Maxilla, Mandible, and Teeth

15

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15.1 Anatomy

Detailed consideration of all craniofacial bones is impossible in a text of this sort, but by focusing on the maxilla and mandible alone, this chapter offers a view of the processes affecting facial bones as a whole and how specimens derived from them might be handled.

The maxilla is the largest bone of the upper facial skeleton and houses the maxillary sinus. It articulates with a large number of other bones, relating to a number of clinically important anatomical areas, including the nasal cavity, the pterygomaxillary space, the infratemporal fossa, and the orbit. It is composed of a body and four processes, namely alveolar, frontal, nasal, and zygomatic processes. The *body of the maxilla* is pyramidal in shape with four surfaces, namely anterior, nasal, orbital, and posterior (or infratemporal) surfaces. The *anterior surface* extends from the alveolar process of the upper anterior teeth below to the infraorbital margin, while the *orbital surface* forms the floor of the orbit. The *nasal surface* articulates with the ethmoid, lacrimal, and palatine bones and the inferior turbinate to complete the lateral nasal and medial orbital walls. The *infratemporal surface* is convex and projects posteriorly and laterally.

The *upper alveolar process* projects from the inferior aspect of the maxilla and contains the sockets of the maxillary teeth. The roots of teeth posterior to the first premolar may be intimately related to the maxillary sinus; teeth and sinus may each become involved in diseases originating in the other. The slightly thickened posterior end of the alveolar process is called the maxillary tuberosity. The *frontal process* projects superiorly between the nasal and lacrimal bones, articulating with the frontal bone and contributing to the medial wall of the nasal cavity. The *palatine process* projects medially from the inferior aspect of the maxilla and forms most of the palatal vault and the nasal floor. The *zygomatic process* is a pyramidal projection from the lateral aspect of the maxilla where anterior, infratemporal, and orbital surfaces converge, articulating with the zygomatic bone.

The mandible is composed of an arched *body*, which runs posteriorly on each side to attach to the flat *ramus*. The body of the mandible has an external surface (buccal or labial plate), an internal surface (lingual plate), an upper border, and a lower border. The *lower border* is rounded and

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well defined, outlining the profile of the lower jaw. The *external surface* bears the mental foramen between the premolar roots. The *internal surface* of the body is indented by the sublingual and submandibular glands. The superior border, more usually referred to as the *lower alveolar ridge*, contains the sockets of the mandibular teeth. The posterior aspect of the body joins the ramus behind the last molar tooth. The anterior surface of the ramus extending from the abrupt change in angulation of the bone is called the *ascending ramus*, while the area around the junction of the body and ramus is called the *angle*. The coronoid process extends upward and slightly forward from the anterosuperior aspect of the ramus and bears the attachment of temporalis. The condylar process extends upward and posteriorly from the posterior aspect of the ramus and bears the knuckle-shaped articulating *condylar head* on the narrow *condylar neck*. The *sigmoid notch* lies between these two processes. Near the centre of the medial surface of the ramus lies the mandibular foramen, where the inferior alveolar branch of the mandibular nerve and its accompanying vessels enter the mandible. The lateral and medial surfaces of the mandible bear several shallow fossae and roughened elevations corresponding to the attachments of muscles both of facial expression and of mastication.

Each fully developed tooth is composed predominantly of dentine. The *crown*, the portion visible within the mouth, is covered by a layer of hard translucent enamel, while a thin layer of bone-like substance called cementum covers the *root* system, which may be single or multiple. The crown and root join at a slight narrowing called the *cervical margin*. The dentine encloses a central cavity called the *pulp canal*; the portion toward the crown is dilated to form the *pulp chamber*, while the pulp canal narrows at the end of the root, the *apex*, into an *apical foramen*. The pulp chamber and canal contain the neurovascular supply to the tooth, passing through the apical foramen. A tooth may have a number of accessory canals which open just short of the apex. The tooth is suspended in the alveolar bone by the periodontal membrane, composed of thick bundles of collagenous tissue running between the cementum and the bone. At the cervical margin, the periodontal ligament merges with the gingival mucosa; a narrow sleeve of epithelium continuous with the gingiva called the *epithelial attachment* surrounds the cervical margin.

The crown of each tooth has five surfaces. The biting surface is called the *occlusal* surface; on incisor teeth, this is termed the incisal edge. The surface closest to the tooth in front is called the *mesial* surface; that closest to the tooth behind is called the *distal* surface. The surface lying closest to the cheek is called the *buccal* surface (or the *labial* surface on anterior teeth); the surface lying closest to the tongue is called the *lingual* surface (or the *palatal* surface on upper teeth). Incisor teeth have a relatively broad crown with a flattened edge for cutting food, while canine teeth have a single point or *cusp*. Premolar teeth have two cusps on the occlusal surface, one buccal and one lingual, while molars have four or five cusps.

There are 20 deciduous (or milk) teeth in the primary dentition—two incisors, a canine, and two molars in each quadrant of the jaw. The teeth of the primary dentition begin their development in the first trimester of pregnancy as epithelial ingrowths from the lining of the oral cavity. The epithelial component of the tooth bud forms the enamel while the mesenchymal element gives rise to the remaining parts of the tooth. The crown of the tooth forms first but the root only forms after the crown is complete; root development is closely linked with eruption into the mouth. The deciduous incisors begin to appear in the mouth at around 6 months of age, usually the central before the lateral, followed by the first deciduous molar at around 12 months. The deciduous canine appears around 18 months and finally the second deciduous molar at around 24 months of age. The precise timing of eruption into the mouth is variable, although the sequence is relatively unchanging and lower teeth tend to appear before the uppers.

There are 32 teeth in the permanent or secondary dentition—two incisors, a canine, two premolars, and three molars in each quadrant of the jaw. There is an ordered pattern of replacement of the deciduous dentition by the permanent dentition. Beginning around 6 years of age, the first

permanent molar erupts distal to the second deciduous molar, soon followed by shedding and replacement of the incisors. The deciduous molars are replaced by the premolars, while the eruption of the permanent canines straddles the eruption of the second permanent molar with the upper canine appearing latest, usually around 13 years of age. The process ends with the eruption of the third permanent molar or *wisdom tooth* around 18 years.

Lymphovascular drainage:

Lymph drainage of the teeth and jawbones corresponds to that of the regional cutaneous and mucosal sites, leading ultimately to the deep cervical chain (see Fig. 20.1).

15.2 Clinical Presentation

The maxilla and mandible are more usually affected by disease arising from closely related structures such as the teeth, oral mucosa, and salivary glands, and, in the case of the maxilla, the maxillary sinus, the orbit or the infratemporal fossa, rather than from primary bone disease. Many of these conditions are described elsewhere; primary diseases of the odontogenic apparatus and jawbones will be considered here.

Disease of the teeth presents as pain, mobility, or swelling, although some conditions are detected as incidental findings at radiographic examination. Caries and periodontal disease are painless until advanced destruction of tissue has occurred. A draining sinus opening onto mucosa or facial skin may accompany dental abscesses but others may present with soft tissue swelling of the face and other signs of spreading infection. Gingival bleeding is often the only sign of chronic marginal periodontal disease until increased tooth mobility or the drainage of pus from between gingiva and tooth occur. Developmental cysts, odontogenic hamartomas, and neoplasms are often painless but may present with bony swelling, facial asymmetry, or a failure of teeth to erupt and normally occur in relationship to the maxillary or mandibular dentoalveolar complex. Discolouration of teeth, rapid wear, or abnormal morphology are features of the hereditary developmental tooth disorders such as dentinogenesis imperfecta or amelogenesis imperfecta; usually all the teeth will be affected.

Primary disease of the jawbones, such as fibrous dysplasia or ossifying fibroma, presents as bony swellings that may or may not involve overlying mucosa or adjacent teeth. Other conditions with a "fibro-osseous" pattern such as cemento-osseous dysplasia, are seen only in the tooth-bearing regions.

Patients with a history of radiotherapy to the jawbones and bisphosphonate medications are prone to developing recalcitrant bone infections (termed *osteoradionecrosis* and *bisphosphonate related osteonecrosis of the jaws* respectively), particularly following tooth extraction.

15.3 Clinical Investigations

- Vitality testing, using the cooling effect of evaporation of ethyl chloride or small electric currents, can assess the health of the pulpal tissues. Tenderness to percussion (TTP) indicates involvement of periodontal tissues. Probing the junction between tooth and gum can assess the depth and extent of periodontal destruction, the presence of bleeding signifying active inflammation. Mobility is assessed in terms of buccolingual and vertical movement and is due to destruction of periodontal support, perhaps as a result of periodontal disease or because of an adjacent cyst or tumour.

Plain radiographs are essential for the assessment of intrabony cystic lesions, particularly to determine the bone–lesion interface (sclerotic and well-defined implies a slow-growing lesion; ill-defined suggests a rapidly growing destructive lesion). Radiographic examination is also vital to determine shape, size, and heterogeneity (unilocular or multilocular), as these can all be clues as to the provenance of the "cyst-like" lesion. CT scanning particularly with 3D reconstruction is useful for large lesions and assessing relationships with adjacent anatomical structures; cone beam CT scanning of jaw bones is widely available in specialist oral surgery practice but have

less utility in large lesions than medical CT. MR imaging has also less utility when investigating lesions confined to bone, but have a role to play in follow-up interval monitoring to reduce exposure to ionizing radiation.

15.4 Pathological Conditions

15.4.1 Non-neoplastic Conditions

Radicular cyst (also known as *apical periodontal cyst, dental cyst)*, *apical granuloma*, and *chronic dental abscess*: These inflammatory lesions form a spectrum of changes related to the apical region of a non-vital tooth (usually a consequence of dental caries), with considerable overlap in clinical, radiological, and pathological findings. Granulomas tend to be smaller (<10 mm), are well defined but do not tend to have a corticated margin. They have a sparser inflammatory cell infiltrate, and show less active inflammation than radicular cysts. Very large radiolucencies tend to be cysts rather than abscesses, although they too can become infected. Very common, over 70% of jaw cysts with 60% occurring in the maxilla; all ages but rare in children and with deciduous teeth. Arise when the contents of the necrotic pulp canal leak out of the apical foramina and stimulate an inflammatory reaction at the apex. The persistent inflammatory stimulus induces granulation tissue formation to help wall off the necrotic debris. Epithelial rests around the root (cell rests of Malassez) proliferate, initially as complex strands and arcades, then as a well-defined lining; when present, the epithelium allows the term *radicular cyst* to be used. Cysts enlarge by a hydrostatic mechanism—the high protein content of the inflammatory exudate in the lumen draws water into the cyst while the lack of lymphatics in the wall prevents it draining away—producing a rounded radiolucency usually with a sclerotic border. May resorb the apical portion of the tooth. Most are located apically but 10% are seen in lateral relationship (accessory apical foramina). Treatment usually involves endodontic therapy (root canal treatment), apicectomy (removing the apical 2 mm of the tooth root via a surgical approach and sealing off the pulp canal), or removal of the tooth. Recurrence is uncommon but relates to a failure to control the contents of the pulp canal.

Dentigerous cyst (follicular cyst): A developmental cyst that surrounds the crown of an unerupted tooth and is attached at the cervical region. Common, 15% of jaw cysts; often in younger patients but not exclusively; usually seen in the upper canine, lower second premolar and third molar regions. Well-defined radiolucency, unilocular in form with a sclerotic border surrounding the crown of an unerupted tooth (so-called dentigerous relationship). May resorb roots of adjacent teeth. Develops from the dental follicle surrounding the crown of the unerupted tooth but through an unknown mechanism. Enlargement is by hydrostatic mechanisms but what generates the forces is not clear. Has a thin fibrous wall (unless subject to infection), minimal inflammatory cell infiltrate (if any), and a thin lining of stratified squamous epithelium. Treatment requires removal of the unerupted tooth, the cyst being delivered at the same time. Recurrence is rare.

Odontogenic keratocyst: A developmental cyst characterized by a distinctive lining of keratinizing stratified squamous epithelium and a marked tendency for recurrence. Common, about 10% of jaw cysts; all ages, any site (but especially near angle of mandible). Well-defined radiolucency, often multilocular in form with a sclerotic border, which may be in dentigerous relationship. Anteroposterior dimension is greater than vertical dimension reflecting the pattern of growth through pathways of least resistance, a combination of epithelial proliferation as well as luminal keratin/fluid accumulation, may resorb roots of adjacent teeth. Histology shows a thin lining of highly organized keratinizing stratified squamous epithelium, which has a prominent palisaded basal layer. Daughter cysts within the wall are common. Derived from primordial dental structures, the epithelium has an active growth potential of its own, unlike that of radicular cysts and dentigerous cysts. This infiltrative growth pattern produces a multilocular radiolucency, in contrast to the ovoid or circular unilocular lesion of expansile cysts like the radicular cyst. Recurrences (20%) are due to small

pieces of lining and/or daughter cysts that remain following curettage. Large cysts are treated by marsupialization and packing; over time, the cyst shrinks in size and may disappear completely.

A small proportion of patients with keratocysts, particularly those aged under 18 years, have Gorlin's syndrome (many stigmata, including multiple synchronous and metachronous keratocysts, skeletal abnormalities especially of skull form, ribs and vertebrae, multiple basal cell carcinomas).

Other cysts: A large variety of cysts can occur in the jaws. Some will be developmental cysts unrelated to teeth (nasopalatine duct cyst, nasolabial cyst, dermoid cyst), others will be associated intimately with the odontogenic apparatus and will be developmental (lateral periodontal cyst, gingival cyst of adults, glandular odontogenic cyst) or inflammatory in nature (paradental cyst). In addition, samples from a periodontal pocket or inflamed dental follicle can mimic cystic lesions. Of these only the glandular odontogenic cyst is likely to recur because of the presence of daughter cysts in its wall.

15.4.2 Neoplastic Conditions

Odontogenic neoplasms and hamartomas provide a bewildering array of complex histological patterns although they are relatively uncommon clinical problems. Classification is based on resemblance to normal tooth formation. Most are benign or self-limiting and can be managed in a similar semiconservative fashion. Of the many different types, only ameloblastoma and odontome are common.

Ameloblastoma: The commonest odontogenic neoplasm, accounting for 1% of all jaw tumour. Usually found in the mandible, especially near the angle (60%), although up to 20% arise in the maxilla. Peak in fourth and fifth decades, but all ages can be affected. Radiographically usually but not exclusively multilocular, often in dentigerous relationship with erosion of the lingual cortex or lower border is a characteristic sign; roots can also be resorbed.

The tumour may be solid, cystic, or microcystic; in solid areas the histology is characteristic but can be very subtle in more cystic areas. Peripheral tall columnar ameloblast-like cells with polarized hyperchromatic oval nuclei and clear cytoplasm ("piano keyboard") surrounding more centrally placed cells resembling stellate reticulum. The tumour grows by epithelial proliferation and infiltrates along the soft tissues between bone trabeculae, usually extending far beyond the radiographic margins. Recurrence is inevitable if not resected completely. Multiple recurrences run the risk of soft tissue involvement (especially into the parapharyngeal spaces) and dissemination of tumour into lungs and lymph nodes.

There are many different histological subtypes: follicular, plexiform, acanthomatous, desmoplastic, granular cell, etc., which probably have no real clinical significance. Two variants have a better prognosis—the unicystic ameloblastoma and the extraosseous ameloblastoma.

Unicystic ameloblastoma: Younger patients (teens/early twenties), predominantly in the lower third molar region associated with an unerupted tooth in dentigerous relationship. A single large cystic cavity is lined by epithelium that is not always typical of ameloblastoma; sometimes, there is epithelial proliferation into the wall or as a luminal polyp. On account of the subtle character of the epithelium, diagnosis is easily missed. Fortunately, this type of ameloblastoma usually responds to thorough curettage or marsupialization and does not always require resection.

Extraosseous ameloblastoma: Less than 5% of ameloblastomas and arise in gingival soft tissue alone without bone involvement where they may resemble a fibrous epulis. Histologically fairly typical of ameloblastoma, less radical surgery is required than their intraosseous cousins; nevertheless, cortical bone may have to be removed from the deep aspect of the tumour to ensure clearance.

Odontome: Hamartomatous malformation forming distinct tooth-like structures (*compound*), disorganized masses of dentine, enamel, cementum (*complex*), or any combination of the two forms. Commonly identified as incidental findings in teenagers or young adults. Most are small, are related to the permanent dentition, and are

discovered accidentally when an unerupted tooth is being investigated; larger ones may produce bony expansion. X-rays show dense radiopaque masses surrounded by a well-defined radiolucent zone; lesions in younger patients may have large radiolucent portions. Complex odontomes are seen most often in the posterior segments; compound odontomes in the anterior segments (especially maxilla). Multiple odontomes suggest Gardner's syndrome. Histologically they are composed predominantly of dentine with varying amounts of enamel, cementum, and other soft tissue components typical of the odontogenic apparatus. Less well-developed forms have abundant pulpal and ameloblastic areas and can resemble other types of odontogenic tumour (e.g., ameloblastic fibroma, ameloblastic fibro-odontoma), while odontomes may be associated with other odontogenic tumours such as the calcifying odontogenic cyst.

Other rarer benign tumours or hamartomatous lesions include calcifying epithelial odontogenic tumour (of Pindborg), adenomatoid odontogenic tumour, calcifying cystic odontogenic tumour, ameloblastic fibroma, odontogenic fibromyxoma, cementoblastoma. Many will display speckled calcification on X-ray, differentiating them from cysts.

Malignant tumours: Involvement of the jawbones by malignant tumour is usually a consequence of direct spread into the bone from mucosal or salivary lesions, although a number of primary bone and soft tissue sarcomas can arise in the jaws. Malignant tumours of the odontogenic apparatus are rare and are usually only diagnosed histologically, although pain, paresthesia, rapid growth, mucosal fixation, or ulceration may be present. Radiographs may show irregular bone destruction.

They include malignant ameloblastoma/ameloblastic carcinoma, clear cell odontogenic carcinoma, carcinoma arising in an odontogenic cyst (any type of odontogenic cyst and usually squamous cell carcinoma), primary intra-osseous carcinoma, and odontogenic sarcomas, the latter being very rare. Overall they tend to be low-grade malignancies, although uncontrolled local tumour growth, recurrences, and metastasis complicate some cases.

15.5 Surgical Pathology Specimens: Clinical Aspects

15.5.1 Biopsy Specimens

The vast majority of teeth are removed because of dental caries or periodontal disease and are not submitted for histological examination unless there are unusual clinical or radiological findings. Teeth adjacent to cystic lesions are removed either as part of the treatment for the lesion (e.g., the unerupted tooth associated with a dentigerous cyst) or because they cannot be restored to useful function (e.g., a tooth whose roots have been extensively resorbed by a keratocyst). Where a primary neoplastic lesion is suspected, teeth may be removed to provide access to underlying lesional tissue via the socket. Teeth may be submitted whole or as fragments; deeply buried unerupted teeth are most likely to be divided by the surgeon prior to removal.

Apicectomy is the removal of a short portion of the tooth root apex to control persistent periapical infection not responsive to nonsurgical endodontic procedures. A flap of mucosa and associated periosteum is reflected to expose the area, the apical portion of the tooth is removed with a drill, and the pulp canal opening sealed following appropriate preparation. Soft tissues associated with periapical infection are removed en passant; most will represent a radicular cyst, apical granuloma, or chronic dental abscess. Other benign-looking odontogenic lesions, such as small cysts or odontomes, will be accessed in a similar fashion, shelled out, and the cavity curetted. The resulting specimens are usually submitted in total. Very large cystic lesions tend to be marsupialized rather than removed in total because of the risk of fracture or iatrogenic injury to nerves. A portion of the lining will be sampled, primarily to detect ameloblastoma, which requires more radical surgery than a keratocyst.

The close proximity of important anatomical structures in the jaws means that biopsy samples of primary bone lesions tend to be small. Benign-looking lesions will be removed in total, often as fragments, while suspected malignancies will be sampled to avoid compromising later definitive surgery. Accurate histological assessment often

requires demonstration of the interface with normal bone so, in the mandible in particular, it is important to avoid sampling only the cortical bone. Access to lesional tissue is achieved either by reflecting a mucoperiosteal flap or extracting teeth in the region and using the sockets to expose the lesion. Biopsies are taken either as curettings or intact pieces removed with a drill or trephine.

15.5.2 Resection Specimens

Resection specimens of maxilla for neoplastic processes include maxillary alveolectomy, palatal fenestration (also known as partial maxillectomy), maxillectomy (also known as hemimaxillectomy), and radical maxillectomy (also known as extended maxillectomy). *Maxillary alveolectomy* is indicated when a small tumour of the alveolar mucosa encroaches on or invades for a short distance into the bone. The resection lies within the alveolar process and does not involve the maxillary sinus. *Palatal fenestration* is performed for relatively localized tumours of the upper alveolar mucosa or floor of the maxillary sinus. The specimen comprises a portion of unilateral maxillary alveolar bone and alveolar mucosa, the opposing mucosa on the floor of maxillary sinus with a minimum of the medial and lateral sinus walls. Tissue from the upper buccal sulcus and a portion of the palatal vault may be included. *Maxillectomy* is indicated for larger tumours of the maxillary sinus and mouth that involve all or part of the maxillary sinus. There are a number of modifications, but the specimen includes all of the maxillary alveolar bone from the midline to the tuberosity; bone from the lateral and medial walls of the maxillary sinus are included at least to the level of the zygomatic buttress. The orbital floor may be included or left intact. *Radical maxillectomy* is indicated for tumours extending beyond the confines of the maxillary sinus into adjacent sites. The specimen includes the orbital floor, orbital contents, or pterygoid plates and muscles with the maxillectomy.

Resection specimens of mandible for neoplastic processes include rim resection (also known as marginal mandibulectomy) and hemimandibulectomy (also known as segmental mandibulectomy). *Rim resection* is performed for tumours of the lower alveolus or floor of mouth mucosa where there is minimal invasion of bone. If teeth are present, the line of excision passes below their apices, often including the inferior alveolar canal. If the ascending ramus is involved, the excision line may include the coronoid process.

Hemimandibulectomy is indicated for extension of mucosal tumour into the cancellous bone of the body of the mandible either from the alveolar aspect or from the buccal or lingual cortical plates such that preservation of sufficient bone at the lower border to prevent stress fracture cannot be achieved. Reconstruction is facilitated by preserving as much bone as possible, consistent with clearance. However, if there is a risk of perineural spread of tumour within the mandible, a block of bone containing the entire inferior alveolar canal is excised from lingula to mental foramen. Ameloblastomas and other locally aggressive odontogenic tumours in the mandible usually require hemimandibulectomy.

15.6 Surgical Pathology Specimens: Laboratory Aspects

15.6.1 Biopsy Specimens

15.6.1.1 Teeth

Should be received in formalin. Identify tooth (e.g., upper left second premolar or lower right second deciduous molar). Note the presence of caries or restoration, root resorption, or attached soft tissue. Sample the soft tissue and process in the usual manner.

For an intrinsic developmental disorder of dental hard tissue (e.g., dentinogenesis imperfecta), submit for preparation an undemineralized 50-micron slice through the buccolingual plane of the tooth.

If no such intrinsic abnormality is suspected, decalcify in 5% formic acid. Endpoint can be tested radiographically or with ammonia water. Stronger acids can be used although close attention must be paid to detecting the endpoint. When negative, bisect molars in the mesio-distal plane; others in the buccolingual plane. Demineralize

further briefly (2 or 3 days), then process and embed as normal. Sections should demonstrate pulpal tissue in pulp chamber and root canal as well as the interface between pulp and dentine.

15.6.1.2 Jaw Cysts

Usually as fragments free-floating in formalin; record number of pieces and dimensions of largest. Submit small specimens in total; if large, submit representative slices.

NB: Small pieces of tooth root and/or bone are frequently included. Test carefully; specimens with hard tissue tend to sink quickly in the fixative.

15.6.1.3 Jaw Bone Biopsies

Usually as fragments in formalin; record number of pieces and dimensions of largest. If small, submit in total for decalcification; otherwise submit representative samples.

15.6.2 Resection Specimens

Most maxillary and mandibular resections are for tumour arising in adjacent structures, although some will be for bone or odontogenic lesions or reactive conditions, such as osteoradionecrosis. Rim resections of alveolar bone will usually be accompanied by definitive resection of a mucosal tumour.

15.6.2.1 Hemimandibulectomy and Maxillectomy Specimens

Procedure:

Radiographs of the specimen can help delineate the lesion.

Ink only the critical external periosteal limit and associated soft tissue limits around the tumour, usually posteriorly and superiorly in the maxilla.

Measurements:

- Anteroposterior length (cm) along lower border (hemimandibulectomy) or along alveolar process to tuberosity (maxillectomy)
- Maximum bone height (cm) of ramus (hemimandibulectomy) or of nasal aspect (maxillectomy)
- Associated soft tissue elements (e.g., oral mucosa, pterygoid muscles, orbital contents)
- Tumour maximum dimensions (cm)
- Distance to closest mucosal and deep soft tissue limits (cm)
- Distance to nearest anterior or posterior bone limit (cm)

Sample the mucosal and deep surgical margins as "radial" sections before sawing the bone and submit separately (reduces contamination of the margins). Cut with a sharp blade firmly down to bone and use a flat blunt instrument to dissect mucoperiosteum free from the bone in the way one might peel an orange.

Sample soft tissue elements of mucosal tumour prior to sawing the bone unless the tumour is very small (see next section).

Saw the bone into 0.5 cm slices in buccolingual plane (vertical plane passing between crowns of adjacent teeth).

15.6.2.2 Rim Resections of Alveolus

Procedure:

Ink the external periosteal limit along one aspect to aid orientation of subsequent histological sections.

Measurements:

- Anteroposterior length (cm) along alveolus
- Maximum bone height (cm)
- Associated soft tissue elements (e.g., mucosa) in the usual fashion

Saw the bone into 0.5 cm slices in the buccolingual plane (vertical plane passing between crowns of adjacent teeth). If the attached mucosal tumour is larger than 1 cm diameter, sample tumour and margins in the usual fashion prior to sawing the bone.

If the attached mucosal tumour is smaller than 1 cm diameter, saw the bone into 0.5 cm slices in the buccolingual plane (vertical plane passing between crowns of adjacent teeth) without disturbing the soft tissue.

Description:

Tumour—solid, cystic, or both solid and cystic
- Circumscribed or infiltrative

Arising in bone or extension from adjacent structures
Adjacent bone
– Periosteal reaction? Osteomyelitis?
Mucosa
– Origin of tumour or secondarily involved?
Other
– Associated soft tissue elements (e.g., oral mucosa) in the usual fashion

Blocks for Histology:

The histology should represent the tumour, its deepest extent, the relationship to the bony, mucosal and deep soft tissue margins, and changes in adjacent tissues (Figs. 15.1 and 15.2).

At least one block of tumour per centimetre diameter.
Abnormal areas of distant bone or mucosa.
Anterior and posterior surgical bone margins as transverse sections.
Mucosal and deep soft tissue and neurovascular surgical margins.

If other specimens are attached as an "in-continuity dissection" (e.g., mucosa, skin, lymph nodes), these can be cut separately in the usual fashion.

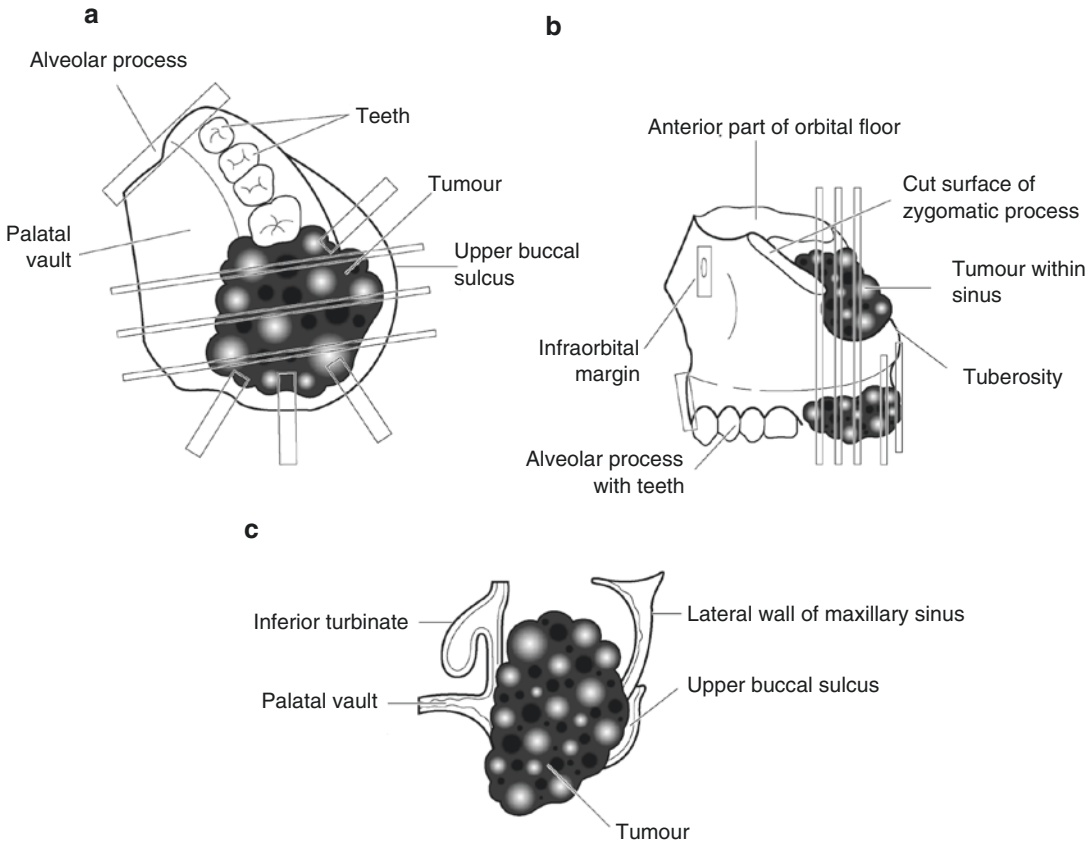

Fig. 15.1 Left maxillectomy specimen for carcinoma. Suggested siting and orientation of tissue blocks for maxillectomy specimens. (**a**) View of palatal aspect; (**b**) view from lateral aspect; (**c**) view of transverse cut surface (Reproduced, with permission, from Allen and Cameron (2013))

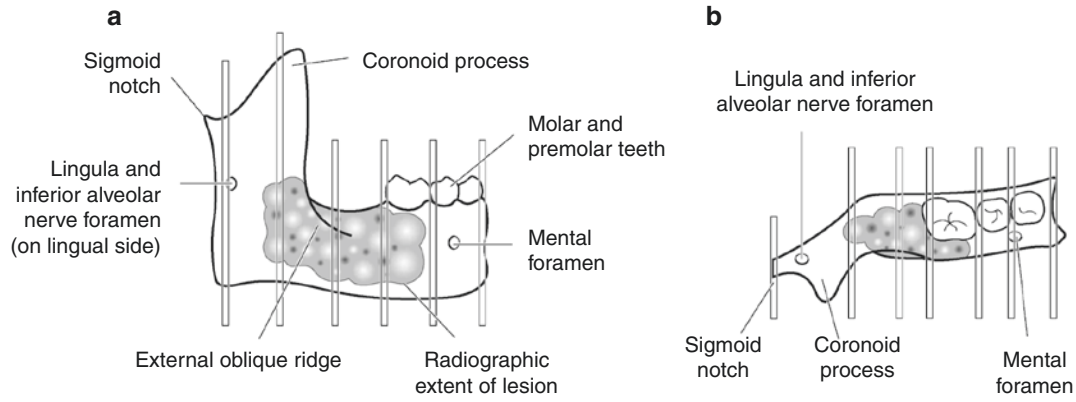

Fig. 15.2 Right hemimandibulectomy for ameloblastoma. Suggested siting and orientation of tissue blocks for hemimandibulectomy for ameloblastoma or other intrabony tumour. (**a**) View from lateral aspect; (**b**) view from above (Reproduced, with permission, from Allen and Cameron (2013))

Histopathology Report:

Final jawbone resection reports should include details on:

- Specimen type
- Type of tumour present (and grade, if relevant)
- Extent of spread
- Distance of tumour from the nearest cutaneous/mucosal margin
- Distance of tumour from the nearest deep soft tissue margin
- Distance of tumour from the nearest bone margin

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