Craniofacial
Fibro-Osseous Disease:
Delimmas in Diagnosis and Treatment

Robert O. Greer, DDS, ScD
Professor, Departments of Pathology, Medicine and Dermatology
University of Colorado School of Medicine
Professor and Chair, Division of Oral and Maxillofacial Pathology
School of Dental Medicine
Anschutz Medical Campus
Fibro-osseous lesions represent a diverse group of developmental, reactive, dysmorphic and neoplastic lesions of bone characterized by the replacement of normal bone by fibrous tissue that contains newly formed immature mineralized product.
The histopathology of fibro-osseous lesions, regardless of site, can be very similar for nearly all disorders, therefore any single biopsy specimen, without appropriate clinical history and radiological findings may prove to be of little or no value.
Fibro-osseous lesions to be discussed

- Condensing osteitis (reactive osseous sclerosis)
- Ossifying fibroma
- Fibrous dysplasia
- Cemento-osseous dysplasias
  - Focal cemento-osseous dysplasia
  - Periapical cemento-osseous dysplasia
  - Florid cemento-osseous dysplasia
Condensing osteitis
(reactive osseous sclerosis)

- A localized form of periapical inflammatory bone sclerosis resulting from a dental related infection
- Bone production rather than bone destruction occurs
- Clinical expansion of bone or pain should not be present
- Most cases occur in the premolar/molar area of the mandible
Important radiographic finding

➢ Condensing osteitis, unlike focal cemento-osseous dysplasia, to be discussed later, will not exhibit a characteristic radiolucent border radiographically
Radiograph: Condensing osteitis of the jaw
Radiograph: Condensing osteitis of the jaw
Treatment and Prognosis

➢ Resolve the odontogenic focus of infection, typically with tooth extraction
➢ If the lesion persists, re-evaluation and biopsy may be required
➢ A residual area of condensing osteitis is termed a **bone scar**
Radiograph: Bone scar
Ossifying fibroma

- A true neoplasm of bone with significant growth potential
- Although ossifying fibromas have been reported in long bones, the cranial-facial bones, especially the jaws, which are far and away the favored site
- Most jaw tumors are thought to arise from primitive cells in the periodontal ligament, although a periosteal source has also been documented
- Rare HRPT2 mutations have been reported. This gene is responsible for the protein product parafibromin which is lacking in ossifying fibromas
Tumors occur across a wide age range, with most occurring as expansile non-painful lesions in the third and fourth decades of life.

Lesions are usually radiographically well-circumscribed, unilocular, and either radiolucent, radiopaque or mixed in their appearance.

Unless the tumor is exceedingly large, in which case there will be a down bowing of the inferior cortex of the mandible, the cortex will remain intact and will be radiographically evident, unlike fibrous dysplasia when the cortex will almost always have “melted away”
Radiograph: Ossifying Fibroma

Radiopaque

Mixed
Radiograph: Ossifying Fibroma

Radiolucent
Histology: Ossifying Fibroma
Histology: Ossifying Fibroma
Treatment and Prognosis

➢ Enucleation with eburnation of the surrounding bone, or with large destructive tumors, surgical resection
Juvenile Ossifying Fibroma (Juvenile Active Ossifying Fibroma)

- A biologically aggressive form of ossifying fibroma seen in adolescents and young adults
- Tumors demonstrate rapid growth and may show a mixed radiopaque/lucent or ground glass opacification
- The maxilla is the favored site
Clinical appearance: Juvenile Ossifying Fibroma
Radiographic appearance: Juvenile Ossifying Fibroma
Radiographic appearance:
Juvenile Ossifying Fibroma
Histopathology

- Two histopathologic patterns are recognized: (1) a trabecular pattern and (2) a psammomatoid pattern.
- The trabecular pattern favors the jaws, while the psammomatoid pattern favors the orbit, frontal bones and paranasal sinuses.
- Intracranial extension has been reported.
Histopathology

- Tumors will be non-encapsulated and composed of either:
  (1) *trabeculae* of *woven bone* set in a cellular fibrous stroma
  or (2) spherical ossicles with basophilic centers set in a
  matrix of cellular fibrous connective tissue (psammomatoid)

- Greatest concern: the process may be mistaken for osteosarcoma
Histopathology:

- Trabecular pattern
- Psammomatoid pattern
Treatment and Prognosis

- Treatment is uncertain due to the unpredictable and progressive growth pattern of the tumor
- Complete local excision is recommended for small lesions
- Locally aggressive lesions may require resection
- Malignant transformation has not been documented
Fibrous dysplasia

- Fibrous dysplasia is a developmental tumor-like disorder of bone and bone marrow that is characterized by the replacement of bone and marrow by fibrous tissue and immature bone.
- The condition results from a post zygotic mutation in the GNAS1 gene.
- The disease can range from asymptomatic with simply incidental bony lesions or it can become a severe disabling process.
Fibrous dysplasia can be classified as monostotic (affecting one area or bone) or polyostotic (affecting multiple bones)

- When multiple bones are affected individuals can also have certain syndrome associated cutaneous and endocrine abnormalities
Monostotic fibrous dysplasia

- Accounts for nearly 85% of all cases of fibrous dysplasia, with the jaws being among the most favored sites.
- Males and females are affected equally and the disorder usually manifests in the second decade of life as a painless swelling of the affected area, in this case the jaws.
- When multiple bones of the craniofacial complex are affected the classification *craniofacial* fibrous dysplasia is appropriate.
Clinical appearance: Monostotic fibrous dysplasia
Radiographic findings

➢ The chief radiographic finding is that of a fine “ground glass” or “orange peel” opacification of the affected bone.

➢ Lesions will appear poorly demarcated and the bony cortex will be absent as the disease process will expand and blend into adjacent bone.
Radiographic appearance:
Monostotic fibrous dysplasia
Polyostotic fibrous dysplasia

- When two or more bones are involved by fibrous dysplasia the process is termed polyostotic.
- Polyostotic disease in association with café au lait pigmentations of the skin is termed Jaffe-Lichtenstein Syndrome.
- Females are most often affected.
Jaw lesion and café au lait spots
McCune-Albright Syndrome

- Polyostotic fibrous dysplasias when seen in association with café-au-lait skin pigmentation and multiple endocrineopathies such as hyperthyroidism, sexual precocity, and pituitary adenoma, is termed McCune-Albright Syndrome.

- Fibrous dysplasia seen in association with intra-muscular myxomas is termed Mazabraud syndrome.
McCune-Albright Syndrome

- Most patients with polyostotic fibrous dysplasia have their long bones affected, rather than the jaws or skull.
- Common findings include leg bowing, bone length discrepancies and fractures.
- Café-au-lait spots tend to be irregular at the borders rather than smooth as in neurofibromatosis in syndrome related fibrous dysplasia.
Histopathology

- The microscopic findings in fibrous dysplasia are not specific, and will most often consist of irregularly shaped \textit{woven} (immature) bone trabeculae set in a matrix of either immature or mature connective tissue.

- The bone involved is often characterized as resembling Chinese script.

- Jaw lesions tend to show more ossification than their long bone counterparts, which tend to be more fibrous.
Histology of fibrous dysplasia
Histology of fibrous dysplasia
Treatment and Prognosis

- Fibrous dysplasia of the craniofacial skeleton can result in minimal to sometimes significant cosmetic and functional deformity
Clinical photos of various patients
Management of craniofacial fibrous dysplasia can include:

- Watchful waiting
- Osseous re-contouring
- Psychological counseling
- Management of endocrinopathies (if syndrome associated)
- Surgical regrowth after re-contouring/reduction occurs in 25-50% of cases
- Bisphosphonates (pamidronate)
Cemento-osseous dysplasias

- Cemento-osseous dysplasias occur in the tooth-bearing areas of the jaws and they represent the most common fibro-osseous lesion encountered in clinical practice.
- The histology of these lesions is non-specific.
- The lesions are thought to arise from a periodontal ligament source or by extensive bone remodeling triggered by a local injury or by some hormonal influence.
Types of cemento-osseous dysplasia

- Focal osseous dysplasia
- Periapical cemento-osseous dysplasia
- Florid cemento-osseous dysplasia
Focal cemento-osseous dysplasia

- Focal cemento-osseous dysplasia involves a mandibular or maxillary single site
- Most cases occur in females in the third to sixth decades of life
- African American females are most often affected followed by East Indians and whites
- Most lesions involve the posterior mandible and they are generally asymptomatic
Radiographic findings

- Focal cemento-osseous dysplasia can range from completely radiolucent to densely radiopaque
- The lesions typically have a peripheral rim that is radiolucent, unlike condensing osteitis
- Lesional borders tend to be well defined
Radiograph:
Focal cemento-osseous dysplasia
Treatment

➢ For asymptomatic patients the best treatment consists of regular radiographic evaluations with recall, prophylaxis and good oral hygiene care to control periodontal disease and prevent tooth loss

➢ In those rare lesions that are symptomatic, surgical intervention should be avoided. Patients should be encouraged to retain their teeth

➢ Management of the rare symptomatic patient who develops secondary osteomyelitis typically involves antibiotic therapy and the removal of sequestrated bone if it develops
Periapical cemento-osseous dysplasia (periapical cemental dysplasia)

- Periapical cemento-osseous dysplasia occurs primarily in the anterior mandible, affecting the periapical regions of the teeth.
- Lesions tend to be multifocal and affect females at a ratio of 10-14:1 over males.
- Most lesions are diagnosed between the ages of 30 and 50.
- The teeth associated with this process tend to be vital.
Periapical cemento-osseous dysplasia (Cont.)

➢ Periapical cemento-osseous dysplasia tends to be asymptomatic

➢ Radiographically the lesions usually appear as circumscribed periapical radiolucencies, similar to periapical granulomas or cysts

➢ These radiolucencies may fuse resulting in a large area of radiolucency
Lesions can also be mixed or totally radiopaque

The periodontal ligament tends to appear intact and fusion of the lesions to teeth is relatively rare

Rarely do lesions become larger than 1 cm in diameter
Radiograph:
Periapical cemento-osseous dysplasia
Treatment

➢ The treatment for periapical cemento-osseous dysplasia is the same as focal cemento-osseous dysplasia, which includes no management for asymptomatic lesions, other than long-term radiographic follow-up and periodic prophylaxis and oral hygiene reinforcement.
Florid cemento-osseous dysplasia

- Florid cemento-osseous dysplasia is a disorder that results in multifocal lesions, typically throughout the entire mandible or maxilla.
- The process is not limited to the anterior mandible, as in periapical cemento-osseous dysplasia.
- Lesions will predominately involve Black females with over 90% of the patients representing this ethnic group.
- Less commonly the lesions occur in East Asians.
- Most patients are middle-aged to older adults.
Radiographic findings

- Florid cemento-osseous dysplasia can appear as a predominantly radiolucent, mixed, or predominately radiopaque lesion
- Some lesions become densely radiopaque
- The lesions typically remain separated from adjacent teeth and will interdigitate between periodontal ligament spaces
- Edentulous and dentulous areas can be affected
- Lesions can radiographically fuse with the root surface
Radiograph: Florid cemento-osseous dysplasia
Radiograph:
Florid cemento-osseous dysplasia
Florid cemento-osseous dysplasia in which teeth have been extracted, resulting in osteomyelitis
Treatment

➢ As with the other cemento-osseous lesions, asymptomatic patients should not receive any treatment other than routine recall or hygiene reinforcement to prevent tooth loss and of course, reassurance

➢ In those lesions that do become symptomatic surgical intervention, including biopsy and extraction, should be avoided

➢ In patients who are symptomatic and develop secondary osteomyelitis, antibiotics and removal of sequestered bone may be required
Histopathology

➢ Microscopically, all three patterns of cemento-osseous dysplasia demonstrate the same histologic features

➢ Lesions usually consist of scattered aggregates of woven and lamellar bone, set in a matrix of well-vascularized connective tissue that contains hemorrhage

➢ When lesions mature the mineralized component becomes predominant with less fibrous connective tissue

➢ When lesions become totally radiopaque the trabeculae may fuse and interdigitate so that significant osteosclerosis is evident
Histology: Cemento-osseous dysplasias
Histology: Cemento-osseous dysplasias
Disorder summary: Fibro-osseous disease
Histology alone will not definitively diagnose fibro-osseous lesions

Clinical and radiographic findings are mandatory for the correct diagnosis

- Inappropriate treatment such as extractions or even biopsy, in some cases, can result in severe osteolytic inflammatory disease