Chapter 7
Fibrous Dysplasia

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Related Conditions: McCune-Albright's Syndrome, Mazabraud's Syndrome

Definition: Intramedullary hamartoma consisting of a peculiar fibro-osseous tissue, it may be either monostotic or polyostotic.
Epidemiology: Monostotic fibrous dysplasia is frequent, polyostotic is uncommon, McCune-Albright's syndrome is rare. Difficult to assess true incidence because often asymptomatic. Slight female predominance. Usually diagnosed between age 10 and 30. When asymptomatic, it can be discovered at any age. The polyostotic forms and McCune-Albright's syndrome manifest in early childhood.

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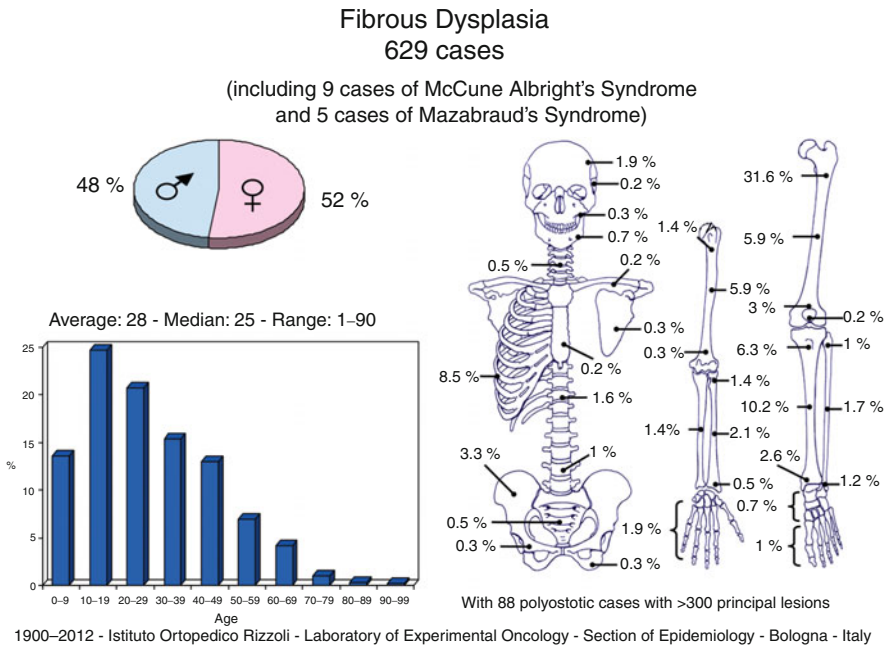


Location: Femur (proximal), tibia, craniofacial bones, ribs; then humerus, forearm, pelvis. Same sites in multicentric and polyostotic disease. Frequently more areas in the same long bone, or two to three adjacent bones affected. Lower limb more frequent than upper limb. Hand, foot involved almost only in extensive polyostotic forms. Spine, scapula, clavicle rarely affected. Poliostotic type is usually prevalent in one body side.

Clinical: Monostotic is usually asymptomatic representing an incidental finding. Polyostotic: discontinuous pain (fatigue fractures), bony expansion in superficial bone, pathologic fracture, deformity and lower limb-length discrepancy. In polyostotic forms also cafè au lait spots ("coast of Maine"), multiple endocrine abnormalities (McCune-Albright's syndrome), intramuscular mixomas (Mazabraud's syndrome).

Imaging: Standard X-rays show defined defect involving cortical and cancellous areas. Margins well defined, sometimes marked by a rind of bone sclerosis. The cortex is sometimes thinned and expanded but continuous. No periosteal reaction. Radiolucency of "ground glass" appearance is depending upon the amount of intratumoral trabeculae of woven bone. Severe "shepherd's crook" deformity of the

proximal femur, usual in polyostotic form. Isotope scan: rather hot (diffuse dysplastic bone formation) and corresponding to radiographic extent. CT: homogeneity of ground glass radiolucency; cystic cavities and cartilaginous areas (sometimes calcified) when present. MRI: fairly homogenous low signal in T1.

Pathology: Periosteum not involved, underlying cortex is regularly smooth but thin. Lesional tissue, well defined from surrounding bone, whitish to pink, from fibrous to gritty, to hard bony. Sometimes, hemorrhagic areas or cystic spaces with serohematic content are present. Rarely, sparse lobules of hyaline cartilage are embedded in the above described tissue. Histology: mixture of benign proliferating fibroblastic cells and islands of woven bone. The bony trabeculae are arranged in a "Chinese letters" fashion. Usually, the bony trabeculae show no clear-cut osteoblastic rimming. Benign giant cells and foam cells are commonly found. No mitotic activity, no atypia. Islands of cartilage may dominate the histologic appearance. May have ABC-like areas.

Course and Staging: Lesions are usually stage 2 in children and adolescents and stage 1 in adults. If a lesion expands and becomes symptomatic in an adult, this may be due to hemorrhage (during pregnancy). Rarely (less than 0.5 % of the reported cases) a sarcoma may develop on a fibrous dysplasia. It usually occurs in adult-advanced age, both in monostotic and polyostotic fibrous dysplasias, more frequent after radiation therapy.

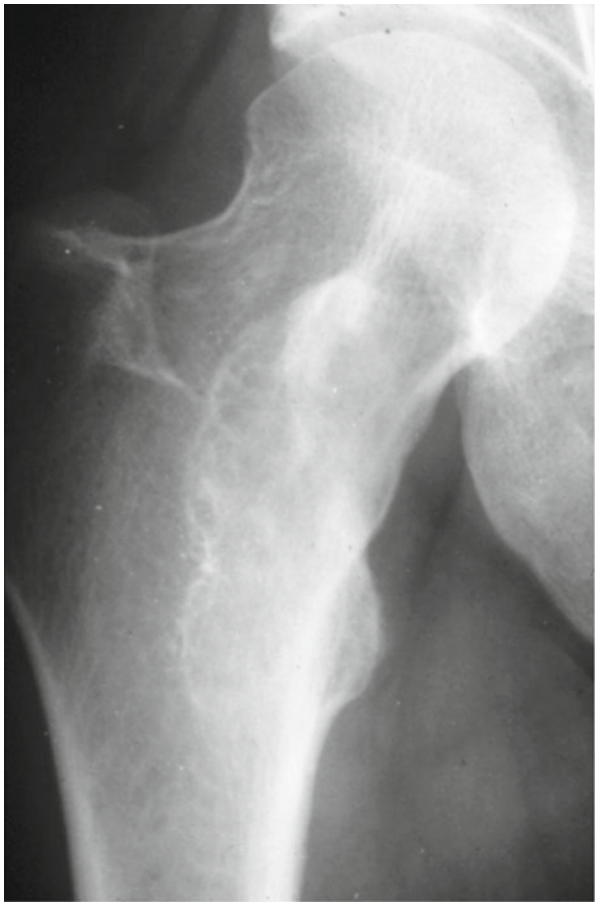
Treatment: Frequently not needed. Curettage and grafting of active lesions should be avoided. Deformities may need corrective osteotomies and internal fixation; preferably by intramedullary devices.

Key Points

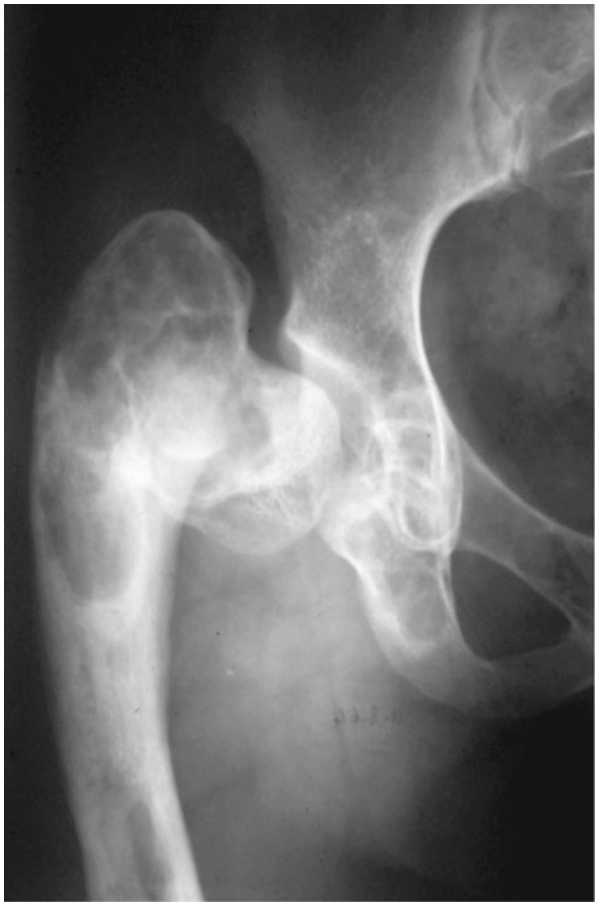
Clinical	Incidental findings
Radiological	"Ground glass" appearance
Histological	Benign fibroblastic lesion producing immature woven bone. No osteoblasts
Differential diagnosis	Low-grade central osteosarcoma

Chromosomal Translocations

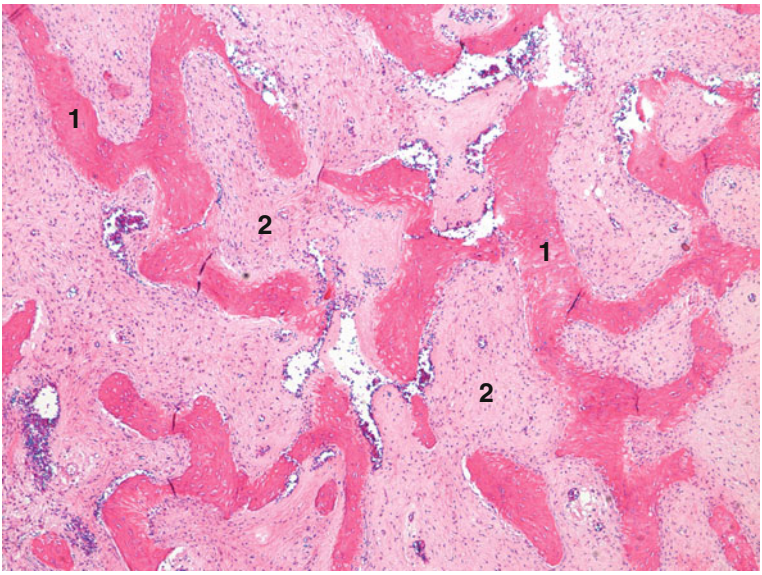
Point mutations GNAS1	20q13.32	93 %



Radiograph of the proximal femur. The lesion is metadiaphyseal, eccentric, sclerotic, and heterogeneous. It is well limited by a sclerotic ring



Radiograph of the hip. Lytic and sclerotic well-limited lesions. Typical femoral neck deformity (Shepherd's crook)



Histopathologic features are represented by immature bone trabeculae enmeshed in immature histio-fibroblastic tissue. (1) The dysplastic bone trabeculae are generally small and shaped like Chinese ideograms; they are usually not bordered by rows of osteoblasts. Trabeculae have a woven structure. (2) Undifferentiated fibrous connective tissue surrounding the trabeculae. The histio-fibroblasts are numerous and plump, with rare mitotic figures

Selected Bibliography

Case DB, Chapman CN Jr, Freeman JK, Polga JP (2010) Best cases from the AFIP: atypical presentation of polyostotic fibrous dysplasia with myxoma (Mazabraud syndrome). Radiographics 30(3):827–832

Dorfman HD (2010) New knowledge of fibro-osseous lesions of bone. Int J Surg Pathol 18(3 Suppl):62S–65S. Review

Dujardin F, Binh MB, Bouvier C, Gomez-Brouchet A, Larousserie F, Muret AD, Louis-Brennetot C, Aurias A, Coindre JM, Guillou L, Pedeutour F, Duval H, Collin C, de Pinieux G (2011) MDM2 and CDK4 immunohistochemistry is a valuable tool in the differential diagnosis of low-grade osteosarcomas and other primary fibro-osseous lesions of the bone. Mod Pathol 24:624–637

Dumitrescu CE, Collins MT (2008) McCune-Albright syndrome. Orphanet J Rare Dis 3:12

Ruggieri P, Sim FH, Bond JR, Unni KK (1994) Malignancies in fibrous dysplasia. Cancer 73(5):1411–1424

Szuhai K, Cleton-Jansen AM, Hogendoorn PC, Bovée JV (2012) Molecular pathology and its diagnostic use in bone tumors. Cancer Genet 205(5):193–204. doi:10.1016/j.cancergen.2012.04.001

Yoshida A, Ushiku T, Motoi T, Shibata T, Beppu Y, Fukayama M, Tsuda H (2010) Immunohistochemical analysis of MDM2 and CDK4 distinguishes low-grade osteosarcoma from benign mimics. Mod Pathol 23(9):1279–1288