1. You are shown an AP view of the pelvis and hips of a 44-year-old woman. What is the MOST likely diagnosis?

A. Osteopetrosis
B. Tuberous sclerosis
C. Renal osteodystrophy
D. Sickle cell disease

Findings:
Diffuse uniform sclerosis of the pelvis and hips with failure of differentiation between cortex and medullary cavity, status post hip fixation.

Rationales:
A. Correct. Osteopetrosis is a sclerosing dysplasia involving a defect in osteoclastic resorption of the primary spongiosa related to endochondral bone formation. Sclerosis is usually diffuse and uniform. Loss of the cortical medullary junction is typical. Alternating bands of sclerosis may also be present reflecting the periodicity of the disease. In the adult form or delayed type, autosomal dominant variety, originally described by Albert-Schoenberg, the patient’s life expectancy may be normal but the skeleton is brittle and prone to fracture.

B. Incorrect. Although the pelvis is a common site for osteoblastic deposits in patients with tuberous sclerosis, they are usually multiple and discrete rather than diffuse and uniform as in the test case.

C. Incorrect. Renal osteodystrophy does not produce such uniform widespread sclerosis with loss of the cortical medullary junction as in the test case. When there is extensive involvement, sclerosis tends to be more patchy and ill-defined related to secondary hyperparathyroidism.

D. Incorrect. The sclerosis of sickle cell disease is secondary to infarction and osteonecrosis which overtime is replaced by fibrosis and new bone formation. The diffuse, uniform sclerosis at the pelvis and hips with diffuse loss of the cortical-medullary junction would be unusual.
2. You are shown a lateral radiograph and a non-contrast CT of a 9-year-old boy with anterior leg bowing. What is the MOST likely diagnosis?

A. Intracortical osteosarcoma
B. Non-ossifying fibroma
C. Osteofibrous dysplasia
D. Aneurysmal bone cyst

Findings:
There is a cortically based, expansile lesion involving the anterior tibia shaft. The tibia is mildly bowed anteriorly. The majority of the lesion is lucent, with a lobulated contour and sclerotic margins.

Rationales:
A. Incorrect. Intracortical osteosarcoma is the most uncommon form of osteosarcoma. They are diaphyseal, usually arising in the femur or tibia. Intracortical osteosarcoma generally presents as lucency within the cortex that measures less than 4 cm, with surrounding sclerosis. If small, they may be mistaken for an osteoid osteoma or fibrous cortical defect.
B. Incorrect. Nonossifying fibromas may be mildly expansile, but they are not associated with bowing of the bone.

C. Correct. Osteofibrous dysplasia is a benign fibro-osseous lesion that is almost exclusively found in the tibia or fibula. It is a disorder of childhood, usually seen within the first 2 decades of life and often under 10 years of age. The lesion is centered in the anterior cortex, and may be associated with anterior bowing. A lobulated lucency is seen, often with surrounding sclerosis. The appearance may mimic a nonossifying fibroma, but the location and bow are key. Adamantinoma may be present in association with osteofibrous dysplasia. The two disorders cannot be differentiated one from the other by imaging.

D. Incorrect. Aneurysmal bone cysts are eccentric, lytic lesions that are usually found in the medullary cavity. They are most often metaphyseal, but may be present anywhere along a bone. Cortical and periosteal locations have been reported, but are unusual. The cortex overlying the lesion is expanded and if growth is rapid, it may be destroyed.

Citations:

3. You are shown an oblique coronal T1-weighted MR image of a 45-year-old woman with chronic mild shoulder pain. What is the MOST likely diagnosis?
A. Parsonage-Turner syndrome  
B. Chronic rotator cuff tear  
C. Quadrilateral space syndrome  
D. Suprascapular nerve entrapment

Findings:  
Atrophy teres minor and deltoid musculature

Rationales:  
A. Incorrect. Parsonage-Turner syndrome (also known as acute brachial neuritis) is an idiopathic denervation of the shoulder muscles resulting in pain and weakness. The muscles demonstrate high SI on T2-weighted imaging due to acute denervation edema and ultimately atrophy and fatty replacement. The suprascapular nerve and, therefore, the supraspinatus and infraspinatus musculature are typically involved. Axillary nerve involvement may occur but is less frequent.  
B. Incorrect. While chronic tears of the rotator cuff tendons may be associated with muscle atrophy and fatty replacement, no tears are demonstrated in the test case.  
C. Correct. Quadrilateral space syndrome is caused by compression of the axillary nerve in the quadrilateral space, usually by small fibrous bands or ganglion cysts and clinically manifests as mild shoulder pain. Axillary nerve dysfunction may eventually lead to atrophy of the teres minor and deltoid musculature.  
D. Incorrect. The teres minor and deltoid muscles are supplied by the axillary nerve, not the suprascapular nerve. The suprascapular nerve innervates the supraspinatus and infraspinatus muscles, which appear normal.

Citation:  

4. Concerning calcium pyrophosphate dihydrate (CPPD) deposition which one is TRUE?  
A. Polarized light microscopy demonstrates needle-shaped crystals with negative birefringence.  
B. Water sensitive MR sequences are most sensitive to the detection of chondrocalcinosis.  
C. Chondrocalcinosis is synonymous with pseudo-gout.  
D. Pyrophosphate arthropathy is most common at the knee.

Rationales:  
A. Incorrect. Polarized light microscopy demonstrates rhomboid crystals with weak positive birefringence. Monosodium urate crystals are needle shaped and demonstrate strong negative birefringence.
B. Incorrect. A gradient echo sequence, T2* GRE, is the most sensitive technique for the detection of chondrocalcinosis because of the increased magnetic susceptibility. Multiple hypointense punctuate foci are characteristic of such chondral calcification.
C. Incorrect. Chondrocalcinosis refers to the presence of calcification within hyaline and fibrocartilage. The crystal is usually, though not necessarily CPPD. The patient may be asymptomatic. Pseudogout is one of several possible clinical presentations of CPPD deposition disease, similar to attacks of acute gouty arthritis. Theoretically, there is some degree of cartilage damage, shedding of crystals into the joint, synovial deposition and inflammation when the patient is symptomatic. Pyrophosphate arthropathy refers to the type of structural joint damage that may eventually result in some patients.
D. Correct. The arthropathy related to CPPD deposition is similar to osteoarthritis in that joint space narrowing, subchondral sclerosis, subchondral cyst and osteophyte formation may be present. There are features, however that are unique to CPPD arthropathy. Weight-bearing and non-weightbearing joints may be involved. The unusual distribution of involvement within a given joint is notable i.e., patella-femoral compartment at the knee, radiocarpal at the wrist. Subchondral cyst formation may be numerous and quite large. Osteophyte formation is quite variable. Destructive bone changes may be severe and progressive resembling neuropathic disease. Pyrophosphate arthropathy is most common at the knee. The wrist and MCP joints are commonly involved but any joint is susceptible.

5. Which of the following is a TRUE statement about the diffuse, intracapsular form of pigmented villonodular synovitis?

A. The small joints of the hands and feet are typically involved.
B. Correct. Diffuse, intracapsular PVNS, is a proliferative disorder of the synovium and therefore presents as a soft tissue mass within the joint. MR signal characteristics are related to hemosiderin deposition, joint effusion, and lipid-laden macrophages. Areas of low signal intensity on all pulse sequences are typical of hemosiderin which is best detected with gradient echo sequences due to magnetic susceptibility. Water sensitive images will reveal high signal intensity related to joint fluid. Lipid-laden macrophages may result in signal changes characteristic of fat.
C. Incorrect. Though a benign process, it may be locally aggressive and a recurrence rate of 20-50% is typical following synovectomy. Although its pathogenesis is unclear, there is evidence which suggests a neoplastic as well as inflammatory or reactive etiology.
D. Incorrect. Osseous erosion with preservation of the joint space and normal bone density is typical. The disorder is monoarticular, the knee being the most common site of involvement. The hip, ankle, and elbow are also common sites. Patients are typically young adults.

6. Which of the following is TRUE concerning acromegaly?

A. Stimulation of intramembranous bone formation results in gigantism
B. Stimulation of endochondral bone formation results in gigantism
C. Stimulation of endochondral bone formation results in widening of osseous structures
D. Stimulation of endochondral bone formation results in enlargement of the costochondral junction

Rationales:
A. Incorrect. Stimulation of endochondral ossification before growth plate closure leads to gigantism. In adults, stimulation of endochondral ossification leads to new bone formation at existing cartilage-bone junctions such as the costochondral junctions. The widening of osseous structures in patients with acromegaly is secondary to periosteal new bone formation which is intramembranous in nature.
B. Incorrect. Gigantism refers to the sequela of growth hormone hypersecretion in the skeletally immature. Excessive height results from endochondral bone formation at the open growth plates. Acromegaly refers to the sequela of growth hormone hypersecretion in the skeletally mature patient. Intramembranous bone formation in the adult results in periosteal new bone formation and widening of osseous structures.
C. Correct. Endochondral bone formation in the adult occurs at existing chondro-osseous junctions such as the costochondral junction resulting in the acromegalic rosary.
D. Incorrect. Gigantism refers to the sequela of growth hormone hypersecretion in the skeletally immature. Excessive height results from excessive endochondral bone formation at the open growth plates. Acromegaly refers to the sequela of growth hormone hypersecretion in the skeletally mature patient. There is no increase in height. Only chondro-osseous junctions in the adult, such as the costochondral junction are susceptible to endochondral stimulation and new bone formation.

7. Which statement is TRUE concerning parosteal osteosarcoma?

A. The prognosis is good.
B. Patients are usually 10-20 years old.
C. New bone formation predominates at the periphery of the lesion.
D. The humerus is the most common site.
Rationales:
A. Correct. Parosteal osteosarcoma is a low grade, bone forming, tumor arising on the surface of the bone. Although it may metastasize to the lungs, most cases are amenable to local excision without the need for chemotherapy.
B. Incorrect. Patients with parosteal osteosarcoma are typically older than those with conventional osteosarcoma, usually 25-40 years of age.
C. Incorrect. Peripheral ossification is a feature of myositis ossificans. Paraosteal osteosarcoma is most dense at the center of the lesion where new bone formation predominates.
D. Incorrect. The femur, posterior and distal, is the most common location, accounting for 2/3 of all cases.

8. Which one of the following characteristically occurs at the end of the bone?

A. Osteoid osteoma
B. Chondromyxoid fibroma
C. Giant cell reparative granuloma
D. Clear cell chondrosarcoma

Rationales:
A. Incorrect. Osteoid osteoma, a benign bone forming tumor, may occur at the end of a bone. When intra-articular, it may provoke synovitis, hyperemia, peri-articular osteoporosis and growth disturbance. It is typically extra-articular, however, provoking periosteal new bone formation when cortical or sub-periosteal in location.
B. Incorrect. CMF is an unusual benign cartilage forming lesion occurring at the metaphyseal region. It appears as a lytic lesion with expansile remodeling.
C. Incorrect. Giant cell reparative granuloma, considered a reactive phenomenon, was first described as an intraosseous lesion of the maxilla and mandible distinct from giant cell tumor. In the appendicular skeleton, the hands and feet are more commonly involved. Lesions may occur at the end of the bone but most arise at the metaphyseal or diaphyseal regions. They are lytic lesions with histology characterized by giant cells. There is no relationship to giant cell tumor of bone.
D. Correct. Clear cell chondrosarcoma, a rare form of chondrosarcoma, characteristically occurs at the end of the bone, the femoral head being the most common location. The patients are younger than those with conventional chondrosarcoma, usually 30-40 years of age. The appearance is often that of a well defined lytic lesion with sclerotic margins. There may be cartilaginous calcification.
9. Concerning multidirectional glenohumeral instability, which one is associated?

A. Trauma
B. Unilateral involvement
C. Rotator cuff tear
D. Primary impingement

Rationales:
A. Incorrect. Multidirectional glenohumeral instability is often found in individuals with generalized joint laxity of varying degrees. Preceding trauma is not typical.
B. Incorrect. Because multidirectional glenohumeral instability is generally found in individuals with generalized joint laxity, it frequently involves both shoulders. Although the underlying condition is usually bilateral, only one glenohumeral joint may be symptomatic.
C. Correct. Since multidirectional instability is a cause of secondary impingement and all forms of impingement may be associated with rotator cuff tear, multi-directional instability is associated with rotator cuff tear.
D. Incorrect. Primary impingement refers to those conditions of and about the coraco-acromial arch that predispose to compression of the rotator cuff at its outlet. This is usually due to osteoarthritis of the acromioclavicular joint with subsequent osteophytic impingement of the subacromial space or subacromial spurs. Multidirectional glenohumeral instability is the most common cause of secondary, or non-outlet impingement. In this condition, laxity is present in many directions. In addition to antero-inferior laxity, the humeral head may also sublux superiorly, reducing the space in which the cuff must function. Another cause of secondary impingement is a prominent greater tuberosity (fracture malunion).

10. Which statement is CORRECT concerning the meniscus of the knee?

A. A peripheral tear must be excised.
B. Radial tears may spontaneously heal in young individuals.
C. Intra-substance signal in an adolescent usually reflects premature mucoid degeneration.
D. The blood supply comes from the geniculate arteries.

Rationales:
A. Incorrect. Peripheral tears are in the "red" portion of the meniscus that has a neurovascular supply in younger patients. Such tears may heal or be amenable to repair.
B. Incorrect. Radial tears begin at the meniscal free edge, and extend peripherally toward the meniscus-capsular junction. The free edge of the meniscus is avascular, and will not heal.
C. Incorrect. Intrasubstance signal may represent residual vascularity in the peripheral aspect of the meniscus in a younger patient. This portion of the meniscus may also be contused with an acute injury, and subsequently heal spontaneously.
D. Correct. The meniscal blood supply comes from the geniculate arteries that enter the meniscus peripherally. In a young individual, this occupies the outer one third of the meniscus.
The vascular portion of the meniscus decreases in size with age, and an adult pattern is usually reached before skeletal maturity.

11. Concerning Blount’s disease, which of the following is TRUE?

A. It is also known as tibia valga.
B. Radiographic abnormalities are evident in the first 2 years of life.
C. The disorder can occur in infants, children and adolescents.
D. It is usually self-limited and requires no treatment.

RATIONALES:
A. Incorrect. Blount’s disease is also known as tibia vara. The disorder affects the medial aspect of the proximal tibia. The deformity consists of varus angulation and internal rotation at the proximal tibial metaphysis. Factors contributing to the disorder include varus stress, focal growth suppression and disruption of endochondral ossification.
B. Incorrect. Radiographic abnormalities in the infantile form rarely are evident before 2 years of age at which time they resemble physiologic bowing. The varus deformity, however, occurs at the metaphysis, not the knee. Eventually, the medial metaphysis becomes depressed and an osseous excrescence or outgrowth may develop.
C. Correct. The early onset or infantile group occurs in children less than three years of age. The late onset group consists of a juvenile and an adolescent form. Deformity is more likely in the younger age groups.
D. Incorrect. The natural history of the disease is that of irreversible deformity resulting from changes at the growth plate. In the infantile form, orthotic bracing is usually the first line of treatment. If this fails, an osteotomy is required. In the adolescent form, treatment is usually surgical.

References:

12. Concerning osteopoikilosis, which of the following is TRUE?

A. Patients often complain of restricted range of motion at the joints involved.
B. Histologically, the lesions are easily confused with metastatic prostate cancer.
C. The patient’s serum alkaline phosphatase may be mildly elevated.
D. Transmission is autosomal dominant.
RATIONALES:
A. Incorrect. Osteopoikilosis is characterized by multiple bone islands or enostoses with a periarticular distribution. This is an asymptomatic, incidental condition not to be confused with other sclerotic lesions most notably blastic metastases. It may be considered a type of sclerosing dysplasia similar in this regard to osteopathia striata (Voorhoeve’s disease).
B. Incorrect. Histologically, the lesions are benign bone islands. They consist of compact lamellar bone with haversian systems. The bone is uniform with regular cement lines and no evidence of cartilage. The characteristic radiographic appearance includes numerous, small, round or ovoid (long axis parallel to long tubular bone) sclerotic lesions, with spiculated margins and periarticular, symmetric distribution favoring long tubular bones, the carpus, tarsus, pelvis and scapulae. Lesions may increase or decrease in size and number although this phenomenon is more common in children. Bone scans are usually normal.
C. Incorrect. Laboratory examinations are normal.
D. Correct. Both inherited and sporadic cases of osteopoikilosis have been described. There is an autosomal dominant pattern of transmission and penetrance is high.

References: