Section VIII – Musculoskeletal Radiology

![Axial gradient-echo](image)

Figure 1

154. You are shown an MR image of the shoulder (Figure 1). What is the MOST LIKELY diagnosis?

- A. Synovial chondromatosis
- B. SLAP lesion
- C. **Dislocated long biceps tendon**
- D. Intra-articular loose body

**Findings:**
There is a low signal intensity structure at the anterior aspect of the joint. There is a joint effusion. The bicipital groove is empty. The subscapularis tendon appears thickened and irregular.

**Rationale:**
A: The shoulder is a common site for synovial chondromatosis. Multiple joint bodies of similar size distributed throughout the joint capsule are characteristic. A solitary synovial chondroma may occur but is less likely, especially in the setting of an absent long biceps tendon and a torn subscapularis tendon.

B: A SLAP (superior labrum, anterior to posterior) tear is a lesion of the superior labrum and/or biceps anchor. These structures are not included in the presented image.

C: The bicipital groove is empty. The tendon has dislocated medially. The subscapularis tendon is abnormal. Medial dislocation of the long biceps tendon results from injury to the biceps pulley or sling composed of the superior glenohumeral (SGHL) and coracohumeral (CHL) ligament complex and the subscapularis tendon insertion. A medially dislocated long biceps tendon may displace within the joint deep to the subscapularis tendon and is associated with disruption of the subscapularis tendon and SGHL-CHL complex insertion at the lesser tuberosity. Extra-articular dislocation may occur with the tendon superficial to the subscapularis or within the substance of the subscapularis in the case of subscapularis delamination.

D: Intra-articular loose bodies in the glenohumeral joint are usually found in the posterior joint, axillary recess or subcoracoid recess. This could potentially represent a loose body, but when viewed in the context of an empty bicipital groove, the most likely choice is biceps tendon dislocation.
155. You are shown a CT image (Figure 2) of the pelvis of a 75-year-old man. What is the MOST LIKELY diagnosis?

A. Radiation osteitis  
B. Paget’s sarcoma  
C. Prostate metastasis  
D. Renal osteodystrophy

**Findings:**
There is diffuse sclerosis at the visualized osseous structures with coarsening of the trabeculae and cortical thickening. On the left, at the medial aspect of the ilium, there is focal bone destruction and a soft tissue mass.

**Rationale:**
A: Radiation-induced changes at the pelvis include focal sclerosis, osteonecrosis and insufficiency fracture. Although the latter are common at the sacrum in patients with osteoporosis, such fracture at the ilium suggests underlying radiation injury.

B: Sarcomatous transformation of Paget's disease develops in about 1% of patients, perhaps related to the extent of disease. The femur, pelvis and humerus are most commonly involved. Except for the higher frequency in the humerus and the lower frequency in the skull and vertebra the distribution is similar to the underlying disorder itself. The most common type of sarcoma is osteosarcoma, followed by malignant fibrous histiocytoma/fibrosarcoma and chondrosarcoma. Prognosis is uniformly poor. Bone lysis, cortical destruction, lack of periosteal reaction and soft tissue mass is characteristic. Additional types of neoplastic involvement include Giant cell tumor of bone (benign and malignant), myeloma, lymphoma, leukemia and metastatic disease.

C: Although blastic metastases may be diffuse, coarsening of the trabeculae and cortical thickening are not features.

D: Renal osteodystrophy is osteomalacia and secondary hyperparathyroidism with or without complications of dialysis itself. Although bone sclerosis or osteopenia may result, coarsening of the trabeculae and cortical thickening are not features.
156. You are shown MR images (Figures 3 and 4) and a CT image (Figure 5) of the proximal thigh of a young boy. What is the MOST appropriate recommendation?

A. Percutaneous biopsy
B. Radiation therapy
C. Follow-up imaging
D. Chest CT

**Findings:**
There is a focal soft issue lesion at the iliopsoas muscle. MR demonstrates extensive surrounding muscle edema. CT shows well-defined, peripheral ossification.

**Rationale:**
A: Although the MR demonstration of the soft tissue mass is rather non-specific and therefore worrisome for soft tissue sarcoma, the extensive surrounding muscle edema suggests a traumatic, inflammatory or reactive condition. The CT demonstrates a pattern of mineralization characteristic of Myositis Ossificans, i.e., mature cortical bone at the periphery with non-mineralized immature osteoid centrally. Biopsy of evolving myositis ossificans, especially at the center of the lesion, will demonstrate immature cells which may be confused with osteosarcoma.

B: Although the MR demonstration of the soft tissue mass is rather non-specific and therefore worrisome for soft tissue sarcoma, the extensive surrounding muscle edema suggests a traumatic, inflammatory or reactive condition. The CT demonstrates a pattern of mineralization characteristic of Myositis Ossificans, i.e., mature cortical bone at the periphery with non-mineralized immature osteoid centrally. When fully mature, these lesions may be resected. If resected too early, they may recur. Radiation therapy is not indicated.

C: Although the MR demonstration of the soft tissue mass is rather non-specific and therefore worrisome for soft tissue sarcoma, the extensive surrounding muscle edema suggests a traumatic, inflammatory or reactive condition. The CT demonstrates a pattern of mineralization characteristic of Myositis Ossificans, i.e., mature cortical bone at the periphery with non-mineralized immature osteoid centrally. Follow-up imaging to document further maturation is appropriate.

D: Although the MR demonstration of the soft tissue mass is rather non-specific and therefore worrisome for soft tissue sarcoma, the extensive surrounding muscle edema suggests a traumatic, inflammatory or reactive condition. The CT demonstrates a pattern of mineralization characteristic of Myositis Ossificans, i.e., mature cortical bone at the periphery with non-mineralized immature osteoid centrally. The search for metastatic disease is premature.
157. You are shown an MR image of the forefoot (Figure 6). What is the MOST LIKELY pathogenesis?

A. Congenital malformation
B. Benign neoplasia
C. Compression neuropathy
D. Crystal deposition

**Findings:**
There is a soft tissue mass at the plantar aspect of the metatarsal heads at the third web space consistent with Morton's neuroma. There is no osseous erosion.

**Rationale:**
A: Incorrect.
B: Incorrect.
C: A soft tissue mass at the plantar aspect of the metatarsal heads, especially at the third or fourth web space is most likely a Morton's neuroma. Correlation with water-sensitive images is important to exclude a fluid collection such as a bursitis. The plantar digital nerve, usually between the third and fourth metatarsals, is susceptible to compression or entrapment at the deep transverse intermetatarsal ligament. Resulting damage leads to thickening and peri-neural fibrosis. This is, therefore, primarily a degenerative, post-traumatic disorder. The second web space may also be involved, the first uncommonly and the fourth rarely. It is usually unilateral and women are much more affected. Short axis T1WIs are best for detection.
D: Incorrect.
158. You are shown an AP radiograph of the foot (Figure 7). What is the MOST LIKELY etiology?

   A. Tuberculosis
   B. Motor vehicle accident
   C. Diabetes mellitus
   D. Psoriatic arthritis

**Rationale:**

A: Osteomyelitis and septic arthritis like inflammatory arthritis may result in uniform joint space narrowing and osseous erosion. Although the articulation itself may be destroyed, the articular relationships are not.

B: Injury to the foot may fracture the base of the second metatarsal and dislocate the forefoot to varying degrees and with different patterns of displacement. Multiple malalignments at the midfoot are not associated with the Lisfranc fracture/dislocation complex.

C: In addition to malalignment at Lisfranc's joint, there is extensive subluxation and dislocation at the midfoot with loss of the normal tarsal bone relationships. There is associated bone fragmentation. Such "disorganization" is typical of neuropathic osteoarthropathy. Diabetes remains the most likely underlying condition.

D: Inflammatory arthritis may result in uniform joint space narrowing and osseous erosion. Although the articulation itself may be destroyed, the articular relationships are maintained. The seronegative disorders are associated with new bone formation including ankylosis, periostitis, cupping and tendon and ligament ossification. This is different from the fragmentation and sclerosis associated with neuropathic disease.
159. You are shown an AP radiograph of the pelvis (Figure 8). What is the MOST LIKELY diagnosis?

   A. Hyperparathyroidism  
   B. Ankylosing spondylitis  
   C. Osteoporosis  
   D. Septic arthritis

**Findings:**
There is marked, diffuse osteopenia, widening of the SI joints and symphysis pubis, narrowing of the femoral necks and distortion about the symphysis pubis compatible with fracture deformity.

**Rationale:**
A: Features of hyperparathyroidism include osteopenia and bone resorption. Insufficiency fracture may result. The bone resorption of hyperparathyroidism has numerous manifestations. Subcortical resorption may produce widening at the SI joints and symphysis pubis. Subperiosteal resorption may result in narrowing or constriction at the femoral necks.

B: Although the osseous erosions of sacroiliitis may result in joint space widening, it is not as pronounced and uniform as here. In addition, reactive sclerosis is typical of the inflammatory spondyloarthropathies.

C: Although osteoporosis may result in diffuse osteopenia, it will not result in SI joint widening and subperiosteal resorption.

D: The destruction of septic arthritis may result in widening of the joint but monoarticular involvement is typical. Associated osteopenia is focal not diffuse. Subperiosteal resorption at the femoral necks is not a feature of infection.
160. You are shown MR images (Figures 9-11) of a young man with leg pain. What is the MOST LIKELY diagnosis?

A. Osteomyelitis  
B. Lymphoma  
C. Langerhans cell histiocytosis  
D. Stress reaction

**Rationale:**

A: Stress reactions and stress fractures often demonstrate abnormal SI with water sensitive imaging that is much more conspicuous than with other imaging sequences, particularly T1WI's. This is a clue to the traumatic nature of the disorder. Infiltration of the bone marrow with infection or neoplasm results in conspicuous abnormal SI with both T1WI and water sensitive imaging.

B: Stress reactions and stress fractures often demonstrate abnormal SI with water sensitive imaging that is much more conspicuous than with other imaging sequences, particularly T1WI's. This is a clue to the traumatic nature of the disorder. Infiltration of the bone marrow with infection or neoplasm results in conspicuous abnormal SI with both T1WI and water sensitive imaging.

C: Stress reactions and stress fractures often demonstrate abnormal SI with water sensitive imaging that is much more conspicuous than with other imaging sequences, particularly T1WI's. This is a clue to the traumatic nature of the disorder. Infiltration of the bone marrow with infection or neoplasm results in conspicuous abnormal SI with both T1WI and water sensitive imaging.

D: Stress reactions and stress fractures often demonstrate abnormal SI with water sensitive imaging that is much more conspicuous than with other imaging sequences, particularly T1WI's. This is a clue to the traumatic nature of the disorder. Infiltration of the bone marrow with infection or neoplasm results in conspicuous abnormal SI with both T1WI and water sensitive imaging.
161. You are shown flexion-extension radiographs (Figures 12 and 13). What is the MOST LIKELY diagnosis?

A. Rheumatoid arthritis  
B. Os odontoideum  
C. DISH  
D. Type III odontoid fracture

**Findings:**
There is atlantoaxial subluxation. There is hypoplasia of the odontoid process with a well-corticated ossicle above. The posterior arch of C1 is hypoplastic and there is hypertrophy of the anterior arch. There is multi-level degenerative disc disease.

**Rationale:**
A: Rheumatoid arthritis is a common cause of atlanto-axial subluxation. This is secondary to ligamentous laxity and erosion of the transverse ligament and/or odontoid process. The smooth contour of the hypoplastic dens, hypertrophy of the anterior arch of C1 and the os odontoideum are not features of RA.
B: An os odontoideum is a well-corticated ossicle superior to a hypoplastic or absent odontoid, usually one half the size of a normal odontoid process. There may be hypertrophy of the anterior arch of C1 which suggests a chronic process. Although often considered a congenital disorder, its development following fracture of a previously normal dens with subsequent osteolysis has been documented. Absence of a normal odontoid process-transverse ligament relationship allows for atlanto-axial instability.
C: There is multi-level degenerative disc disease with disc space narrowing, endplate sclerosis and osteophyte formation. There is no ossification of the anterior longitudinal ligament. Atlanto-axial subluxation is not a feature of DISH.
D: Type II odontoid fractures (transverse, at the base with no involvement of the body) are less stable than Type III fractures (with extension to the body) because there is less surface contact for healing. Atlanto-axial subluxation may occur in either type. No fracture is demonstrated here and there is no pre-vertebral swelling.
162. You are shown frontal radiographs (Figures 14 and 15). What is the MOST LIKELY diagnosis?

A. Langerhans cell histiocytosis
B. Fibrous dysplasia
C. Ewing’s sarcoma
D. Simple bone cyst

**Findings:**
There is a lytic, geographic lesion at the metaphysis, oriented along the long axis of the bone and wider at the metaphyseal end. There is a fragment of bone in the dependent portion of the lesion. There is no periosteal reaction or cortical destruction. There is no matrix mineralization.

**Rationale:**
A: The radiograph shows a characteristic “fallen fragment” which reveals the cavitary nature of this lesion. Langerhan Cell Histiocytosis may have varied radiographic appearances but are solid lesions. Statistically, a benign metaphyseal lytic lesion at the proximal humerus of a child or teenager is most likely a simple bone cyst.

B: The radiograph shows a characteristic “fallen fragment” which reveals the cavitary nature of this lesion. Fibrous dysplasia may have varied radiographic appearances but are solid lesions. Statistically, a benign metaphyseal lytic lesion at the proximal humerus of a child or teenager is most likely a simple bone cyst.

C: The radiograph shows a characteristic “fallen fragment” which reveals the cavitary nature of this lesion. Ewings sarcoma may have varied radiographic appearances but are solid lesions. They characteristically demonstrate aggressive periosteal reaction and a prominent soft tissue mass. They are more common at the diaphysis but may be metaphyseal. Statistically, a non-aggressive metaphyseal lytic lesion at the proximal humerus of a child or teenager is most likely a simple bone cyst.

D: A simple (unicameral) bone cyst is a true fluid-filled cavity and when associated with a fracture, a fragment of bone may settle in the dependent portion of this cyst. The radiograph shows a characteristic “fallen fragment” which reveals the cavitary nature of this lesion. As the patients gets older, the process of enchondral bone formation may produce bone proximal to the lesion, and the cyst will appear more diaphyseal. It is important to stress that simple bone cysts don't always look so simple when they are complicated by fracture. The most common location for a simple bone cyst in the skeletally immature is by far the proximal humerus, followed by the proximal femur. Statistically, a benign metaphyseal lytic lesion at the proximal humerus of a child or teenager is most likely a simple bone cyst with or without a "fallen fragment."
163. You are shown MR images of the knee (Figures 16-18). Which one of the following statements applies to the pathology demonstrated?

A. There is a focal and diffuse form.
B. The shoulder is most frequently involved.
C. Radical excision and joint replacement are preferred methods of treatment.
D. Patients present with hemorrhagic effusion.

Findings:
There is a fairly well-defined, ovoid mass at the intercondylar notch with low SI with T1 and T2 weighting and intermediate SI with water sensitive technique most consistent with nodular synovitis.

Rationale:
A: The differential diagnosis of a focal mass at the intercondylar notch includes cruciate ganglion cyst, joint body, synovial chondroma and nodular synovitis. The MR appearance is not that of a cyst or joint body. The relatively low SI favors nodular synovitis. The proliferative disorders of the synovium (synovial chondromatosis and PVNS) both have a focal and diffuse form and both may be intra- or extra-articular. The intra-articular forms are most common at the knee. The focal forms are best treated with simple excision and neither presents with hemmorhagic effusion. Histologically, focal nodular synovitis consists of a well-defined soft tissue mass with varying amounts of histiocytic mononucleated giant cells, collagen strands, and xanthomatous cells covered by a lining of synovial tissue which are features of PVNS as well. The main difference is a relative lack of hemosiderin, with a variably small concentration compared to PVNS. This more localized form is more common at the tendon sheath at the hand, i.e., giant cell tumor of tendon sheath. The knee is the most common site for intra-articular nodular synovitis and the diffuse form of PVNS. Within the knee, the nodular form is most common at Hoffa’s fat, the supra-patellar bursa and the intercondylar notch.

B: The knee is the most common site for PVNS and synovial chondromatosis, focal or diffuse. Nodular synovitis at the knee is most common at Hoffa’s fat pad, followed by the suprapatellar bursa and the intercondylar notch.

C: Simple excision is the primary method of treatment for nodular synovitis since the risk of recurrence is negligible and it does not metastasize. Diffuse PVNS requires synovectomy and recurrence is a common problem.

D: Patients with nodular synovitis present with mechanical symptoms most frequently. Hemorrhagic effusion is not a feature.
164. Concerning de Quervain’s tenosynovitis, which one of the following is CORRECT?

A. Imaging is essential for diagnosis.
B. Ultrasound shows thickening and edema of the extensor carpi ulnaris tendon.
C. The condition is most common in women between 30 and 50 years of age.
D. It may lead to palmar fibromatosis and contracture.

Rationale:
A: The disorder is traditionally diagnosed clinically.
B: This is a disorder of the radial, not ulnar side of the wrist, specifically the first dorsal compartment (extensor pollicis brevis and abductor pollicis longus tendons).
C: One synonym, "washer woman's sprain," indicates the pathogenesis (repetitive activity and overuse leading to friction, inflammation and scarring) and the type of patient. Women are affected 8-10X as much as men. This condition is also seen in athletes.
D: Palmar fibromatosis is the cause of Dupytren contracture or disease and it is the most common of the fibromatoses. It begins as a nodular mass at the palmar aponeurosis and progresses to cord-like thickening with contracture. Dupytren contracture is not related to de Quervain tenosynovitis.

165. Concerning rupture of the anterior cruciate ligament, which one of the following is CORRECT?

A. It is more common in men.
B. Avulsion of the anterior tibial spine may occur.
C. Most are associated with bone contusion.
D. Most are associated with a Segond’s fracture.

Rationale:
A: Women are up to eight times more likely to tear their ACL. This is likely multifactorial, including hormonal.
B: The ACL runs from the intercondylar notch to the anterior medial intercondylar tibial eminence. The PCL extends from the intercondylar notch to the posterior lateral intercondylar tibial eminence. No structures insert on the tibial spines. Avulsion fractures occur when the ligament is stronger than the attachment site, usually in younger individuals. In such cases the ligament itself is intact.
C: Bone contusions are common sequelae of ACL rupture resulting from femoral and tibial impaction at the time of injury. Most commonly, valgus stress with rotation and subsequent ACL insufficiency allows the posterior lateral femoral condyle to impact the posterior lateral tibial plateau. Less common mechanisms of ACL injury including hyperextension and varus stress with rotation produce less common contusion patterns. All of these, however, are useful secondary signs of ACL rupture.
D: The Segond fracture is an avulsion fracture at the lateral margin of the proximal tibia related to the attachment of the posterior fibers of the iliotibial tract posterior to Gerdy's tubercle and the anterior oblique band (AOB) of the fibular collateral ligament (FCL). Varus stress is required to create tension at the lateral aspect of the knee and subsequent avulsion. There are several mechanisms of injury that result in ACL tear. Most ACL tears are associated with valgus stress. Therefore, most ACL tears are not associated with Segond fracture. When present, however, these fractures predict ACL rupture 90% of the time.
166. Concerning ankylosing spondylitis, which one of the following is more commonly involved?

A. Shoulder  
B. Hip  
C. Knee  
D. Ankle

**Rationale:**
A: Incorrect.  
B: The spine and sacroiliac joints are most frequently involved in cases of Ankylosing Spondylitis. Peripheral joint involvement, however, is common. The hips, shoulders, knees, ankles, wrists, elbows and small joints of the hand and feet may be affected. Of these, the root or more central hip and shoulder articulations are most commonly involved. The hip is the most common peripheral joint affected and accounts for one of the most disabling aspects of the disease.  
C: Incorrect.  
D: Incorrect.

167. Which one of the following conditions is associated with joint-space widening of the adult hip?

A. Effusion  
B. PVNS  
C. Rheumatoid arthritis  
D. Acromegaly

**Rationale:**
A: A joint effusion may distend the joint capsule but will not displace the articulation itself.  
B: Any mass-like lesion within the joint may grow and distend the joint capsule. Disorders such as PVNS and synovial chondromatosis may focally erode the adjacent bone and cartilage. The joint space and overall depth of articular cartilage, however, is maintained. The articular surfaces are not "pushed" away from each other.  
C: Rheumatoid arthritis, like any inflammatory or septic arthritis, uniformly destroys the articular cartilage leading to uniform joint space narrowing.  
D: The articular cartilage in adults with increased secretion of growth hormone hypertrophies leading to true widening of the joint space. Ultimately, this cartilage will outgrow its ability to nourish itself and die. The ensuing desiccation and collapse leads to premature osteoarthritis.
168. Which one of the following findings is a feature of both synovial chondromatosis and PVNS?

   A. Calcification
   B. Hemorrhage
   C. Neoplasia
   D. Inflammation

Rationale:
A: Synovial chondromatosis may or may not calcify and ossify and this calcification is characteristic and often diagnostic. PVNS almost never calcifies.
B: PVNS is characterized by bleeding into the joint and subsequent hemosiderin deposition which is often diagnostic. Hemosiderin deposition is the "pigment" of pigmented villonodular synovitis. Synovial chondromatosis is not associated with hemarthrosis.
C: Recently, genetic studies have suggested that PVNS and synovial chondromatosis are benign neoplasms.
D: Historically, PVNS was never considered to be an inflammatory disorder despite the misnomer "synovitis." The etiology has been disputed. Synovial chondromatosis had been considered primarily a metaplasia until recently. Both are now considered to be benign neoplastic conditions.

169. Which one of the following is NOT a complication of osteoid osteoma?

   A. Overgrowth
   B. Malignant transformation
   C. Synovitis
   D. Osteoarthritis

Rationale:
A: Growth deformity secondary to the hyperemic osteoid osteoma may be seen in the immature skeleton. Increase in the length and girth of long tubular bones is a known complication.
B: Osteoid osteoma is a benign bone forming neoplasm. There are no reported cases of malignant transformation.
C: Intra-articular lesions may provoke a lymphofollicular synovitis resulting in pain, soft tissue swelling, effusion and limited range of motion. The initial clinical presentation may mimic a primary arthritis. Radiographs may reveal peri-articular osteopenia and the correct diagnosis may be missed for a long while.
D: The synovitis of intra-articular lesions may lead to irreversible joint damage and premature osteoarthritis. Growth deformity secondary to the hyperemia of the tumor and the synovitis may also contribute to altered joint mechanics and secondary osteoarthritis.
170. Which one of the following may be associated with compression neuropathy of the median nerve?

A. Ligament of Osborne
B. **Ligament of Struthers**
C. Anconeus epitrochlearis
D. Arcade of Frohse

**Rationale:**
A: The ligament of Osborne or cubital tunnel retinaculum or arcuate ligament extends from the medial epicondyle proximally to the medial olecranon process distally. It is the roof of the cubital tunnel and, therefore, may be associated with compression neuropathy of the ulnar nerve. The floor of the tunnel is the joint capsule and portions of the ulnar collateral ligament. The cubital tunnel is the most common site of ulnar neuropathy.

B: The ligament of Struthers is a fibrous band that may arise from a supracondylar process and attach to the medial epicondyle forming a fibro-osseous tunnel through which the median nerve may become entrapped. The supracondylar process syndrome is the least common compression neuropathy of the median nerve. The supracondylar process or avian spur is seen in about 3% of individuals. The ligament of Struthers should not be confused with the arcade of Struthers which is a fibrous band about 8 cm proximal to the medial epicondyle related to the medial head of the triceps and medial intermuscular septum. The ulnar nerve passes beneath.

C: The anconeus epitrochlearis is an accessory muscle in the cubital tunnel and therefore, may be associated with compression neuropathy of the ulnar nerve. Because the roof of the cubital tunnel may vary from no ligament at all to a well defined accessory muscle, some think the cubital tunnel retinaculum is a remnant of the anconeus epitrochlearis.

D: The arcade of Frohse is a fibrous ridge at the proximal aspect of the supinator muscle and may compress the radial nerve. Near the radiocapitellar joint, the radial nerve branches into the deep, motor, posterior interosseous nerve and the superficial sensory branch. It is the deep branch that passes beneath the arcade of Frohse which is the most common site of compression of the radial nerve.

171. Concerning soft tissue sarcoma, which one of the following statements is CORRECT?

A. Liposarcoma has a characteristic MR appearance.
B. Synovial sarcoma is most commonly an intra-articular mass at the knee.
C. Malignant fibrous histiocytoma is unusual in adults.
D. **Myxoid subtypes may appear cystic.**

**Rationale:**
A: Only low grade liposarcomas contain abundant fat.

B: Synovial sarcoma does not arise from the synovium but more likely undifferentiated mesenchymal tissue. The term, therefore, is a misnomer. The lesion rarely arises in joints and is most common at the soft tissues of the lower extremity. It is the most common soft tissue sarcoma of the lower extremity in patients between 5 and 35 years of age.

C: MFH is the most common soft tissue sarcoma of older adults.

D: Myxoid Malignant Fibrous Histiocytoma and particularly myxoid liposarcoma may appear cystic with MR imaging, especially when near joints. U/S or gadolinium enhanced MR will differentiate synovial or ganglion cysts from sarcoma.
172. When all other imaging characteristics are held constant in an MRI acquisition, the image’s signal-to-noise ratio (SNR) will be increased by:

A. decreasing the number of phase-encoded steps.
B. decreasing the slice thickness.
C. increasing the TE.
D. decreasing the bandwidth.

Rationale:
A: Image SNR (the image signal divided by the standard deviation determined by a region of interest in a uniform image area) is determined by the number of times the volume is excited, which is directly proportional to the number of phase encode steps.
B: Image SNR is directly proportional to the voxel volume, which is determined by the x, y and z dimensions. Slice thickness determines one dimension of the voxel, and by decreasing the slice thickness, SNR will drop proportionately to the loss of volume.
C: As TE lengthens, more transverse magnetization decay occurs, reducing the signal that is acquired. While longer TE potentially gives better contrast (when optimized for T2 differences), the absolute signal is decreased.
D: Image SNR is inversely proportional to the square root of the bandwidth: $\text{SNR} \propto \text{BW}^{-1/2}$. Note: by reducing the bandwidth, in order to keep the slice thickness the same, the gradient strength must also be reduced.

173. Concerning chondroblastoma, which one of the following statements is CORRECT?

A. **MR imaging commonly demonstrates bone marrow edema.**
B. Lesions are metaphyseal prior to closure of the growth plate.
C. Middle-aged individuals are usually affected with a peak incidence of 45 years.
D. Calcification is rare.

Rationale:
A: Although chondroblastoma is a benign bone tumor characterized by a well-defined, sclerotic margin, it may provoke periosteal reaction, bone marrow and soft tissue edema. The MR appearance of these features may suggest a more aggressive lesion and the importance of the initial radiographic findings cannot be overemphasized.
B: The radiographic hallmark of this benign cartilaginous neoplasm is a well-defined osteolytic lesion often with a sclerotic border that is centrally or eccentrically located within the epiphysis or apophysis of a bone, usually a long bone. Chondroblastoma may cross the growth plate but does not originate in the metaphysis. Sometimes patients present after growth plate closure in which case the lesion may appear as subarticular.
C: Nearly 90% of patients present between the ages of 5 and 25 years, usually, but not always before skeletal maturity.
D: Although many of these benign cartilaginous neoplasms do not calcify, approximately 30% to 50% contain calcification.
174. Concerning melorheostosis, which one of the following statements is CORRECT?

A. It is asymptomatic.
B. It is transmitted as an autosomal dominant trait.
C. It generally affects older adults.
D. It is associated with endosteal hyperostosis.

Rationale:
A: Clinical manifestations include pain, swelling, weakness and limited range of motion. There may be muscle atrophy, muscle contracture and tendon and ligament shortening. Limb length discrepancy, scoliosis and joint contracture may develop. Bony masses may protrude into adjacent joints. The periarticular soft tissues may calcify and ossify ultimately leading to joint ankylosis.
B: Although it tends to present in late childhood/early adulthood it is not an inherited disorder.
C: It is usually recognizable in children and young adults.
D: Melorheostosis is characterized by cortical hyperostosis along the length of a bone which appears wavy and sclerotic, reminiscent of melted candle wax dripping down the side of a lit candle. The distribution of involvement tends to correlate with single sclerotomes which represent skeletal zones supplied by individual sensory nerves. Endosteal hyperostosis is often associated and may completely occupy the medullary canal. In the carpal and tarsal bones, rounded foci may resemble osteopoikilosis. In fact, although osteopoikilosis, osteopathia striata and melorheostosis possess unique radiographic findings, many patients demonstrate elements of each, hence the concept of mixed sclerosing bone dystrophy or dysplasia.