Can't touch this: top ten most commonly misdiagnosed skeletal do not touch lesions

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Learning objectives

1. Recognize skeletal "do not touch" lesions through CT, MRI and plain film
2. Compare with misdiagnosed differentials
3. Acknowledge the importance of quick detection for diagnosis and avoiding unnecessary procedures
Background

Skeletal "do not touch" lesions are defined as being so radiologically characteristic that further diagnostic interventions are unnecessary. Most are found incidentally. Given their characteristic appearance, offering differentials would be inappropriate and lead to unnecessary interventions, amounting to avoidable economic expenses and preventable morbidity. Unfamiliarity can lead to misdiagnosis and affected management.
Findings and procedure details

NORMAL VARIANTS:

#Humeral pseudocyst Fig. 1 on page 13

1. **Overview:** Increased amount of fat within bone with concomitant decrease in trabeculae on the superolateral aspect of the humeral head (greater tuberosity).[1,2] With disuse, may become more lucent.[2]

2. **Imaging:** Sharp demarcation between radiolucent pseudolesion and normal bone marrow in superolateral portion of the humeral head, best seen on external rotation.[1] May show radionuclide uptake in the setting of shoulder disorder. The increased fat in the pseudocyst is appreciated on MRI.[1]

3. **Misdiagnoses:**

   - **Chondroblastoma Fig. 2 on page 13**
     
     **#Overview:** Benign cartilaginous neoplasms in the epiphysis of long bones, usually lower extremities. Incidence of humeral involvement is 20%→90% occur in the proximal humerus.[4] Tend to occur in children.[3,4]
     
     **#Imaging:** Well-defined, lytic lesions with sclerotic margins, eccentric in epiphyseal region of the bone involved.[3,4,5] Tend to measure 1-4cm, [3,4] and could present with internal chondroid matrix calcification, seen on CT (50% of cases).[5,7] MRI: low signal intensity on T1WI,[3] surrounding reactive marrow edema, joint effusion or fluid-fluid levels after aneurysmal bone cyst formation.[5]

   - **Infection Fig. 3 on page 14**
     
     **#Overview:** Subacute/chronic osteomyelitis can cause intraosseous (Brodie's) abscesses that occur in the metaphysis of long bones[1] and walled-off intraosseous infection surrounded by granulation tissue/sclerosis.
     
     **#Imaging:** Acutely periosteal reaction secondary to tissue swelling/abscess formation. Chronically: Brodie's abscess may be visualized well-defined lytic lesion, which may be single/multilobulated, with surrounding sclerosis fading into the periphery.[1] Tend to present cortical destruction/disorganized trabecular patterns.

   - **Metastasis Fig. 4 on page 15**
     
     **#Overview:** Typically multiple lesions at time of diagnosis, located in the medullary canal with outward cortical spread.
     
     **#Imaging:** Lytic, sclerotic or mixed lesions usually >2cm. CT imaging allows for better depiction of lesions. MRI may show T1 hypointense foci, varying T2 intensities and hyperintense areas on STIR sequences.

#Os odontoideum Fig. 5 on page 16

1. **Overview:** Ossicle superior to shortened dens base.[5] Not considered an acute finding and no immediate need for halo fixation/operative management.
May be unstable#central canal stenosis and cord compression. May be fused to C1, or move anterior to C2 with flexion.

2. **Imaging**: Smooth, well-corticated ossicle superior to hypoplastic dens. May also see a hypertrophied anterior arch of C1.[5]

3. **Misdiagnoses**:

   - **Persistent ossiculum terminale**Fig. 6 on page 17
     
     **#Overview**: Persistence of unfused odontoid tip ossification center.[7] Usually asymptomatic, stable and without clinical significance. Rarely presents with neck pain or instability.
     
     **#Imaging**: Smooth, separate, corticated ossicle at the tip of the dens, with the dens usually of normal size.

   - **Odontoid fracture**Fig. 7 on page 18
     
     **#Overview/Imaging**: Usually occur after flexion injuries.[2] Divided into three groups:
     
     1. **Type I** (1-3%): Avulsion fracture of the odontoid tip at the insertion of the alar ligament#stable.
     2. **Type II** (54-60%): Transverse through the base of the dens at the junction of the C2 body. Seen in the elderly (>70).
     3. **Type III** (39-42%): Transverse or oblique and extend into C2 vertebral body#prone to displacement.

# Patellar dorsal defect (PDD)Fig. 8 on page 34

1. **Overview**: Benign normal variant,[2] though some believe it to be a chronic traumatic lesion via pull-through of the vastus lateralis.[5] Classically located in the superolateral aspect of the patella.[8] Usually asymptomatic, though may present knee pain. Resolve spontaneously, leaving behind an irregular sclerotic area.[7]

2. **Imaging**: Round, lucent lesions with sclerotic margins at dorsal aspect of the patella.[5] MRI: Intact articular cartilage, focal T2 hyperintensity and T1 hypointensity,[2] without bone marrow edema.

3. **Misdiagnoses**:

   - **Infection**
     
     See previously described **Infection**

   - **Osteochondritis dissecans**Fig. 9 on page 36
     
     **#Overview**: An osteochondral injury, affecting both the articular cartilage and bone. Usually seen post-traumatically and in adolescents.[3] Due to cartilage dehydration and thickening#transmits greater force onto the subchondral bone. Most common in the knee, at lateral aspect of medial femoral condyle, followed by ankle and elbow.[3] May also be seen in the lateral femoral condyle and patella.[10]

     **#Imaging**:
     
     1. **Stage I**: Localized trabecular compression
     2. **Stage II**: Incompletely separated fragment and formation of subchondral cysts
3. **Stage III**: Undetached, non displaced fragment  
4. **Stage IV**: Displaced, inverted fragment  
5. MRI: fluid-sensitive sequences#hyperintense curvilinear region interposed between an osteochondral fragment and the underlying bone#suggesting instability.[3]  

**POST-TRAUMATIC**

**# Avulsion injury** Fig. 10 on page 24  

1. **Overview**: Seen in children and adolescents, whose muscles/tendons commonly attach to apophyses#making them more susceptible to trauma. [11] Common among patients who participate in sports and can happen in any ligament-to-bone/tendon-to-bone insertion sites.[5,9] Avulsion injuries may mimic malignant lesions histologically, especially among the skeletally immature.[5]  
2. **Imaging**:  
   1. **Acute**: Avulsed fragments, adjacent to or displaced from the parent bone with possible soft tissue findings, such as hematomas.[5]  
   2. **Subacute**: Mixed lysis and sclerosis.  
   3. **Chronic**: May be associated with a protuberant bony mass or exuberant callus, resembling neoplasm or infection.[5,11] MRI can detect ligaments, tendons and muscle, allowing for detection of fragment origin.[11]  
3. **Misdiagnoses**  
   • **Calcific tendinitis** Fig. 11 on page 19  
     #Overview: Calcium hydroxyapatite crystals deposit in peri-articular tissues, within tendons#pain/dysfunction of the affected anatomical region. The most commonly affected area: rotator cuff#supraspinatus tendon.[3] Women and patients that have sedentary jobs are more prone to shoulder calcific tendinopathy.[12]  
     #Imaging: Varied anatomical positioning ensures that the calcium deposition is visualized. Ultrasonography findings vary depending on the stage of calcific tendinopathy: resting phase#calcifications hyperechoic with acoustic shadowing; resorptive phase#fluffy, fragmented calcium deposits.  
   • **Tumor**  
     #Overview: Abnormal growth of cells that have no physiologic function essential to the normal homeostasis of the human body.  
     #Radiographic characteristics: May have calcium, cause abnormal bone growth within normal bone, or cause bone destruction.  

**#Discogenic vertebral sclerosis (DVS)** Fig. 12 on page 20  

1. **Overview**: Variant of a Schmorl node, DVS falls on a spectrum of changes involved in degenerative disk disease (DDD)#"Modic" changes, of which
there are three types: Modic Type 1 ('fluid-like'), Modic Type 2 ('fat-like') and Modic Type 3 ('sclerotic-like' changes classically related to the endplate).

Presentation: middle-aged woman with chronic low back pain.[13,14,15]

2. Imaging: Sclerosed vertebral body, usually anteriorly, with osteophytes/joint space narrowing.[2] May appear as lytic or mixed. There is always an association to the endplate and the disc space should be narrow. Associated degenerative changes (ex. vacuum phenomenon) and possible loss of vertebral body height will also be present. MRI: hypointense lesions on all pulse sequences.[16]

3. Misdiagnoses

- **Metastasis** Fig. 13 on page 21
  - See previously described Metastasis
- **Disk space infection**
  - **Overview**: Or discitis/diskitis, it is usually the product of blood-borne agents and is mostly seen in the pediatric population or adults in the post-operative setting.
  - **Imaging**: May present as sclerotic lesions in the vertebral body with narrowed disc space, but will also have sclerosis of adjacent bodies and irregularity of endplates due to erosive changes, with intradiscal fluid-like signal.

**Subchondral cysts** (Geodes) Fig. 14 on page 22

1. **Overview**: Subarticular cystic-like lesions[2] with strong association to degenerative joint disease (DJD). Osteoarthritis, particularly, can lead to defects in the overlying cartilage, allowing synovium/joint fluid to enter subchondral bone, producing the 'cysts.'[1,13,16]

2. **Imaging**: Small, well-defined lytic lesions with sclerotic margins in periarticular surfaces. MRI: hypointense sclerotic margins and thin extension to articular surface. May extend to tubular bone.[1] Fluid signal intensity characteristics, presenting T1 isointensity to muscle and T2 hyperintensity. May present T1 hyperintensity if proteinaceous material is contained within the cyst, as well as enhancement if it contains fibrous material.

3. Misdiagnoses:

- **Epiphyseal lytic lesions**
  - **Overview**: The differential diagnosis for a lytic lesion of the epiphysis is infection, chondroblastoma, giant cell tumors.[9,16] Geodes must be considered when dealing with a lytic epiphyseal lesion concurrent with any entity that can cause DJD.[9]
  1. **Infection**: See previously described Infection
  2. **Chondroblastoma**: See previously described Chondroblastoma
  3. **Giant cell tumor (GCT)** Fig. 15 on page 23: Uncommon, locally aggressive, generally benign tumor that occurs in adults, 25-40, in the ends of long bones.[2] Cannot be categorized as benign or malignant
radiographically/histologically, with suspicion of malignancy on the basis of their recurrence rate.[2] Four criteria must be met:
1. Closed epiphyses (98-99% of cases)
2. Abuts the articular surface
3. Eccentric
4. Well-defined lesion with non-sclerotic margins

# Humeral Pseudodislocation

Fig. 16 on page 29

1. **Overview**: Occurs post-traumatically, after hemarthrosis from a fracture causes joint distension/inferior migration of the humeral head. Appearance could lead to fruitless/painful “relocation” attempts.[2] Typically has spontaneous resolution of strength and tone. May necessitate sling and joint aspiration for symptom relief.[17,18]
2. **Imaging**: Inferolateral migration of the humeral head. Transcapsular/axial views are key to diagnosing humeral pseudodislocations,[2] as they show that the humeral head is not anteriorly or posteriorly dislocated.
3. **Misdiagnoses:**

   • **Shoulder joint dislocation**
   
   #Overview: Most common type: anterior dislocation#subcoracoid dislocation. Posterior dislocation#occurs after direct or indirect force (seizures/electric shock)#most commonly subacromial. Inferior dislocations#cause luxatio erecta#may cause brachial plexus and axillary vasculature injury.[18]
   
   #Imaging:
   1. **Anterior**: Humeral head#anteriorly displaced with respect to glenoid, inferior to the coracoid process. Predisposed Hill-Sachs (posterosuperior and lateral) and Bankart (anteroinferior) lesions. Fig. 17 on page 36
   2. **Posterior**: Best seen on axillary view, the humeral head#superior to glenoid. Grashey view shows characteristic loss of glenohumeral space. Fig. 18 on page 35
   3. **Inferior**: Humeral head#below glenoid with shaft in extreme abduction with abutment of the humeral neck against acromion process.

**REAL LESIONS THAT ARE BENIGN**

# Calcaneal Pseudotumor

Fig. 19 on page 25

1. **Overview**: Non-neoplastic lesions that usually occur in patients with severe hemophilia resulting from recurrent extra-articular hemorrhage. Most common bony locations#femur, pelvis, tibia#rarely involve the calcaneus. Progressive expansion#erosion of calcaneal tuberosity#pathologic fractures. [19,20]
2. **Imagin**: Varies with different locations, hemorrhage stage, bone destruction, and soft tissue abnormalities.
**X-Ray:** Well-defined, expansile, unilobular/multilobular, and osteolytic with sclerotic border. Trabeculae may be seen crossing the osteolytic zones.

**CT:** Better modality for trabeculae evaluation, cortical changes, and periosteal reaction. Central area of lesion will have variable attenuation#different stages of hemorrhage.

**MRI:** May see an intramedullary cystic lesion with fluid components and heterogeneous signal intensity, correlating with recurrent hemorrhages and clot formation. T2 hypointensity on the lesion margins#hemosiderin deposition.

3. **Misdiagnoses:**

- **Calcaneal lipoma** *Fig. 20 on page 26*

  **Overview:** Benign neoplasm that most commonly affects the calcaneus (15%), subtrochanteric region of the femur (15%), distal tibia/fibula (13%/20%) and metatarsals.[16,20]

  **Imaging:** Well-circumscribed radiolucent lesion with thin sclerotic borders, as well as a central ossified nidus. [3] Lesion respects cortical bone and the periosteum. CT imaging will confirm the fat density of the mass, as well as display the nidus component.

- **Calcaneal unicameral bone cyst (UBC)**

  **Overview:** Solitary/simple bone cyst#benign fluid-filled lesion that typically occurs between the ages of 10-20. [5] Typically on long tubular bones (90%), usually the proximal metaphysis of the humerus.[5] Only 4% are in the calcaneus and always affect the anteroinferior portion of the calcaneus (base of the calcaneal neck). Usually involute more slowly than at other areas and thus may be seen in older patients and undergo "lipidization". [16,20]

  **Radiographic characteristics:** Explansile lesions that are always located centrally/intramedullary[2,3] and respect the physis. There is generally no periosteal reaction, unless fractured, where the fractured cortical fragment may migrate to the dependent portion of the cyst ("fallen fragment sign")#pathognomonic in a young patient in a location appropriate for UBC. [3,5] Fluid-fluid levels within the cyst may be seen. MRI: hypointensity on T1 and hyperintensity on T2.[5]

- **Chondroblastoma**
  - See previously described **Chondroblastoma**

- **Giant Cell Tumor**
  - See previously described **Giant Cell Tumor**

4. **Enostosis (Bone Island)** *Fig. 21 on page 27*

   1. **Overview:** Small, spiculated osteoblastic focus of cortical bone within cancellous bone.[3] Clinically insignificant, though may increase in size over time.[6] If large enough (>2cm), may be difficult to differentiate from aggressive entities.[3] May be associated to osteopoikilosis#multiple bone islands.
2. **Imaging**: Small, round/oval sclerotic focus. A brush border that blends with the host trabeculae is classically seen.[5] MRI: homogeneously dense, well-marginated lesion with low signal intensity on all sequences#compact bone.
[6]

3. **Misdiagnoses**:

   - **Osteoblastic metastasis (mets)** Fig. 13 on page 21
     
     #Overview: More common in adults over 40, typically originate from the prostate/breasts. In elderly patients with breast/prostate cancer, must be first in the differential when presented with diffuse sclerotic lesions.
     
     #Imaging: Diffuse sclerotic lesions in a patchy pattern, or multiple, well-circumscribed sclerotic lesions that do not blend into the surrounding trabeculae.[6] CT imaging can help differentiate untreated mets using threshold Hounsfield Unit (HU) values: mean attenuation of 885 HU and maximum of 1060 HU are a reliable threshold below which mets are the favored diagnosis.

   - **Osteoid osteoma**
     
     #Overview: Common benign bone tumor seen in children, adolescents and young adults.[6] Classically associated with nighttime pain relieved by aspirin. Consists of a nidus of highly vascularized fibrous tissue producing osteoid.[2] Typically cortical.[3]
     
     #Imaging: Dense, sclerotic area surrounding a lucent nidus, #2cm in diameter, with varying degrees of surrounding reactive sclerosis. Typically no periosteal reaction. May present eccentrically. On radionuclide scans, there is a hot spot corresponding to the nidus, with less uptake in the surrounding sclerotic border#double density.[5]

   - **Osteosarcoma (OS) (low-grade)**
     
     #Overview: Common primary malignant bone tumors that produce an osteoid matrix. Typically occur in the metaphysis. High-grade/conventional (HGOS)#most common subtype (80%).[6] Low-grade OS (LGOS)#less than 1% of all OS.[7] Central LGOS, like enostosis, tends to occur in the medullary canal of long bones, typically involving the femur and tibia.
     
     #Imaging: LGOS most commonly presents with a large, intra-compartmental, expansile lytic, destructive lesion with coarsely thick/thin incomplete trabeculations. May also present as a densely sclerotic lesion, which may mimic an enostosis. Lesions may extend to surrounding tissue, with cortical erosion/soft tissue extension.

# Non-ossifying fibroma Fig. 22 on page 28

1. **Overview**: Most common focal lesion in the bone. Classified as benign fibrohystiocytic tumors (WHO classification).[5] Typically >2cm. May appear in up to 30-40% of adolescents. Commonly around the knee. Healing is typically spontaneous any may leave behind a sclerotic ghost.[5] Eccentric and not contained in the cortex. Margins are typically sclerotic and may
appear trabeculated/septated. May grow large enough to produce pain or predispose to pathological fracture.

2. **Imaging**: Lytic lesions, sharply demarcated by a sclerotic border, usually in metaphyseal areas with polycyclic borders that protrude into the medullary cavity. MRI: heterogeneous lesion with low-signal intensity in T1WI and decreased central T2 signal (varies depending on healing stage) that enhances with IV contrast.

3. **Misdiagnoses**:

   - **Fibrous cortical defect (FCD)** *(Fig. 23 on page 30)*
     
     **#Overview**: Benign, non-neoplastic lesions, thought to precede NOF. Histologically identical to NOF. Typically <15-20mm.[5] Usually appear in the first decade of life.
     
     **#Imaging**: Well-defined, elliptical/oval lytic lesions confined to the cortex of long bones and surrounded by a thin sclerotic rim, adjacent to a growth plate.[5]

   - **Aneurysmal bone cyst** *(Fig. 24 on page 31)*
     
     **#Overview**: Expansile, progressively destructive lesions with thin-walled, blood-filled cystic cavities with a predilection for children and adolescents. [5] May be primary/non-neoplastic (70%) or secondary to other bone tumors/lesions (30%).[5] Most commonly involve the long bones and posterior vertebral arches.
     
     **#Imaging**: Osteolytic lesions with "eggshell" borders, septated, eccentrically located and expansile. CT: thin and maintained cortex without periosteal reaction. MRI: fluid-fluid levels within the cystic components#layering of blood products.[5]

   - **Fibrous dysplasia (FD)** *(Fig. 25 on page 32)*
     
     **#Overview**: Benign, non-neoplastic, fibro-osseous lesions usually seen in children/adolescents. FD replaces normal cancellous bone with abnormal fibrous tissue, with varying amounts of immature woven bone. May affect one (70%) or multiple (30%) bones. Tends to be central and metaphyseal and may cause bowing, leading to extreme varus deformity.[3,5] Potential for malignant transformation.[5]
     
     **#Imaging**: Varies from radiolucent to cystic (in pelvis) to sclerotic, depending on the area in which it is found, though typically it shows a "ground glass" internal matrix with faint peripheral sclerosis, most notable in long bones and ribs.[5]

   - **Desmoplastic fibroma**
     
     **#Overview**: Locally aggressive, benign tumors (0.11% of all primary bone tumors). 50% occur in second decade. Typically located in the metaphysis of long bones, pelvis and mandible.
     
     **#Imaging**: Expansile, lytic lesions with thick septations, marginal sclerosis or pseudo-trabeculation, without significant mineralized matrix. MRI: T1 hypointense lesions, with post-contrast enhancement and cortical breakthrough.
Fig. 1: Humeral pseudocyst in [a] neutral, [b] external rotation and [c] internal rotation views, seen as a lucent lesion at the humeral greater tuberosity.

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Fig. 2: Lateral [a] and AP [b] views of the knee demonstrating a chondroblastoma, a lucent lesion with a thin sclerotic rim at the lateral aspect of the distal tibial epiphysis.

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Fig. 3: AP view of the foot [a] of a male with history of diabetes, demonstrating erosive changes at the head of the metatarsal bone and at the proximal phalanx of the fifth digit with overlying subcutaneous soft tissue emphysema, as can be seen with osteomyelitis infection. AP view of the left arm [b] of a patient with chronic osteomyelitis at the medial supracondylar region of the humerus, manifested by cortical destruction. Note the associated ‘floating’ piece, representing sequestrum, a complication of osteomyelitis.

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Fig. 4: Sagittal [a] and coronal [b] CT reconstructions of a patient with history of renal cell carcinoma, demonstrates a lytic lesion with poorly defined margins within the indicated thoracic vertebra.

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Fig. 5: Sagittal [a] and coronal [b] CT views demonstrating an os odontoideum, an accessory ossicle of the odontoid. It is the most common anomaly of the odontoid process and is typically asymptomatic. Bony structure is smooth and well-corticated, not to be confused with an odontoid fracture.

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Fig. 6: Sagittal [a] and coronal [b] CT views demonstrating a persistent ossiculum terminale, seen as a small well-corticated ossicle at the tip of the dens.

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Fig. 7: Fig 2: Sagittal [a] and coronal [b] CT views. Comminuted fracture of the base of the odontoid, below the level of the transverse band of the cruciate ligament. Findings are in favor of an Anderson and D'Alonzo type 2 odontoid fracture. Note similar position as os odontoideum, without smooth cortication. A different patient [c] with another Type II odontoid fracture seen in sagittal CT reconstruction. The odontoid fragment has been displaced anteriorly. Os odontoideum may also be found in this location, but will be uniformly well-corticated.

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**Fig. 11:** Plain radiograph of the right shoulder in neutral position demonstrating deposition of calcium hydroxyapatite within tendons of the rotator cuff, most commonly the supraspinatus tendon.

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Fig. 12: Coronal CT abdominopelvic CT reconstruction bone window [a] presenting focal areas of vertebral endplate sclerosis secondary to DDD changes. Joint space narrowing [asterisk], anterior marginal osteophytes and vacuum phenomenon [yellow arrow] are present as well. Lateral plain film of the spine [b] demonstrating intervertebral disc space narrowing and endplate sclerosis along the lower lumbar spine, suggestive of discogenic vertebral sclerosis in the setting of DDD.

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Fig. 13: [a] Portable chest plain film of a female patient with history of breast cancer demonstrating osteoblastic metastatic disease. Incidentally, a left-sided pleural effusion is noted as well. There are ill-defined sclerotic lesions along the left humeral head/neck/proximal epiphysis, distal clavicle and ribs. [b] Sagittal CT reconstruction of the thoracic spine in same patient demonstrates diffuse sclerotic lesions along the visualized vertebrae. Findings are most consistent with diffuse osteoblastic metastatic disease. Note that findings in thoracic spine may resemble DVS.

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Fig. 14: [a,b] Plain films of the left shoulder. A subchondral cyst is appreciated at the acromial end of the clavicle, seen as a well-defined lucent structure underlying the articular surface of the acromioclavicular joint.

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Fig. 15: AP supine plain film of the left knee [a] demonstrates a large lucent lesion at the proximal tibial metaphysis and diaphysis, with associated cortical thinning and minimal expansion. There is no associated periosteal reaction, no surrounding sclerosis or definite soft tissue component. Findings as seen with a pathologic fracture through a proximal tibial bone lesion, suggestive of a bone cyst. [b-d] Coronal reconstructions of the left knee further characterizing the lesion. T1WI [b] demonstrates a hypointense solid component. T2WI [c] reveals cystic changes within the lesion and T1WI post contrast [d] reveals loculated components with thin peripheral contrast enhancement with some central areas of solid enhancement. Findings are highly suggestive of a giant cell tumor of the proximal tibia with a secondary aneurysmal cyst component.

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Fig. 10: AP [a] and oblique [b] radiographs of the left foot demonstrating an avulsion injury at the tip of the lateral malleolus. Lateral [c] radiograph of the left foot of a different patient showing an avulsion injury at the insertion site of the Achilles tendon.

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**Fig. 19:** Lateral view of the right foot of a male patient, demonstrating an ill-defined, lucent area along the anterior aspect of the calcaneus, consistent with normal variation of the trabecular pattern, also known as a calcaneal pseudotumor. Plain films two years prior redemonstrate the same lesion without interval changes.

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Fig. 20: Lateral [a,b] plain films of the left foot with a calcaneal lipoma. Note that the trabecular pattern is disturbed and there is a central nidus of calcification [yellow arrow]. Axial [b] and sagittal [d] CT reconstructions of the left foot of the same patient confirm the fat density of the mass, as well as display the nidus component.

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**Fig. 21**: Bone islands (enostosis) visualized in coronal [a], axial [b] and sagittal [c] CT reconstructions, seen as small, rounded, sclerotic lesions in the pelvic bones, one of the most common locations for bone islands to be found.

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Fig. 22: AP [a] and lateral [b] radiographs of the right ankle show a cortical-based lytic lesion with thin sclerotic margins projecting over the distal tibia, a common location for non-ossifying fibromas (NOF).

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**Fig. 16:** AP neutral [a], internal rotation [b] and external rotation [c] views of the left shoulder of a 4-year-old female patient with history of trauma and direct impact to the left shoulder. There is a mildly displaced proximal humeral metaphyseal fracture with impaction causing cortical buckling. There is also widening of the glenohumeral joint space [red double arrow] suggesting hemarthrosis and mild pseudodislocation. Normal bone density.

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Fig. 23: AP view [a] of the right knee demonstrating a well-defined elliptical lytic lesion with sclerotic borders in the medial aspect of the proximal tibial diaphysis. Oblique view [b] of the right ankle shows a similar lesion at the distal tibial diaphysis. Both lesions are oriented parallel to the long axis of the bone, characteristic of fibrous cortical defects.

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Fig. 24: Lateral (a) and frontal (b) radiographs of the right hip show an expansile osteolytic bone lesion with thin "eggshell" borders at the proximal diaphysis of the femur, consistent with an aneurysmal bone cyst.

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Fig. 25: Frontal [a] and lateral [b] plain films of the hip show lateral apex bowing of the femur with focal areas of expansion of the proximal shaft and distal metadiaphysis with areas of sclerosis and lucency as may be seen in fibrous dysplasia.

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Table 1: Summary table of all "do not touch" lesions, their misdiagnoses and the key features that set them apart.

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**Fig. 8:** Coronal [a,c] and axial [b] views of the knee demonstrating a patellar dorsal defect at the superolateral aspect of the patella. The lesion shows hypointensity on T1WI [a] and heterogeneous high signal on T2-weighted sequences [b,c]. Note the intact overlying articular cartilage.

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**Fig. 18:** [a,b] plain films of the left shoulder of a male patient after a seizure episode, showing posterior dislocation of the humeral head.
Fig. 17: [a,b] Plain films of the right shoulder, demonstrating an anteroinferior migration of the humeral head, consistent with an anterior shoulder dislocation. Note the associated Hill-Sachs lesion [yellow arrow] seen as a sclerotic line along the superior aspect of the humeral head.

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Fig. 9: Sagittal [a] and coronal [b] CT reconstructions of the knee demonstrating osteochondritis dissecans at the lateral aspect of the proximal tibia, manifested by minimal separation of an osteochondral fragment from the articular surface.

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Conclusion

It is common practice in radiology to offer a list of differentials, allowing for clinicians to rule out possibilities with supplemental diagnostic interventions and the clinical picture. Skeletal "do not touch" lesions, however, are so radiologically distinct that they only require radiography to be definitively diagnosed. Offering a list of differentials in these cases is inappropriate and may lead to unnecessary interventions, leading to increased costs and morbidity.
Personal information

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References


