MONOGRAPH

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I. NORMAL RADIOGRAPHIC ANATOMY

A. INTRAORAL ANATOMIC LANDMARKS

Reference: White and Pharoah, pages 169-193

lamina dura
alveolar crest
periodontal ligament space
cancellous bone
intermaxillary suture
anterior nasal spine
nasal fossa
incisive foramen
superior foramina of nasopalatine canal
lateral fossa
soft tissue of nose
nasolacrimal canal
maxillary sinus
zygomatic process and zygomatic bone
nasolabial fold
pterygoid plates
symphysis of mandible
genial tubercles
mental ridge
mental fossa
mental foramen
mandibular canal
nutrient canals and foramina
mylohyoid ridge (internal oblique ridge)
submandibular fossa
external oblique ridge
coronoid process
hamular process

B. BASIC BONE LANDMARKS (as seen on panoramic radiographs)

Reference: Langland, Langlais, McDavid and DelBalso, pages 197-223.

condyle
sigmoid notch
articular eminence
glenoid fossa
zygomatic arch
maxillary sinus, walls and floor
hard palate
anterior nasal spine
orbital floor and lateral wall
external oblique ridge
mental ridge
genial tubercles
styloid process
infraorbital foramen
infraorbital canal

lingual foramen
mental foramen
mandibular canal
mandibular foramen
hyoid bone
mastoid bone
incisive foramen
lateral pterygoid plate
maxillary tuberosity
panoramic innominate line

C. SOFT TISSUE SHADOWS AND AIR SPACES (as seen on panoramic radiographs)
Reference: Langland, Langlais, McDavid and DelBalso, pages 197-223.

tip of nose
dorsum of tongue
border of soft palate
oral pharynx
nasopharynx
nasolabial fold
upper and lower lip
commissure
ear lobe
mucosal lining of nasal conchae
common nasal meatus
ethmoid sinus
frontal sinus
maxillary sinus

II. LESIONS THAT AFFECT THE JAWS WITH SOME FREQUENCY (BY CATEGORY)

A. ODONTOGENIC CYSTS

Primordial cyst

Dentigerous cyst
1. eruption cysts

Periodontal cyst
1. apical
2. lateral

Gingival cyst
1. newborn (dental lamina cyst)
2. adult

Odontogenic keratocyst
1. Basal cell nevus syndrome

Keratinizing and calcifying odontogenic cyst (Gorlin cyst)

B. ODONTOGENIC TUMORS

Ectodermal origin
1. Ameloblastoma
2. Calcifying epithelial odontogenic tumor (Pindborg tumor)
3. Odontogenic adenomatoid tumor

Mesodermal origin
1. Central odontogenic fibroma
2. Odontogenic myxoma

Mixed origin (epithelial and mesodermal)
1. Ameloblastic fibroma
2. Ameloblastic odontoma
3. Ameloblastic fibro-odontoma
4. Odontoma

Malignant variants of some odontogenic tumors and cysts have been reported. These include:

Ameloblastic carcinoma
Malignant Pindborg tumor
Ameloblastic fibrosarcoma (ameloblastic sarcoma)
Primary intra-alveolar carcinoma
Malignant Gorlin cyst
Malignant transformation of lining of dentigerous cysts (both carcinoma and mucoepidermoid carcinoma)

C. CEMENTAL LESIONS OF THE JAWS*

Periapical cemental dysplasia (cementoma)
Benign cementoblastoma
Cementifying fibroma
Sclerotic cemental masses (florid osseous dysplasia, chronic diffuse sclerosing osteomyelitis)

* (some people prefer to classify the cemental lesions as odontogenic tumors, whereas others classify them as fibro-osseous lesions of the jaws)

D. FISSURAL (DEVELOPMENTAL) CYSTS OF THE JAWS

Nasopalatine duct cyst (incisive canal cyst, median anterior maxillary)
Median palatal cyst
Globulomaxillary cyst
Median mandibular cyst
Nasoalveolar cyst (nasolabial cyst)

E. FIBRO-OSSEOUS LESIONS, TUMORS AND DISEASES

Tori and exostoses
Condensing osteitis
Osteosclerosis

Enostosis
Bone scar
Fibrous healing defect
Osteoporotic bone marrow defect
Osteoma (multiple osteomas may be associated with Gardner's Syndrome)
Osteoid osteoma
Osteoblastoma
Cementoblastoma
Periapical cemental dysplasia
Cementifying fibroma
Ossifying fibroma
Fibrous dysplasia (monostotic or polystotic)
Cherubism
Central giant cell lesion
Aneurysmal bone cyst
Osteomyelitis (specific infectious lesions)
Garre's osteomyelitis
Chronic diffuse sclerosing osteomyelitis (sclerotic cemental masses, multiple enostosis, florid osseous dysplasia, gigantiform cementomas)
Paget's disease
Osteopetrosis
Hyperparathyroidism

F. MALIGNANCIES OF THE JAWS

1. PRIMARY
   a. Osteogenic sarcoma
   b. Chondrogenic sarcoma
   c. Fibrosarcoma
   d. Ewing's sarcoma
   e. Primary intra-alveolar carcinoma
   f. Carcinoma arising in the lining of odontogenic cysts
   g. Mucoepidermoid carcinoma arising in the lining of odontogenic cysts
   h. Ameloblastic fibrosarcoma (odontogenic sarcoma)
   i. Malignant lymphoma*
   j. Burkitt's lymphoma
   k. Multiple myeloma*

   *may arise as primary tumors of the jaws or may secondarily affect the jaws with widespread disease elsewhere

2. SECONDARY (METASTATIC)

   Metastatic disease to the jaws constitutes the most common malignant process of the jaws. The primary site may be quite varied, but frequently will be:
   a. lung
   b. prostate
   c. breast
   d. gastrointestinal
   e. kidney

III. RADIOGRAPHICALLY DESCRIPTIVE CATEGORIES FOR DIFFERENTIAL DIAGNOSIS

A. Periapical Radiolucencies (pg. 252)
Periapical Abscess
Periapical Granuloma
Periapical Cyst
Periapical Cementoosseous Dysplasia (stage 1)
Fibrous Healing Defect (Apical Scar)

B. Pericoronal Radiolucencies (pg. 280)

Follicular Space

Dentigerous (Follicular) Cyst
1. Ameloblastoma
2. Squamous Cell Carcinoma

Eruption Cyst

Ameloblastic Fibroma

C. Pericoronal Radiolucencies (that may or may not have radiopaque foci; pg 425)

Ameloblastic Fibro-Odontoma
Adenomatoid Odontogenic Tumor
Calcifying Epithelial Odontogenic Tumor (a.k.a. *Pindborg Tumor*)
Calcifying Odontogenic Cyst
(a.k.a. *Gorlin Cyst* and
Keratinizing and Calcifying Odontogenic Cyst)

D. Interradicular and Solitary Radiolucencies (not necessarily contacting teeth; pp. 296; 309; and 311)

Globulomaxillary Cyst
Incisive Canal Cyst (a.k.a. *Nasopalatine Cyst*)
Median Mandibular Cyst
Mid-Palatine Cyst
Lateral (Developmental) Periodontal Cyst
Residual Cyst
Traumatic Bone Cyst
Posterior Lingual Mandibular Bone Defect (a.k.a. *Stafne Cyst*)
Primordial Cyst
Focal Osteoporotic Bone Marrow Defect of the Jaws
Fibrous Healing Defect (surgical or traumatic)
Neuroma, Neurofibroma

Many other odontogenic and non-odontogenic lesions may manifest as solitary “cyst-like” radiolucencies. For example, ameloblastoma and central giant cell granuloma, cementifying and ossifying fibroma (early stage) and chronic localized Langerhans’ Cell Disease (i.e. Eosinophilic Granuloma)

E. Multilocular Radiolucencies (pg 333,353)

Ameloblastoma
Central Giant Cell Granuloma
Odontogenic Keratocyst
Odontogenic Myxoma
Central Hemangioma (and other vascular lesions including the *Aneurysmal Bone Cyst*)
Cherubism (a.k.a. *Familial Fibrous Dysplasia*)

F. Solitary Radiolucencies (with poorly defined borders) (pg 356)

Chronic Osteomyelitis
Osteoradionecrosis (p. 436)
Primary Intra-alveolar Epidermoid (i.e., Squamous Cell) Carcinoma
Metastatic Tumors
Osteogenic sarcoma (early stage, osteolytic)
Chondrogenic sarcoma (early stage, osteolytic)
Other sarcomas (rare)

G. Generalized Rarefactions

Hyperparathyroidism
1. Primary
2. Secondary (a.k.a. *Renal Osteodystrophy*)
3. Tertiary (a.k.a. *Functional Adenoma*)

Langerhans' Cell Disease (a.k.a. *Idiopathic Histiocytosis* and *Histiocytosis X*)
1. Acute Disseminated LCD (a.k.a. *Letterer - Siwe Disease*)
2. Chronic Disseminated LCD (a.k.a. *Hand-Schüller Christian Disease*)
3. Chronic Localized LCD (a.k.a. *Eosinophilic Granuloma*)

Multiple Myeloma

Basal cell nevus syndrome (multiple odontogenic keratocysts)

H. Mixed Radiolucent-Radiopaque Lesions

Cemento-Ossifying Fibroma
Garre's Osteomyelitis
Chondrosarcoma
Osteosarcoma
Calcifying Epithelial Odontogenic Tumor (a.k.a. *Pindborg Tumor*)
Calcifying Odontogenic Cyst
(a.k.a. *Gorlin Cyst* and *Keratinizing and Calcifying Odontogenic Cyst*)

I. Periapical Radiopacities

Condensing Osteitis
Idiopathic Osteosclerosis

Cementoblastoma
Periapical Cementoosseous Dysplasia
Focal Cementoosseous Dysplasia
Hypercementosis

H. Solitary Radiopaque Lesions

Tori and Exostosis

Pontic Hyperostosis

Idiopathic Osteosclerosis

Osteoma

Root Fragments

Odontoma
1. Compound
2. Complex

Fibrous Dysplasia - monostotic

I. Generalized Radiopacities

Florid Cementoosseous Dysplasia

Paget's Disease (a.k.a. *Osteitis Deformans*)

Osteopetrosis (a.k.a. *Albers-Schönberg Disease* and *Marble Bone Disease*)
1. Malignant
2. Benign

Fibrous Dysplasia - polyostotic

J. Radiopacities Outside the Jaws

Elongated Stylo-hyoid Ligament
Calcified stylo-hyoid ligament (may be associated with Eagle's Syndrome)
Foreign Bodies
Antrolith, Rhinolith
Sialolith
Phlebolith
Calcified lymph node
Calcified scar, cyst or acne
Mucous Retention Cyst of the Maxillary Sinus
Mucositis of Maxillary Sinus
Maxillary Sinusitis
Periapical Halo
Mucocele
Calcified Arteries

IV. RADIOGRAPHICALLY DESCRIPTIVE TERMS

A. Punched-out radiolucency

Multiple myeloma
Histiocytosis X (a.k.a. *Hand-Schüller Christian Disease, Eosinophilic Granuloma*)

B. Scalloped radiolucency

Traumatic (hemorrhagic) bone cyst

C. Sunburst (sunray) effect (osteophytic bone spicules)

Osteosarcoma
Chondrosarcoma

D. Onion-skin appearance (reduplication of the cortex)

Garre's osteomyelitis
Ewing's sarcoma

E. Cotton-wool radiopacity

Paget's disease
Chronic diffuse sclerosing osteomyelitis

F. Moth-eaten or tunneled (radiolucency)

Osteomyelitis
Malignant tumors

G. Marble bone (radiopacity)

Osteopetrosis

H. Loss of lamina dura

Hyperparathyroidism
Fibrous dysplasia
Paget's disease

I. Driven snow (mixed radiolucent-radiopaque)

Calcifying epithelial odontogenic tumor (a.k.a. *Pindborg tumor*)

J. Ground-glass, orange peel, smoke screen appearance (radiopacity)

Fibrous dysplasia
Hyperparathyroidism

K. Hair-on-end effect

Hemolytic anemias (Thalassemia, sickle cell disease)

L. Tram line calcification (in meninges of brain)

Sturge-Weber syndrome

M. Widened periodontal ligament space (radiolucency)

Osteosarcoma, chondrosarcoma
Other malignancies
Periodontal disease
Scleroderma

N. Multilocular (honey-combed, soap-bubble) radiolucency

Ameloblastoma
Odontogenic myxoma
Odontogenic keratocyst (basal cell nevus syndrome)
Central giant cell tumor
Aneurysmal bone cyst
Central hemangioma
Cherubism

O. Step-ladder trabeculae

Anemias

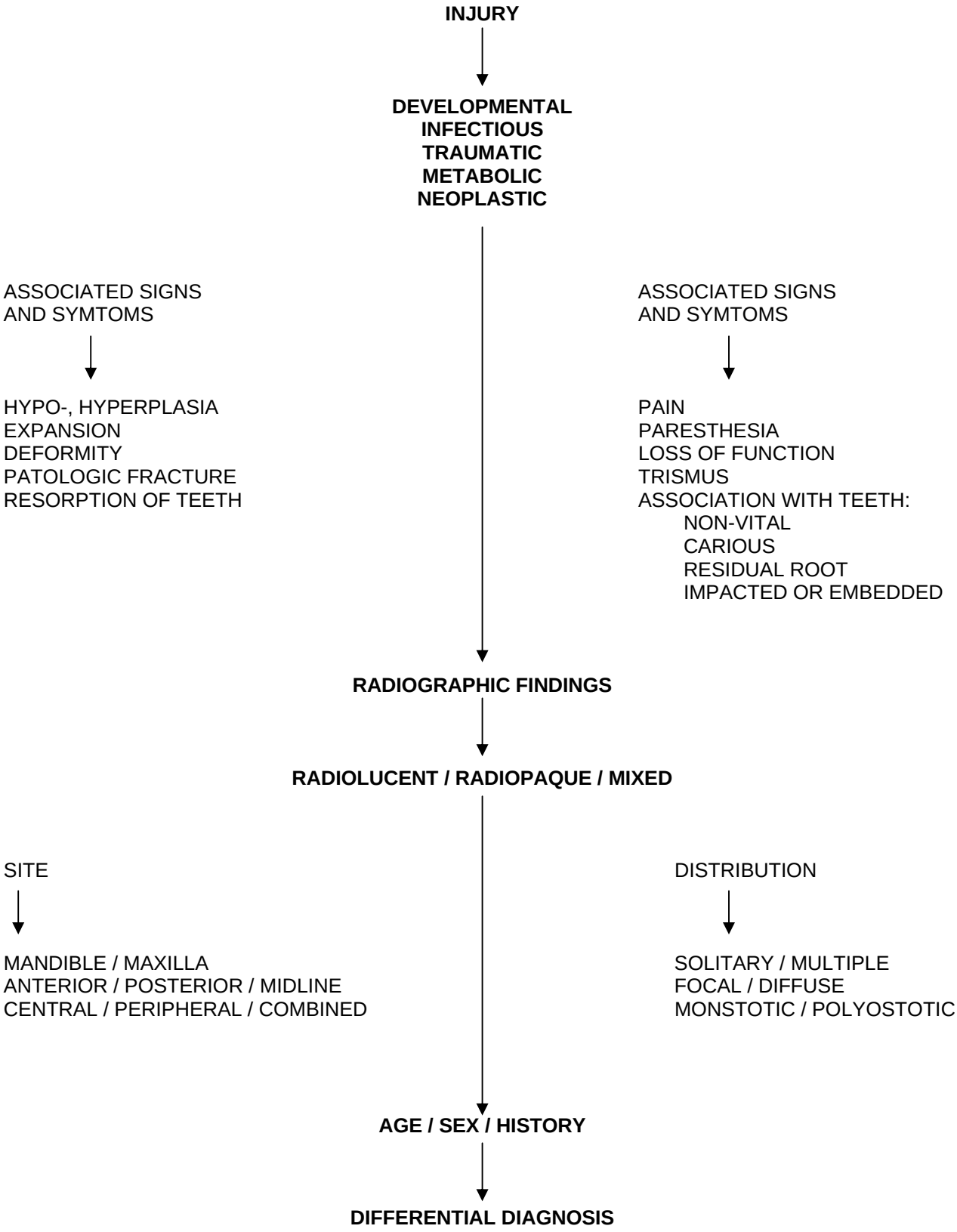
V. APPROACH TO DIFFERENTIAL DIAGNOSIS OF LESIONS OF THE JAW

As with most other tissues of the body, bone reacts to injury in only a limited number of ways. With a given injury, whether it be developmental, infectious, traumatic, metabolic, or neoplastic, there may be no immediate discernible effect, or bone may respond radiographically in the following basic ways:

a) bone destruction (radiolucency)
b) bone formation (radiopacity)
c) combined destruction / formation (mixed, radiolucent-radiopaque)

These injuries may manifest clinically with varying degrees of pain or paresthesia, or gross morphologic changes such as enlargement. In other instances, no objective signs or symptoms will be evident except on radiographs. The diagnosis of such lesions in bone, therefore, must be based upon careful consideration of the patient's medical and dental history, duration of the lesion, age and sex of the patient, anatomic location, and occasionally alterations in the blood chemistry.

In other words, a close correlation between the radiographic appearance of the lesion and clinical data is essential in order to establish a differential diagnosis. (See diagram on the following page.)


INJURY
DEVELOPMENTAL
INFECTIOUS
TRAUMATIC
METABOLIC
NEOPLASTIC
ASSOCIATED SIGNS AND SYMTOMS
HYPO-, HYPERPLASIA
EXPANSION
DEFORMITY
PATOLOGIC FRACTURE
RESORPTION OF TEETH
ASSOCIATED SIGNS AND SYMTOMS
PAIN
PARESTHESIA
LOSS OF FUNCTION
TRISMUS
ASSOCIATION WITH TEETH:
NON-VITAL
CARIOUS
RESIDUAL ROOT
IMPACTED OR EMBEDDED
RADIOGRAPHIC FINDINGS
RADIOLUCENT / RADIOPAQUE / MIXED
SITE
MANDIBLE / MAXILLA
ANTERIOR / POSTERIOR / MIDLINE
CENTRAL / PERIPHERAL / COMBINED
DISTRIBUTION
SOLITARY / MULTIPLE
FOCAL / DIFFUSE
MONSTOTIC / POLYOSTOTIC
AGE / SEX / HISTORY
DIFFERENTIAL DIAGNOSIS