecrosis of the jaws (see section 6.2)
- Osteomyelitis (see section 5.4)
- Ameloblastoma (see section 10.1)
- Central giant cell granuloma (see section 13.1)
- Odontogenic myxoma (see section 10.8)
- Ossifying fibroma (see section 9.3)
- Vascular anomalies (see sections 12.1–12.4)
- Malignant lesions including metastatic disease (see sections 11.1–11.3)
- Aneurysmal bone cyst (see section 13.3)
- Ameloblastic fibro-odontoma (see section 10.5)
- Adenomatoid odontogenic tumour (see section 10.6)
- Calcifying cystic odontogenic tumour (see section 10.7)
- Paget disease of bone (see section 13.5)
- Calcifying epithelial odontogenic tumour (Pindborg) (see section 10.2)
- Osteoblastoma (see section 10.14)
- Osteoid osteoma (see section 10.15)
- Desmoplastic fibroma (see section 10.16)
- Cherubism (see section 13.2)

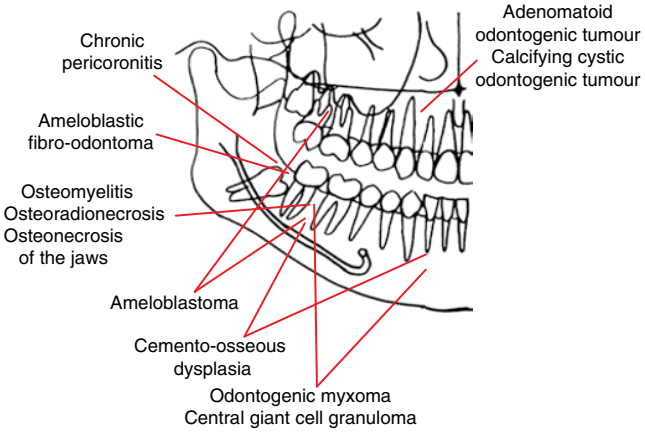


Figure 1.3 Representation of the jaws and teeth. Conditions that have a predilection for certain regions of the jaws are shown. Note: (1) These lesions are not necessarily more common than other conditions. Refer to the text for lists of common and less common conditions. (2) Most of these lesions also occur elsewhere within the jaws. (3) The pointers identify a region, not a specific site.

CHAPTER 2

Radiological Anatomy

2.1 The panoramic radiograph

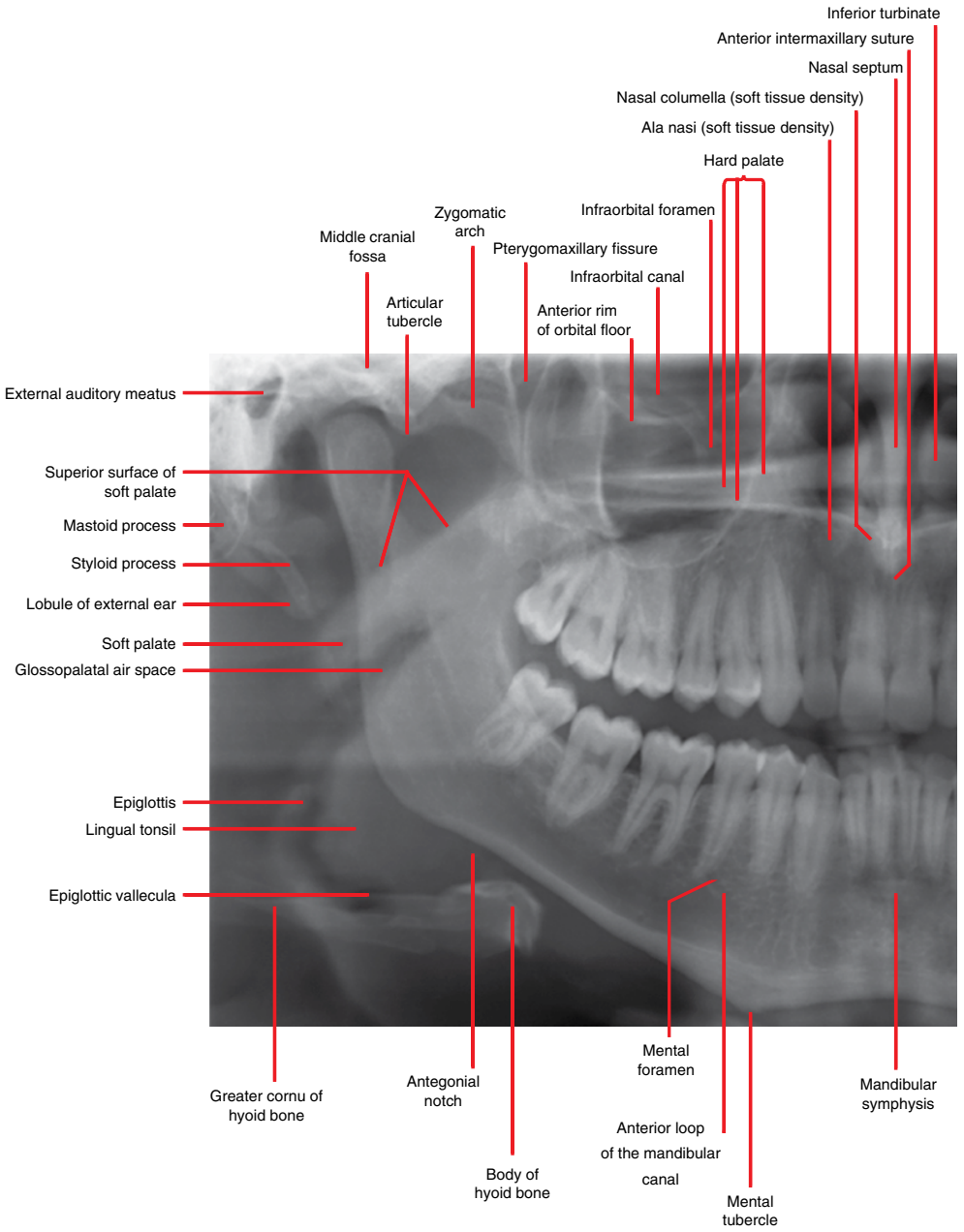
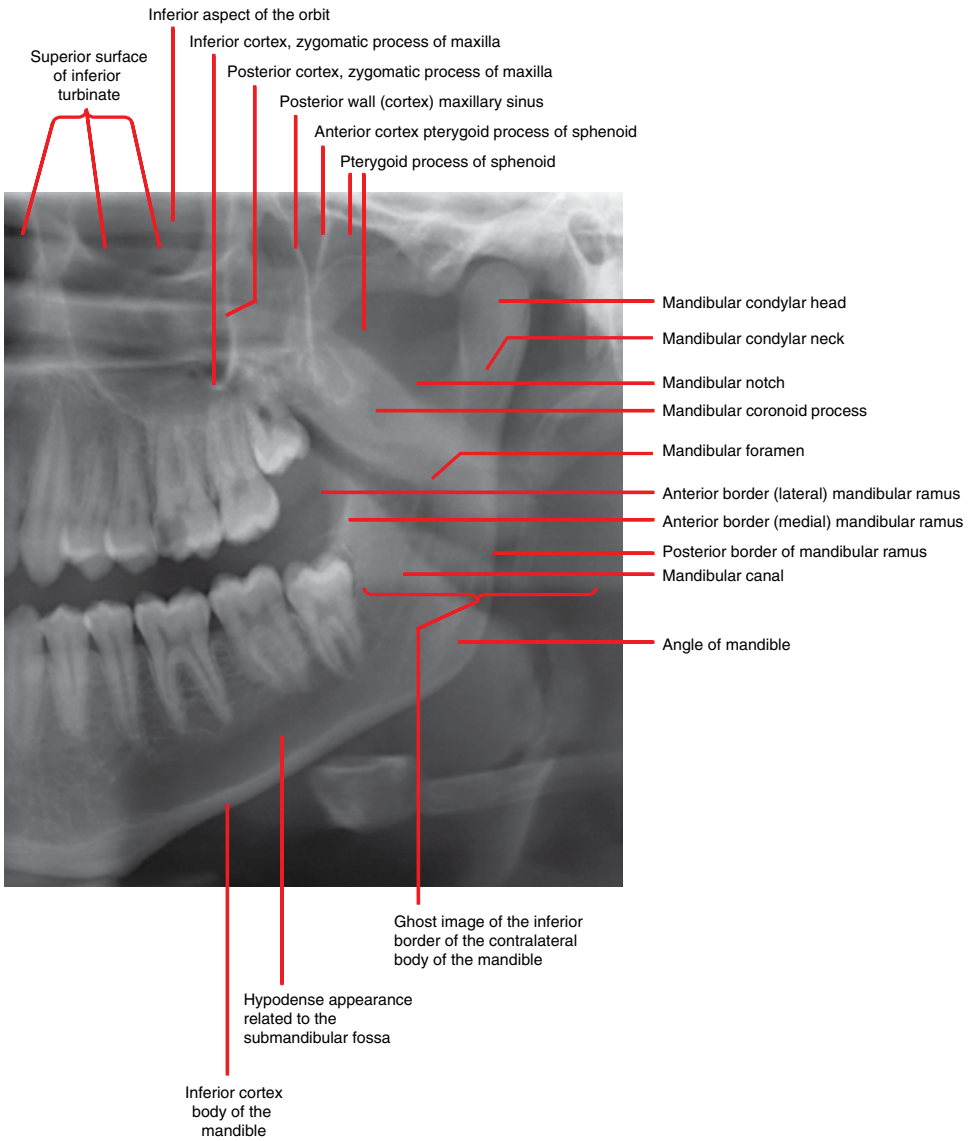


Figure 2.1

Atlas of Oral and Maxillofacial Radiology, First Edition. Bernard Koong.



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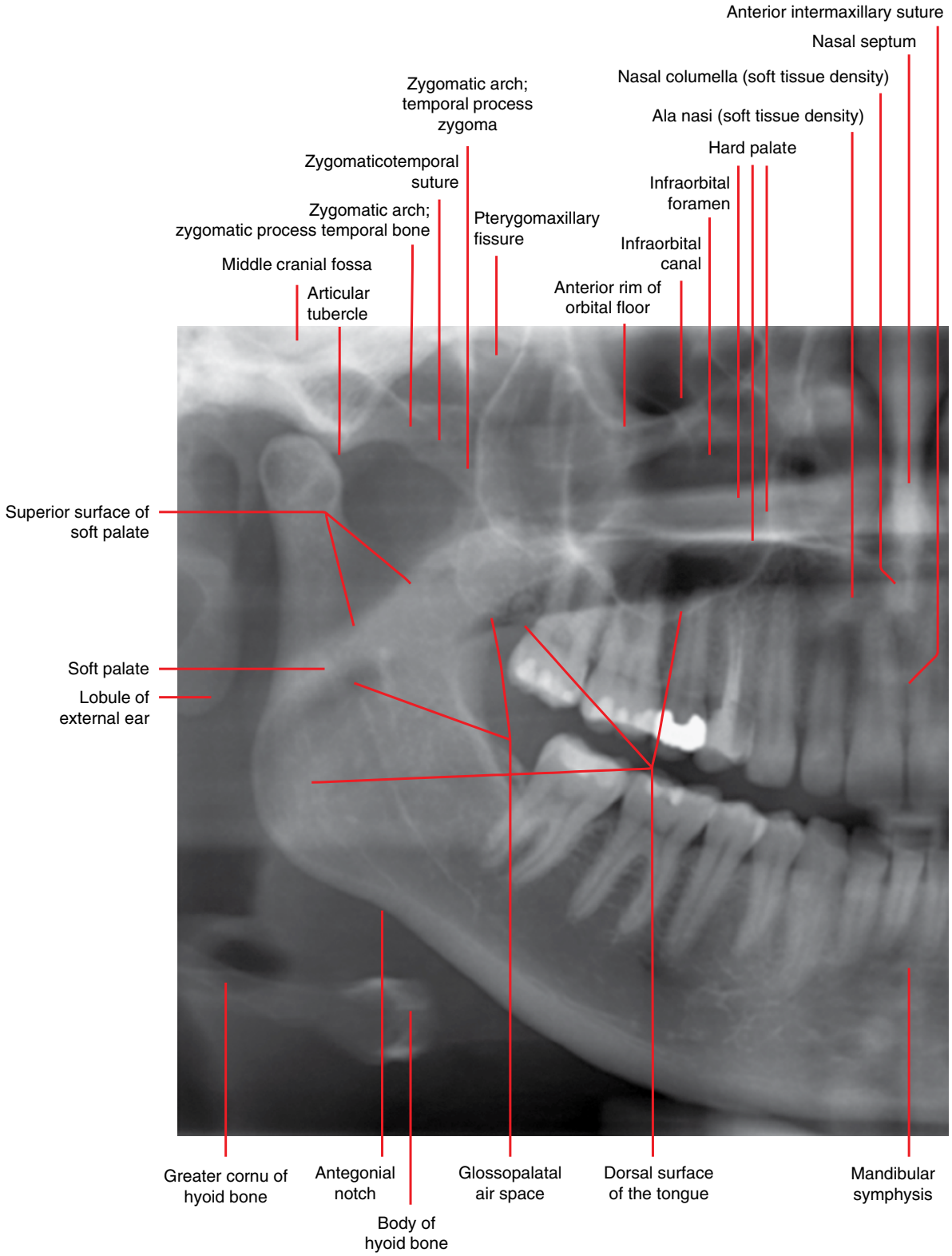

Anterior intermaxillary suture
Nasal septum
Nasal columella (soft tissue density)
Zygomatic arch; temporal process zygoma
Ala nasi (soft tissue density)
Hard palate
Zygomaticotemporal suture
Infraorbital foramen
Zygomatic arch; zygomatic process temporal bone
Pterygomaxillary fissure
Infraorbital canal
Middle cranial fossa
Anterior rim of orbital floor
Articular tubercle
Superior surface of soft palate
Soft palate
Lobule of external ear
Greater cornu of hyoid bone
Antegonial notch
Body of hyoid bone
Glossopalatal air space
Dorsal surface of the tongue
Mandibular symphysis

Figure 2.2

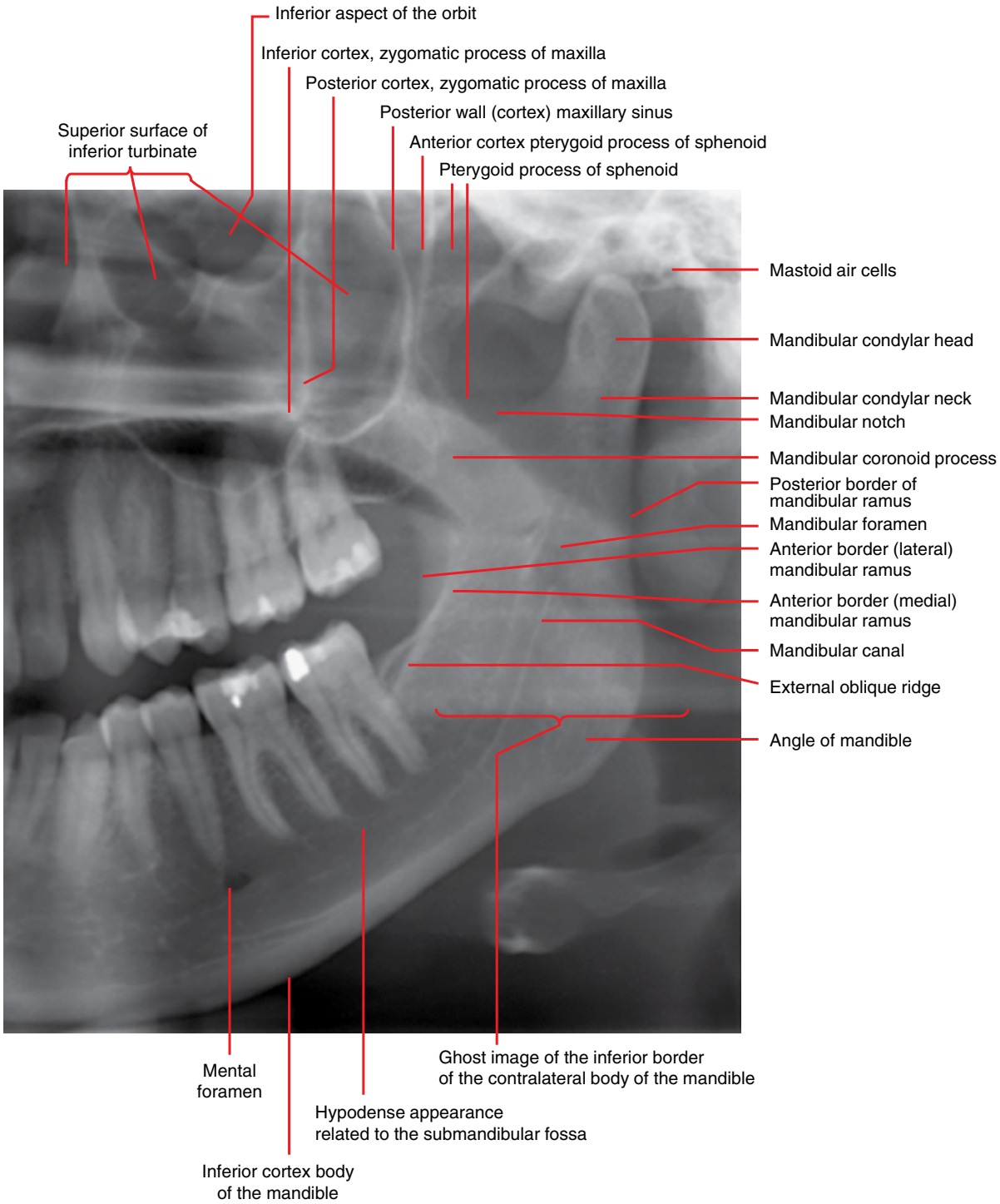
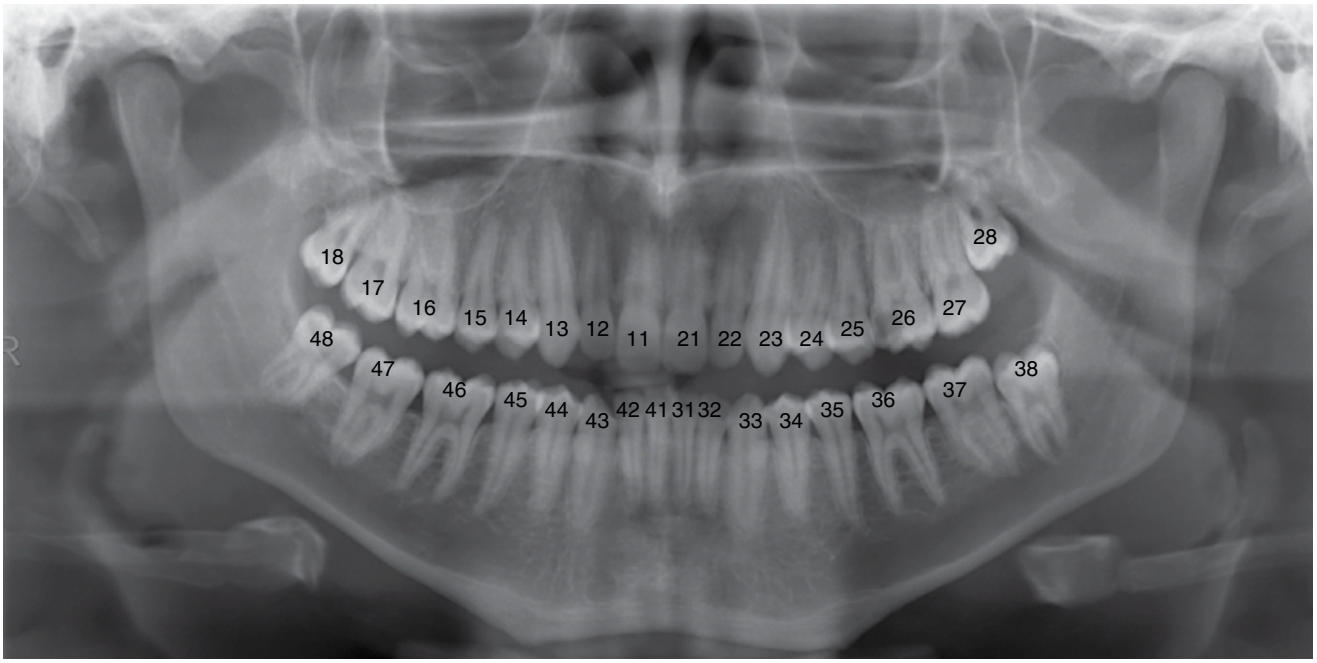


Figure 2.2 (Continued)

2.2 Identification of teeth – FDI (Fédération Dentaire Internationale) World Dental Federation notation



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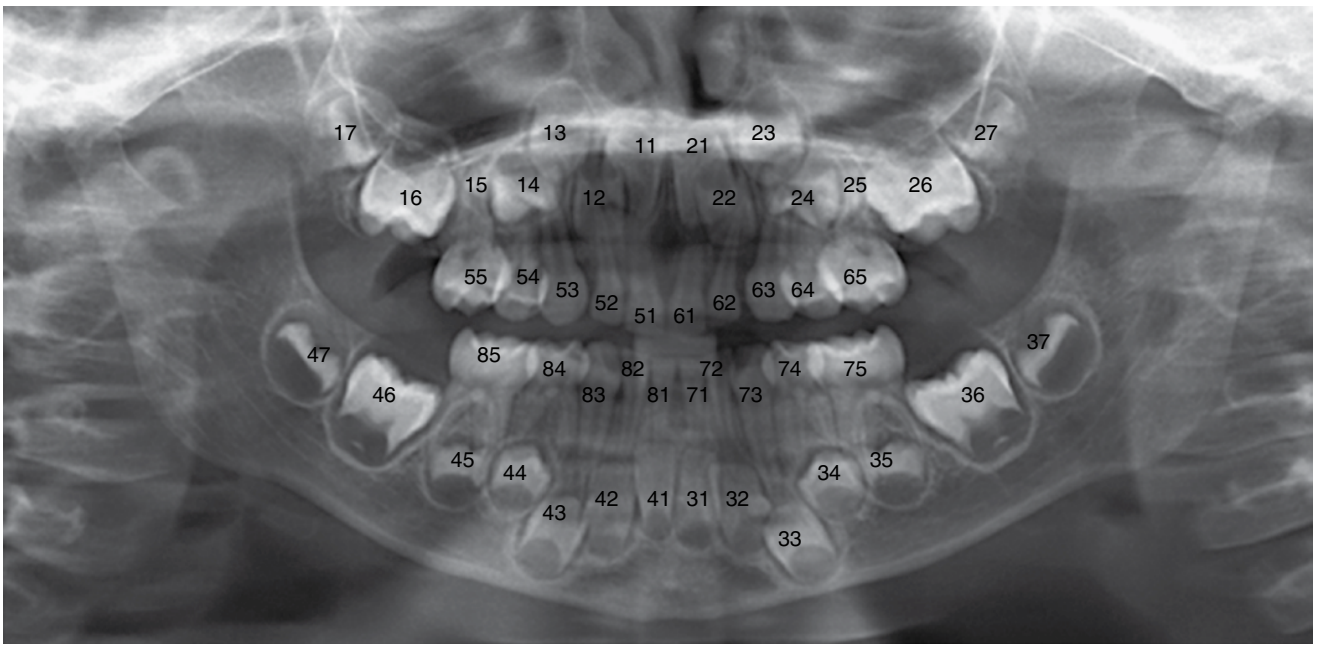

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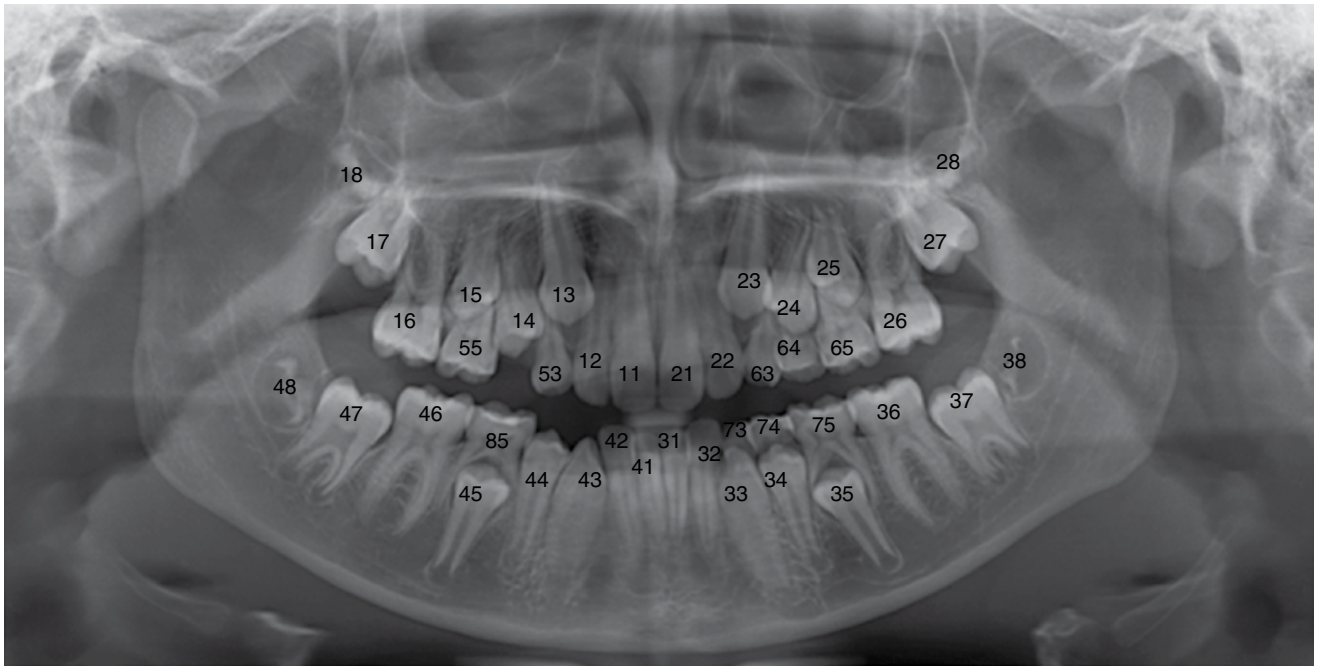

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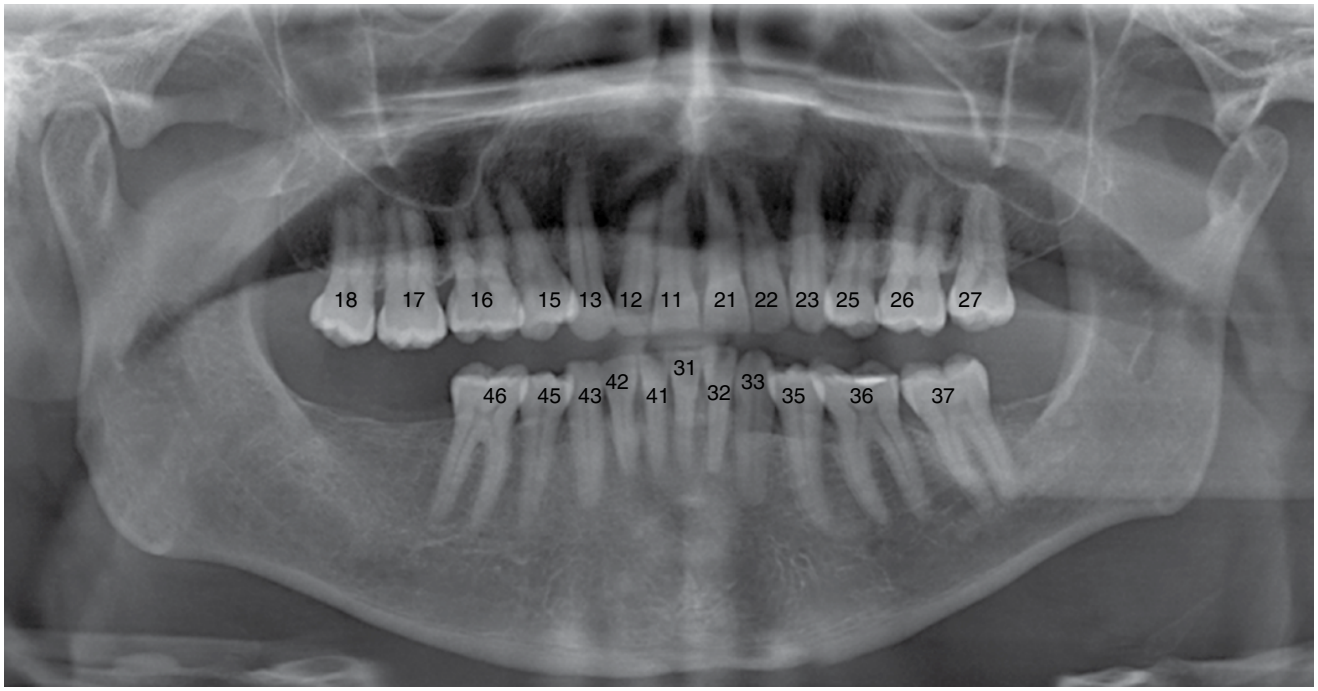

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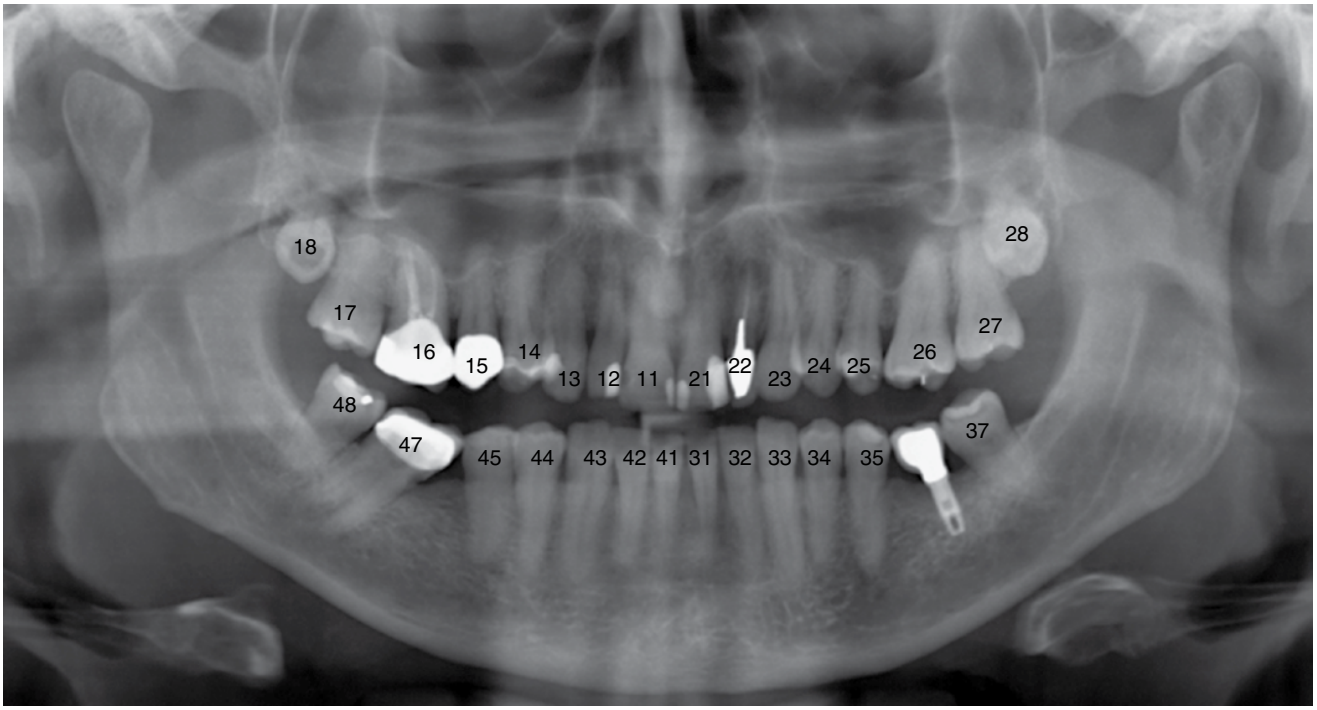
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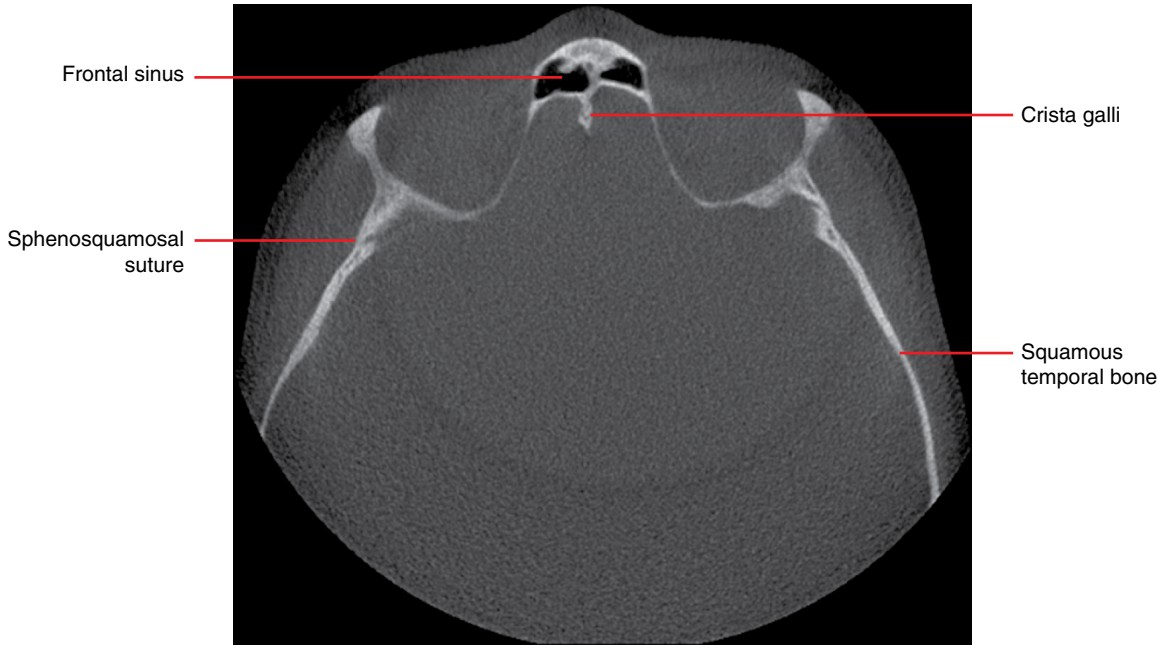
Figure 2.7

2.3 Cone beam computed tomography

Axial



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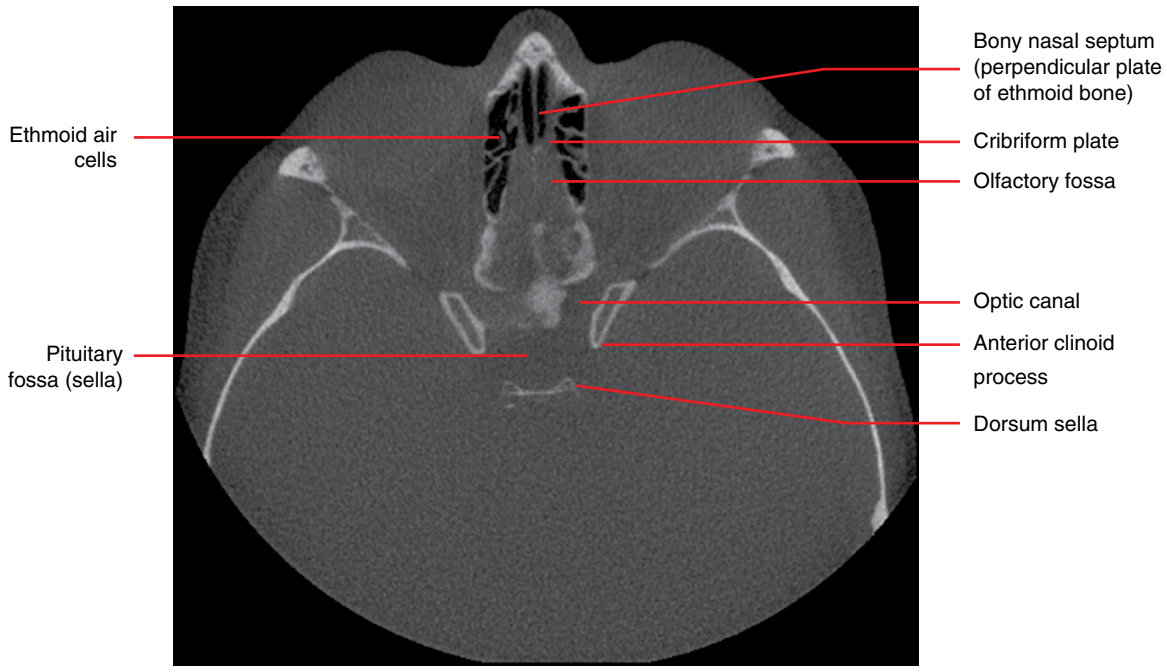

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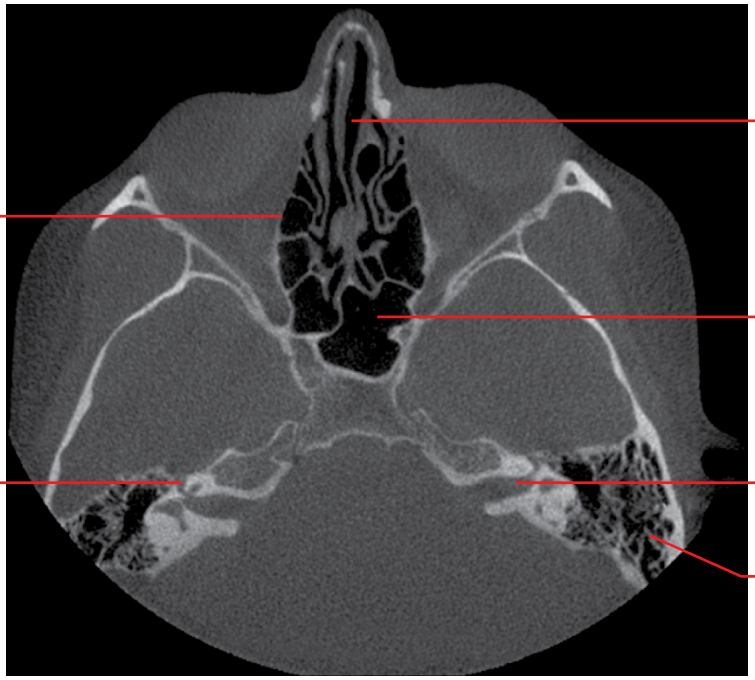

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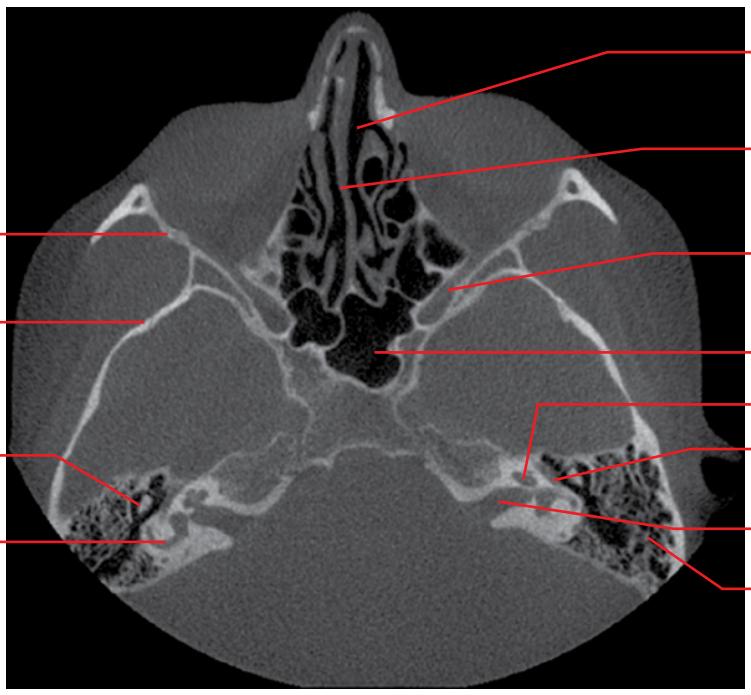

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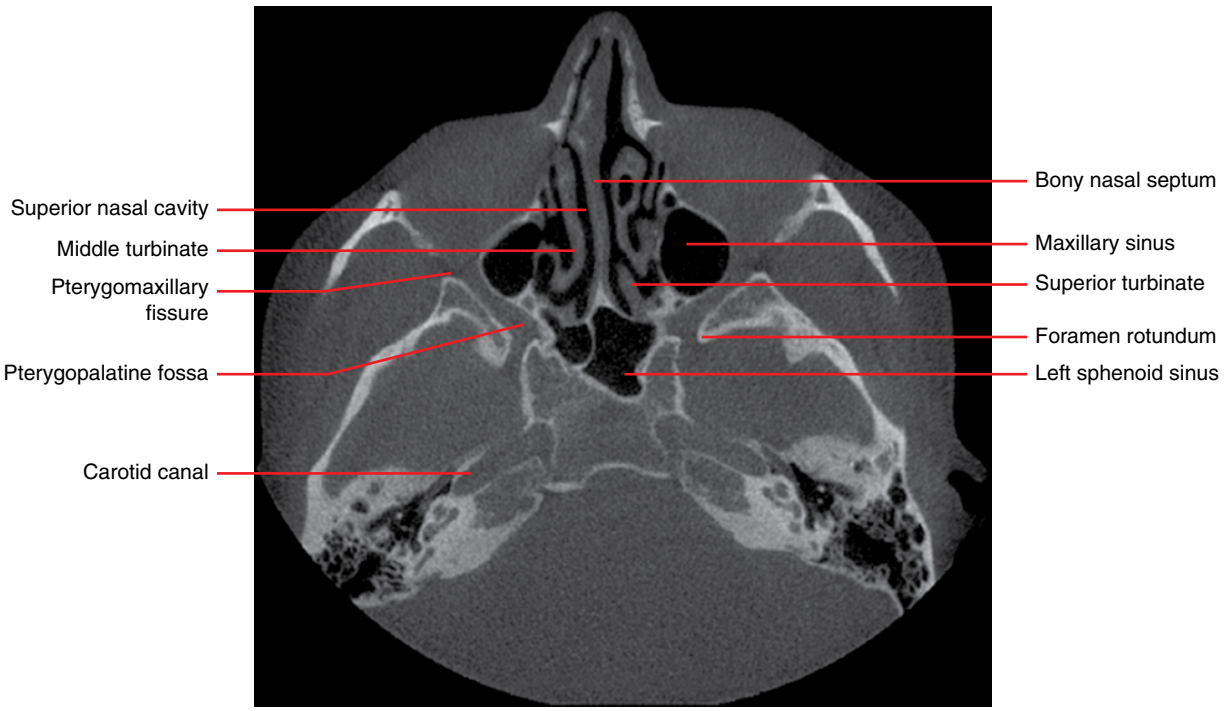

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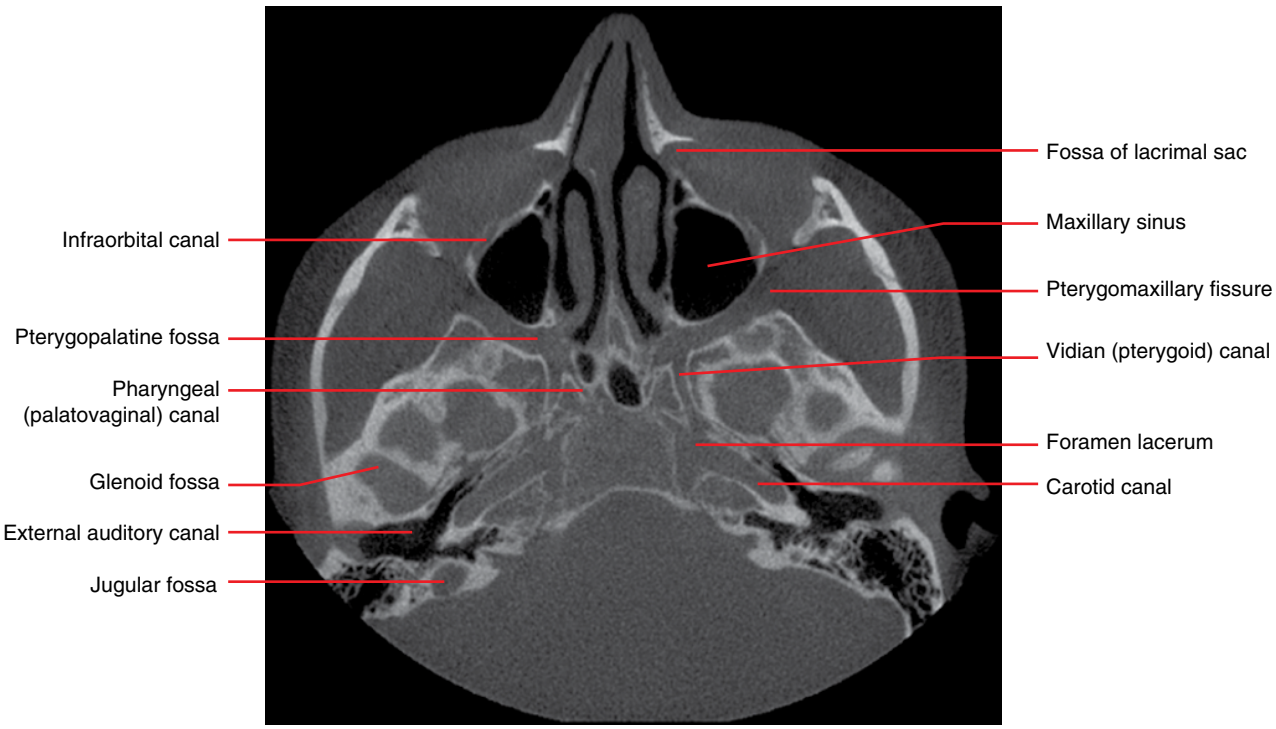

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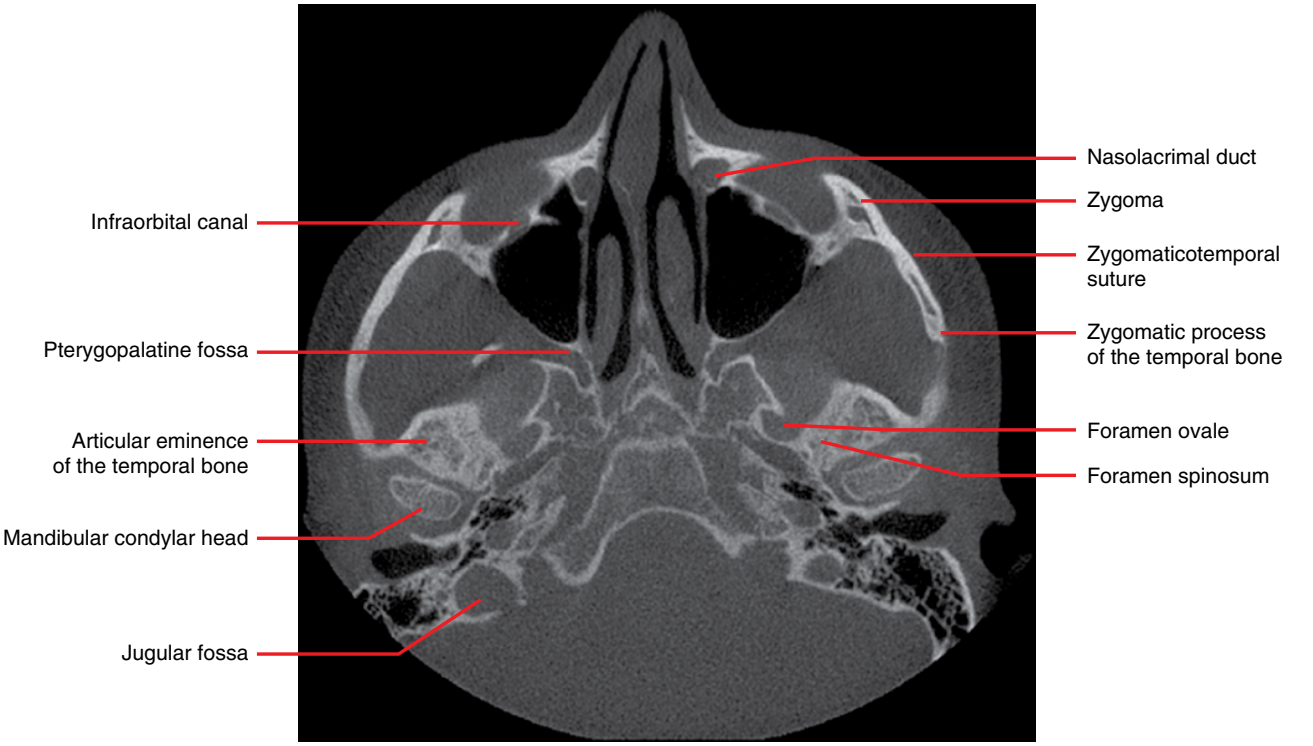

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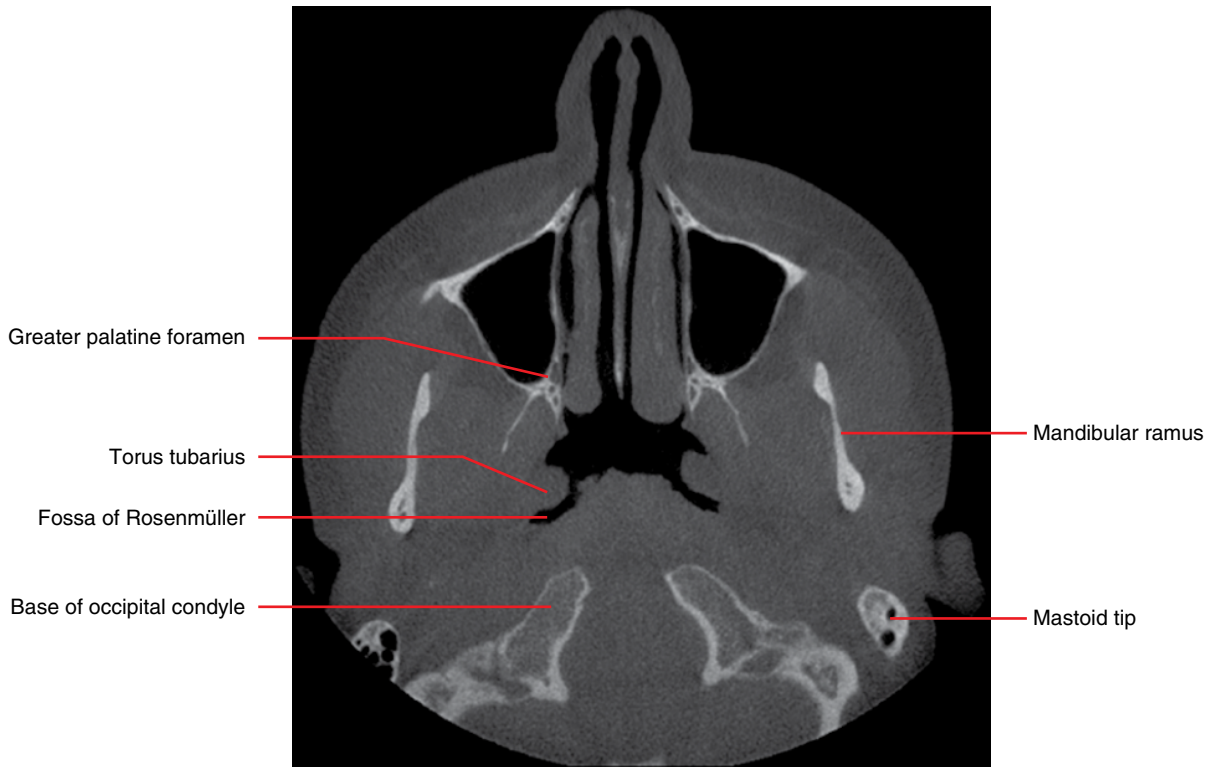
Figure 2.15

Figure 2.16



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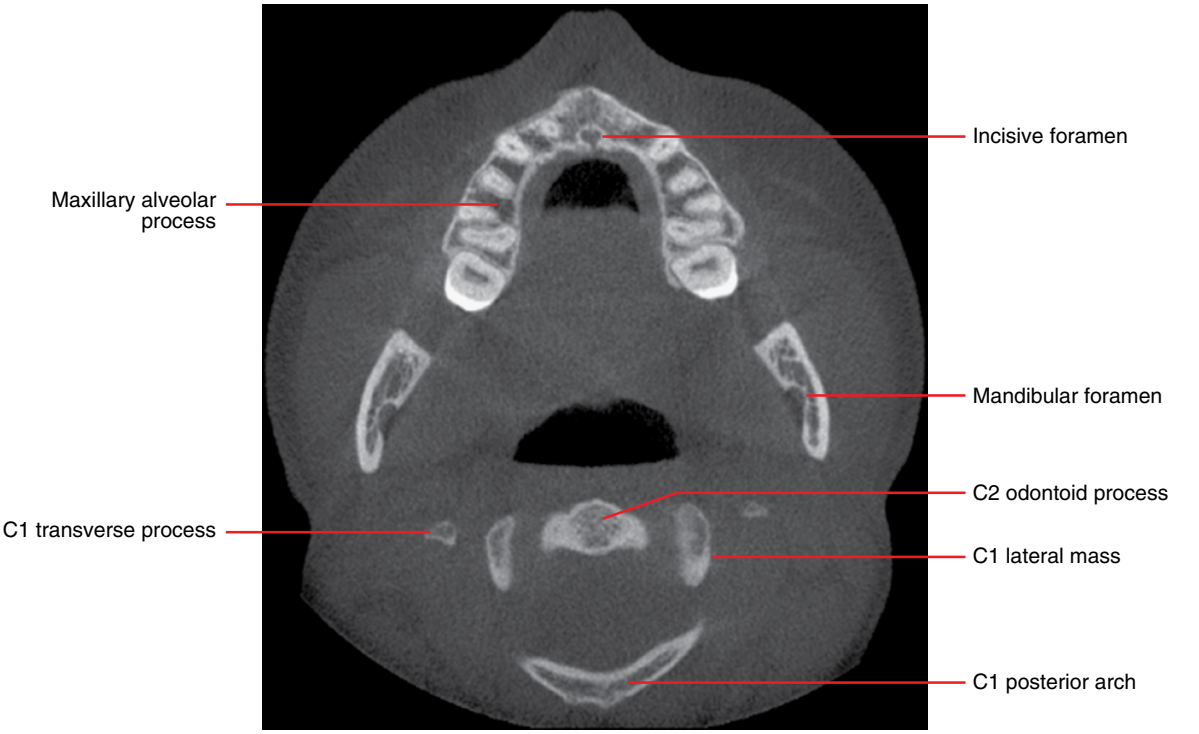

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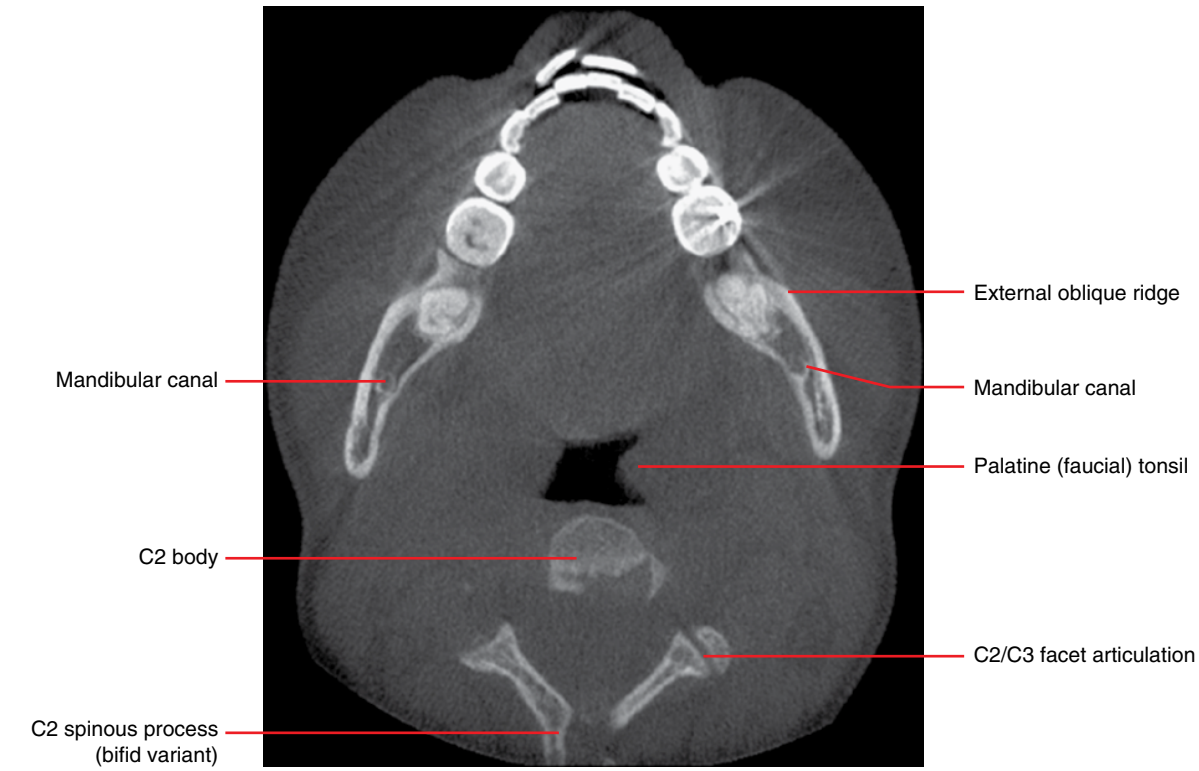

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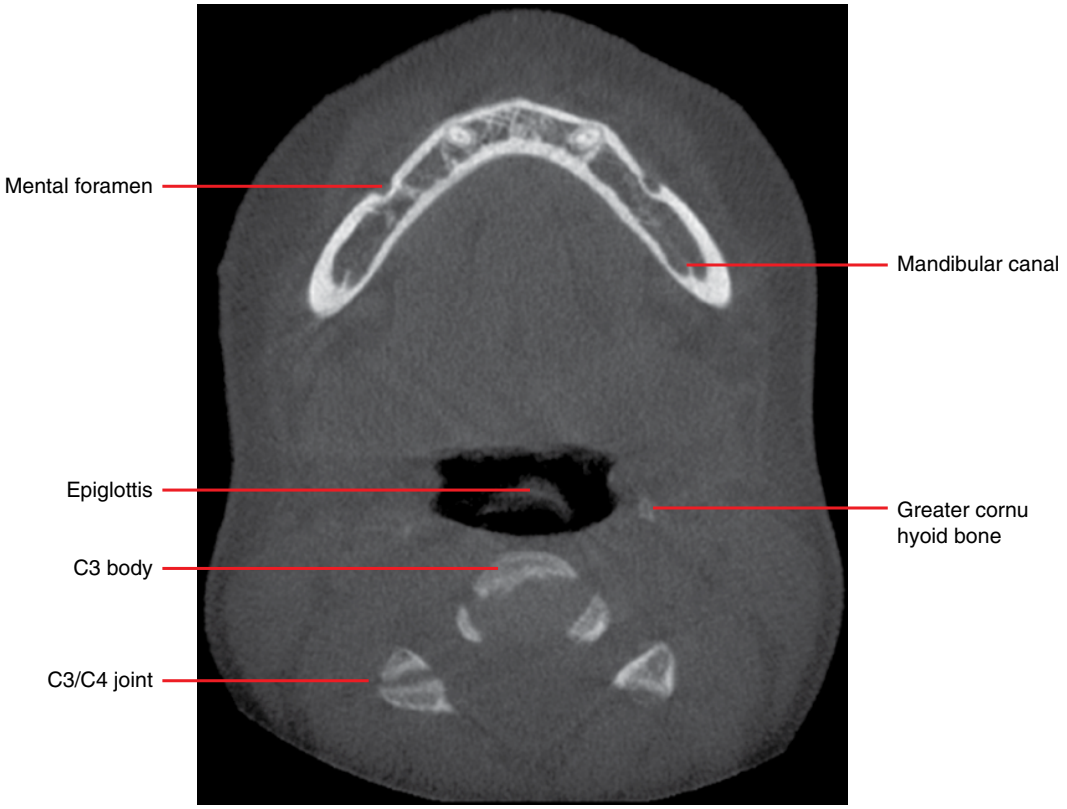

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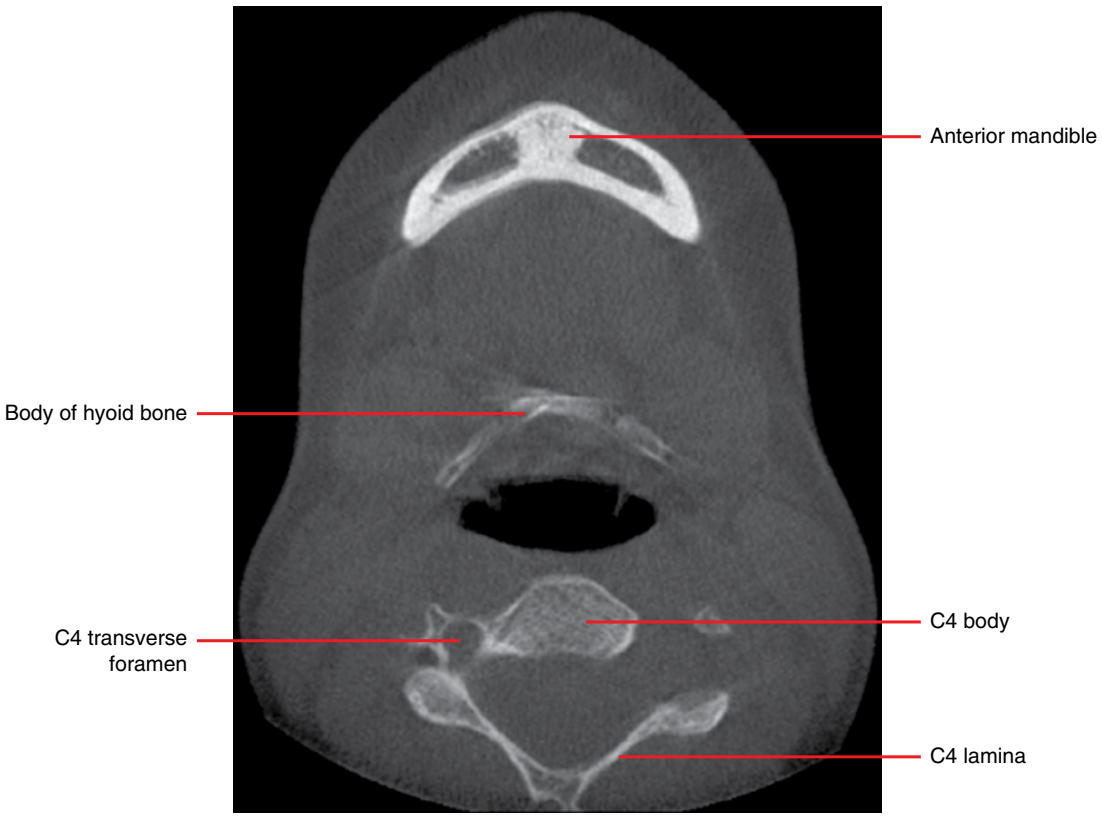
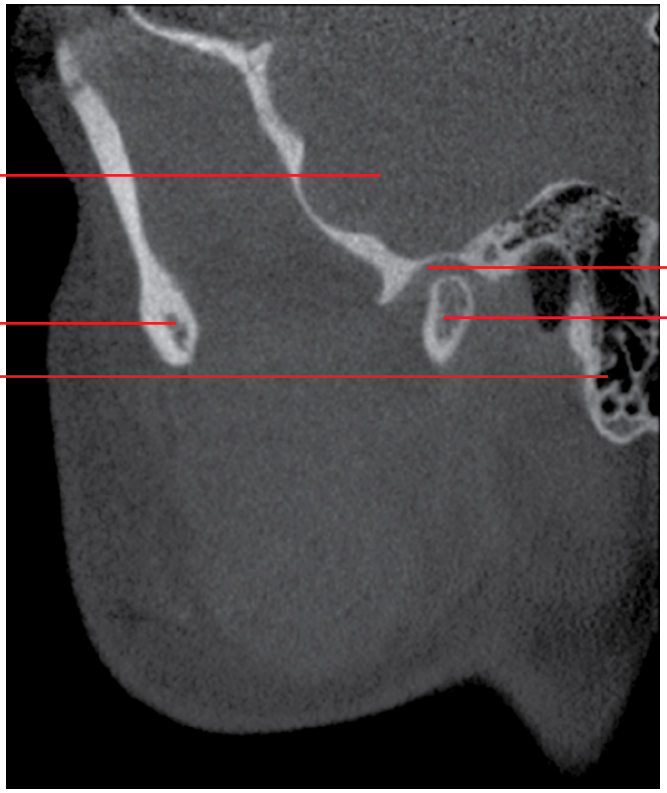


Figure 2.21

Sagittal



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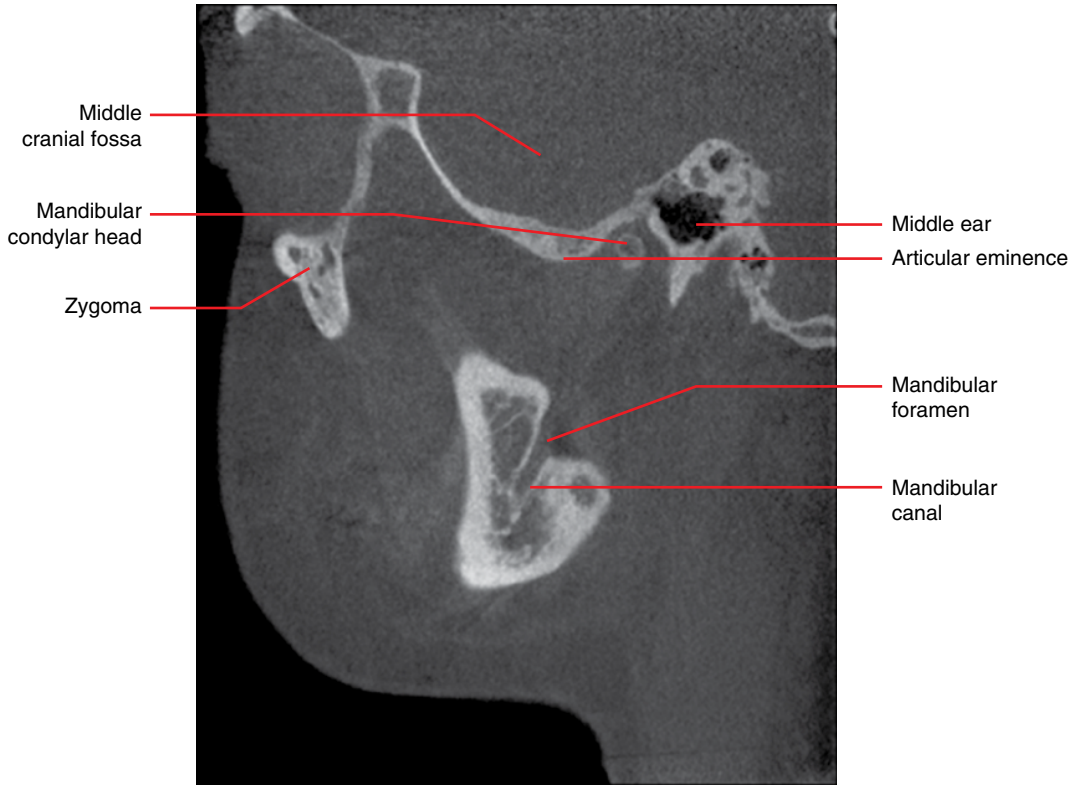

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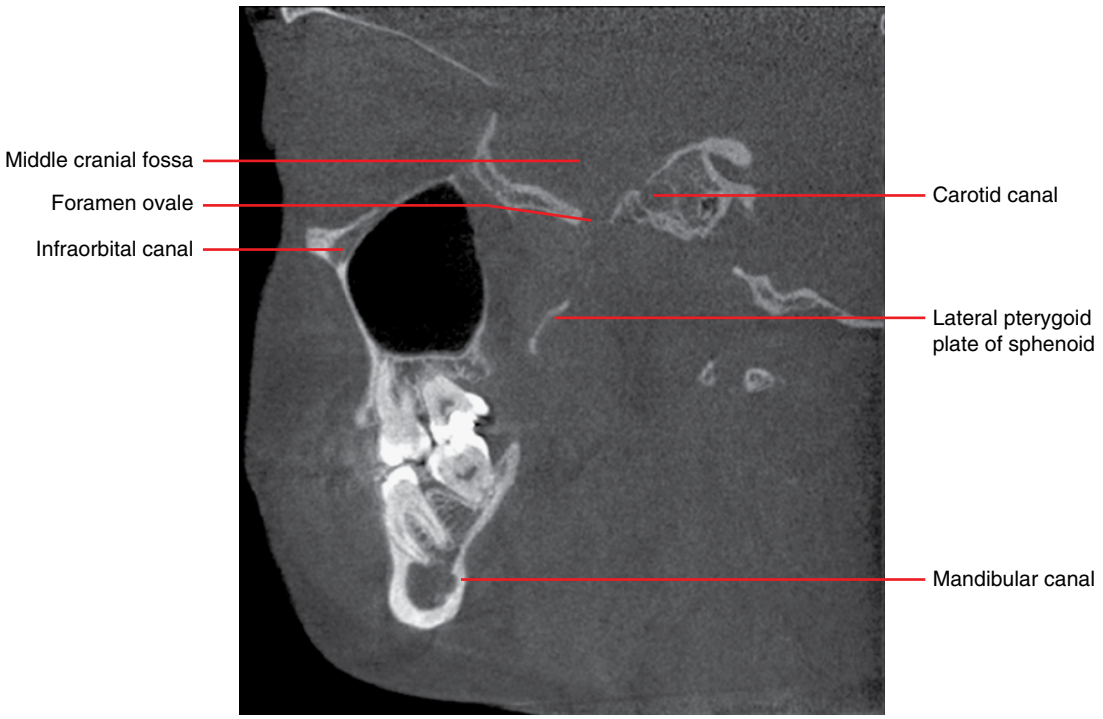

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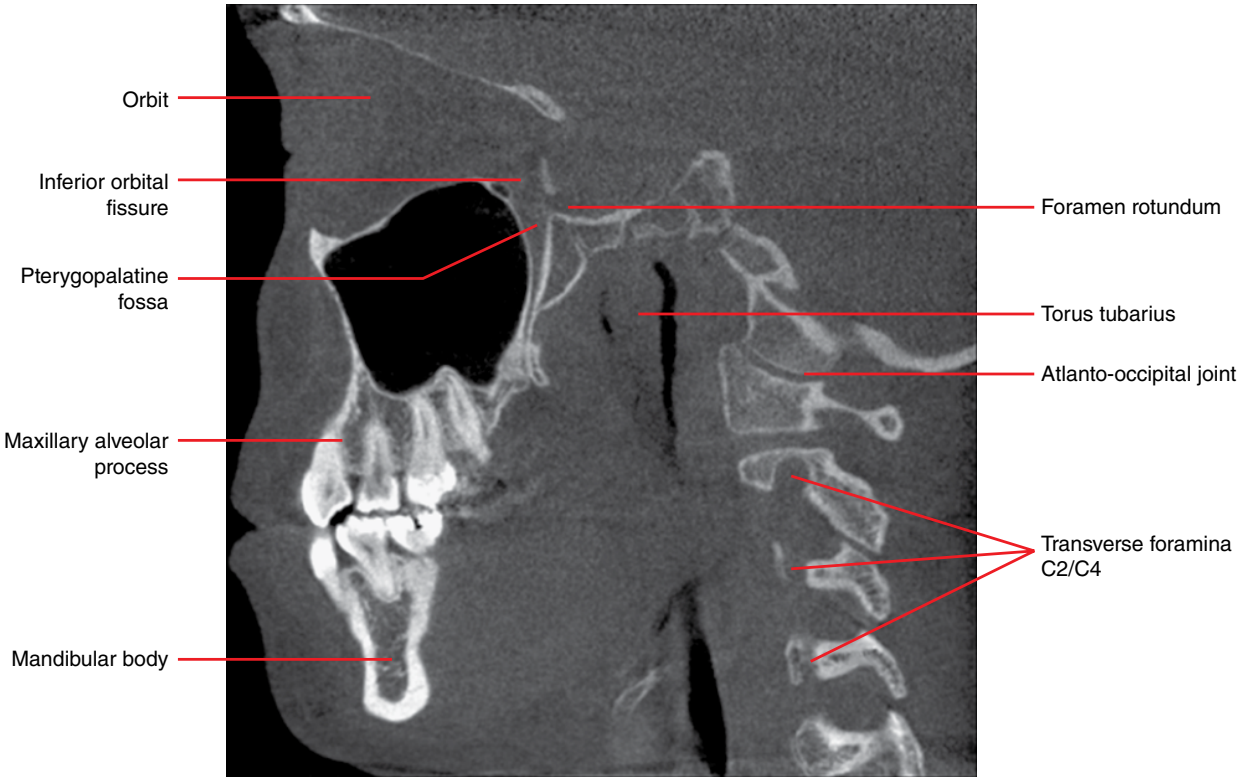

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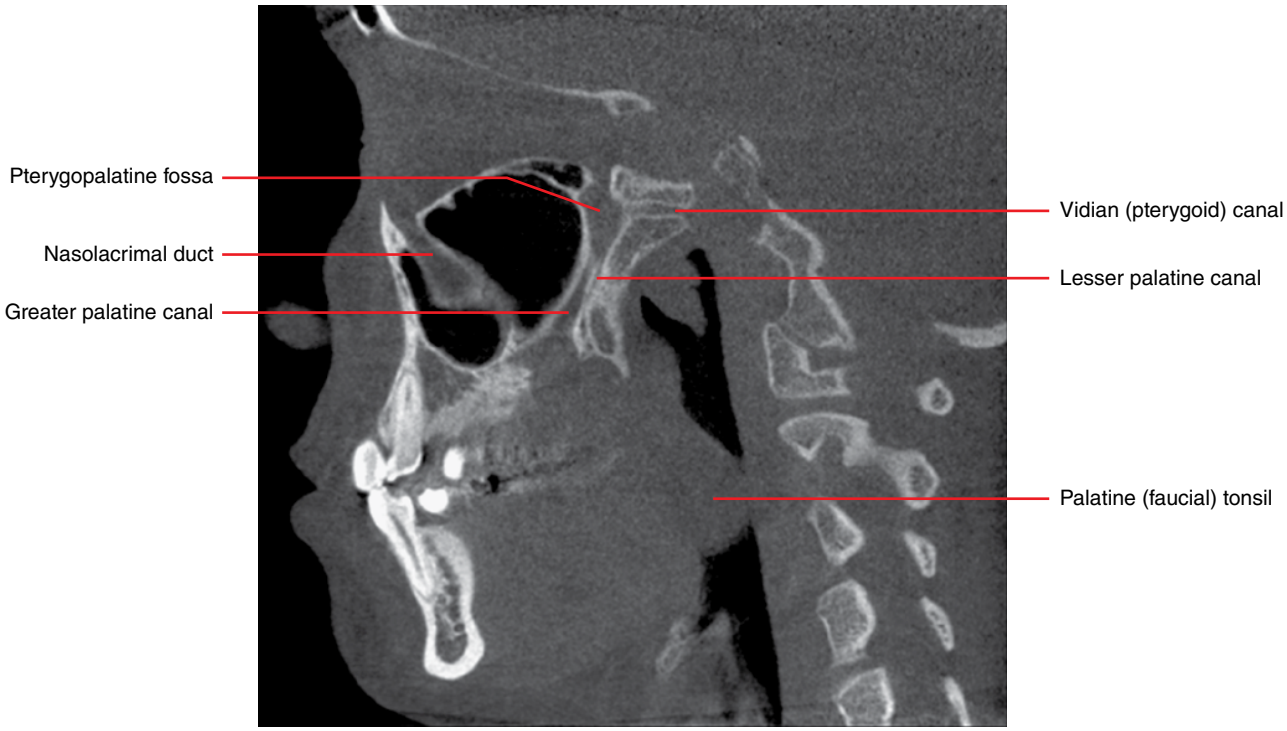

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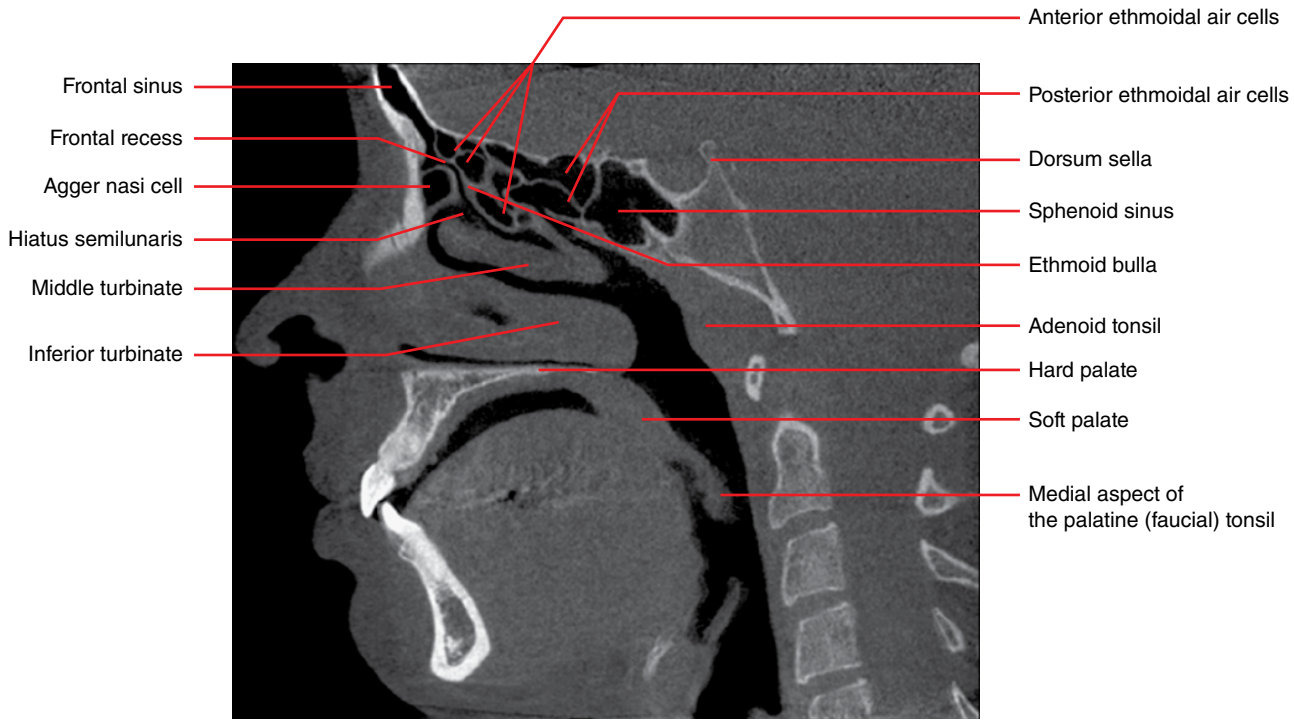

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