Skeletal Radiol (1993) 22:1–9

Skeletal Radiology

Review

Calcific tendinitis: a review of the usual and unusual

Peter D. Holt, M.D. and Theodore E. Keats, M.D.

Department of Radiology, University of Virginia Health Sciences Center, Charlottesville, Virginia, USA

Abstract. The purpose of this review is to illustrate examples of calcific tendinitis in common and unusual locations.

Key words: Calcific tendinitis – Peritendinitis calcarea – Tendon, calcification – Hydroxyapatite deposition disease

Calcific tendinitis results from the deposition of calcium hydroxyapatite crystals in periarticular muscular attachments. It causes inflammation, necrosis, and loss of tissue structure. Historically, it was assumed that such deposits resulted from trauma around involved joints, but no specific mechanism for their formation was completely elucidated. More recently, genetic [5] and metabolic [25] factors have been postulated as other etiologies. In any case, the end result is calcification in the tendons. Calcific tendinitis most commonly affects the tendons about the shoulder, being seen in approximately 3% of adults [3]. Clinically, the most frequent associated symptom is pain. It is estimated that the condition is responsible for 7% of painful shoulder syndromes [28] and for almost 50% of all shoulder pain. The supraspinatus tendon is the most frequent site of involvement [21].

Calcific tendinitis has been described in other sites about the shoulder joint and in many other locations throughout the body, particularly the hip joint [11]. Most of these types of calcific tendinitis have been well documented. This review should help in recognizing and evaluating calcific tendinitis and in differentiating this entity from other pathologic conditions.

Shoulder

The rotator cuff, composed of the tendons of the subscapularis, supraspinatus, infraspinatus, and teres minor muscles, fuses to enclose the shoulder in a fibrous capsule. The subscapularis tendon inserts on the lesser tuberosity of the humerus, while the other tendons insert on the greater tuberosity. The long head of the biceps brachii, which originates in the fibrous capsule as a tendon from the supraglenoid tubercle, courses over the humeral head before descending the humerus behind the humeral ligament. The short head arises from the coracoid process and passes anterior to the joint before fusing with the long head.

Supraspinatus. This tendon serves as an external rotator of the shoulder. Calcification in this tendon is clearly seen near its point of insertion on the promontory of the greater tuberosity. As the shoulder is rotated internally, these calcific deposits may project over the humeral head as they move medially and become hidden. Figures 1–3 are excellent examples of calcific tendinitis in this most common location.

Infraspinatus, teres minor, subscapularis. Calcifications in these tendons are considered as a group since they commonly occur together and may also be seen with supraspinatus calcification [21]. The infraspinatus and teres minor tendons, like the suprasinatus, are external rotators and also attach to the greater tuberosity of the humerus, the infraspinatus just distal and anterior to supraspinatus and the teres minor just distal and posterior to the supraspinatus. Internal rotation of the humerus projects calcifications in these tendons laterally away from the humeral shaft (Fig. 4). The subcapularis tendon, which serves as an internal rotator, inserts on the lesser tuberosity and overlies the humeral head on internal and external rotation views of the shoulder (Fig. 5). Calcification in this tendon is often best seen in a fully abducted axillary view [25].

Biceps brachii. The tendon descends from its origin in the fibrous capsule of the shoulder at the supraglenoid tubercle down the humerus via the bicipital groove. It flexes the shoulder and flexes and supinates the elbow.

Correspondence to: P.D. Holt, M.D., University of Virginia Health Sciences Center, Charlottesville, VA 22908, USA

Fig. 1. Calcific tendinitis in the supraspinatus

Fig. 2. Calcific tendinitis: supraspinatus. Internal rotation view of shoulder

Fig. 3. Calcific tendinitis: supraspinatus. External rotation view of shoulder

Fig. 4. Calcific tendinitis: infraspinatus and teres minor

Fig. 5. Calcific tendinitis: subscapularis

Fig. 6. Calcific tendinitis: long head of biceps brachii (proximal)

Fig. 7. Calcific tendinitis: long head of biceps brachii (distal)

Fig. 8. Calcific tendinitis: short head of biceps brachii

Fig. 9. Calcific tendinitis: pectoralis major

Fig. 10. Calcific tendinitis: pectoralis major with cortical erosion of humerus

Calcific deposits near the origin of this tendon are less common than those along the bicipital groove, and are seen regardless of humeral rotation, just superior to the glenoid fossa (Fig. 6). In the distal tendon, calcification is seen medial to the shaft of the humerus on internal rotation and moves laterally over the shaft on external rotation (Fig. 7). The location of deposits is confirmed on the axillary view, which projects them anteriorly. Calcification in this tendon is relatively common. In one recent study of calcific tendinitis in the shoulder, 20 of 119 cases included calcificiation in the long head of the biceps. These cases most often occur in association with rotator cuff and other soft tissue injuries to the shoulder (including the impingement syndrome) [10].

The short head of the biceps brachii arises from the apex of the coracoid process. It runs anterior to the shoulder joint to fuse with the long head. Calcification in the short head is much less frequent than in the long head. It is seen just below the inferior lip of the glenoid fossa on both internal and external views of the shoulder (Fig. 8).

Pectoralis major. This muscle originates from the anterior surface of the sternum and clavicle and from cartilage of the anterior ribs. Its triangular shape is defined as these origins fuse to form a single tendon that attaches to the humerus at the lateral margin of the intertubular sulcus. The tendon is divided into anterior and posterior laminae which, together with parts of the muscle, twist upon themselves so that fibers originating lower along the chest wall insert higher on the humerus as the posterior lamina. The posterior lamina extends up the humerus to fuse with the joint capsule. The principal function of the pectoralis major is to adduct and rotate the humerus medially. Calcification is seen in the tendon along its broad attachment. These deposits project over the humeral shaft on anteroposterior and external rotation views, but are seen medial to the humeral cortex on internal rotation (Fig. 9). Calcific tendinitis in this tendon has been described as being associated with a defect in the humeral cortex at the site of attachment and is accompanied by point tenderness over the affected area [6] (Fig. 10). The cortical lesion is a recognized normal variant when it is asymptomatic [4].

Elbow

Calcific tendinitis is rarely visualized in the tendons surrounding this joint. Soft tissue calcifications that are seen tend to be bulky, most often reflecting olecranon bursitis due to infection or trauma in the area [27]. Isolated radiographically demonstrable calcification in a particular tendon as a manifestation of acute calcific tendinitis has not been documented.

Wrist and hand

Flexor carpi ulnaris. This muscle originates from the medial epicondyle of the humerus. Its tendon of origin splits to form the pronator teres, the palmaris longus, the flexor carpi radialis, the flexor carpi ulnaris, and the flexor digitorum superficialis muscles. The flexor carpi ulnaris, the most medial of the group, serves as a wrist flexor and adductor. Its origin in the common tendon is called the humeral head. A second origin, the ulnar head, is larger and arises from the olecranon process and an aponeurosis on the proximal dorsal ulna. The two heads fuse over the ulnar nerve at the elbow, and the muscle runs the length of the ulna along its medial edge. At the wrist, a tendinous insertion occurs at the pisiform bone. This tendon continues from the pisiform, splits into the pisohamate and pisometacarpal tendons, which insert on the hamate and the fifth metacarpal, and contributes to the flexor retinaculum. Hence, the flexor carpi ulnaris also maintains the position of the pisiform bone during flexion and abduction of the fifth finger. When calcification forms in this tendon, it is commonly seen proximal and volar to the pisiform; however, it may form anywhere along the length of the tendon. Lateral views of the wrist may be helpful in confirming the location of calcification (Fig. 11). Development of calcific tendinitis appears to be related to repetitive activities, such as typing, which cause chronic inflammation. As symptoms resolve, so does the characteristic, well-circumscribed amorphous calcification in the region of the pisiform attachment [9]. This is the most common location of calcific tendinitis in the wrist and hand [17].

Intrinsic tendons. These tendons provide the insertion for the lumbrical and interosseus muscles. The lumbricals attach to the lateral aspect of the dorsal digital expansion of the extensor digitorum muscle on each finger. The interosseous muscles include two groups, the dorsal and the palmar. They arise from the metacarpals and insert on the phalanges, crossing the metacarpal/carpal joints. The chief function of all of these muscles is to flex the phalanges. The dorsal interossei also abduct the fingers, and the palmar interossei adduct them. Calcific tendinitis in the tendons of the intrinsic muscle generally presents secondary to recent trauma, stress, or strenuous use of the hand and wrist. Symptoms often mimic infectious processes or arthritis. Pain is the usual complaint, and focal calcific deposits are usually present at points of maximum tenderness [12]. These calcifications are useful in differentiating the condition from other clinical entities. As the calcifications often overlie the metacarpals and proximal phalanges, several radiographic views of involved areas may be useful (Fig. 12–15).

Neck

Longus colli muscle. This muscle consists of three parts: inferior oblique, superior oblique, and vertical. The inferior oblique portion originates from the anterior aspect of the upper thoracic vertebral bodies to insert on the anterior transverse processes of the fifth and sixth cervical vertebral bodies. The superior oblique portion originates from the same region of this insertion (generally the anterior tubercles of the transverse processes of the

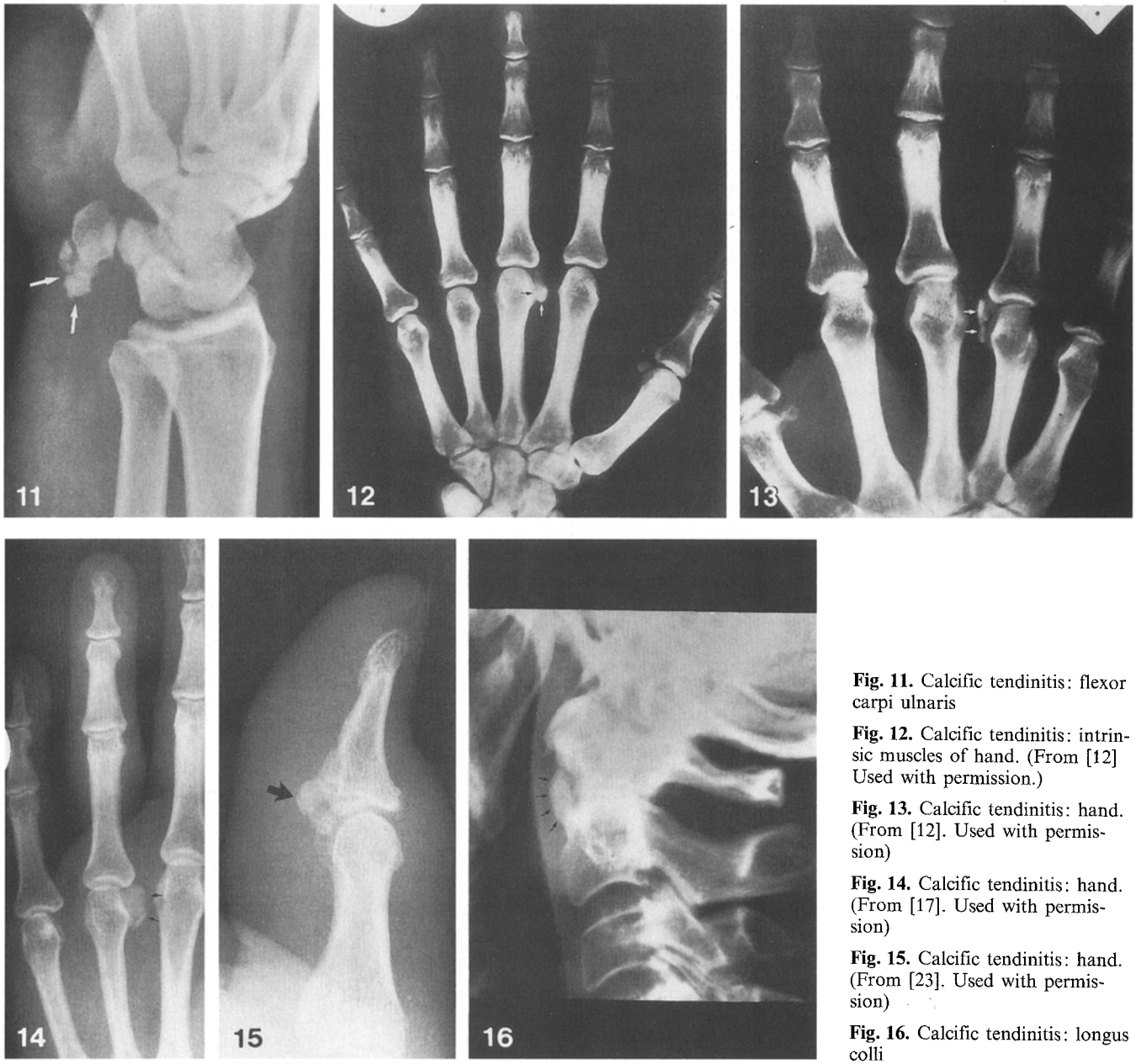

Fig. 11. Calcific tendinitis: flexor carpi ulnaris

Fig. 12. Calcific tendinitis: intrinsic muscles of hand. (From [12] Used with permission.)

Fig. 13. Calcific tendinitis: hand. (From [12]. Used with permission)

Fig. 14. Calcific tendinitis: hand. (From [17]. Used with permission)

Fig. 15. Calcific tendinitis: hand. (From [23]. Used with permission)

Fig. 16. Calcific tendinitis: longus colli

third through fifth cervical bodies). These sections of the muscle run up the anterior surface of the cervical spine and fuse to form one tendon of insertion on the anterolateral surface of the anterior arch of the atlas. The vertical part runs up from the anterior aspects of the C4–6 and T1–3 bodies to insert on the anterior surface of C2–4. The primary function of the longus colli is to flex the neck; however, the oblique portions also help to rotate the neck laterally. The muscle is separated from the vertebral bodies by the anterior longitudinal ligament. Tendinitis tends to occur in the superior oblique portion and is best seen on a well-aligned lateral neck film just anterior to C1 (or occasionally C2) (Fig. 16). The tendinitis may be symptomatic and is often found incidentally [18]. This often makes is differentiation from other conditions difficult. For example, it can be mistaken for calcification in the stylohyoid ligament [21] on poorly aligned lateral radiographs, although this ligament runs further anteriorly from the cervical spine. More commonly, the calcification may be mistaken for the inferior accessory ossicle of the anterior arch of the atlas. This ossicle has bone matrix and can usually be distinguished from calcification [15]. In certain clinical settings, prevertebral soft tissue swelling is an important associated radiographic finding in acute cases [1].

Hip

The bones of the hip, like those of the shoulder, are surrounded by many attachments/origins of muscular tendons.

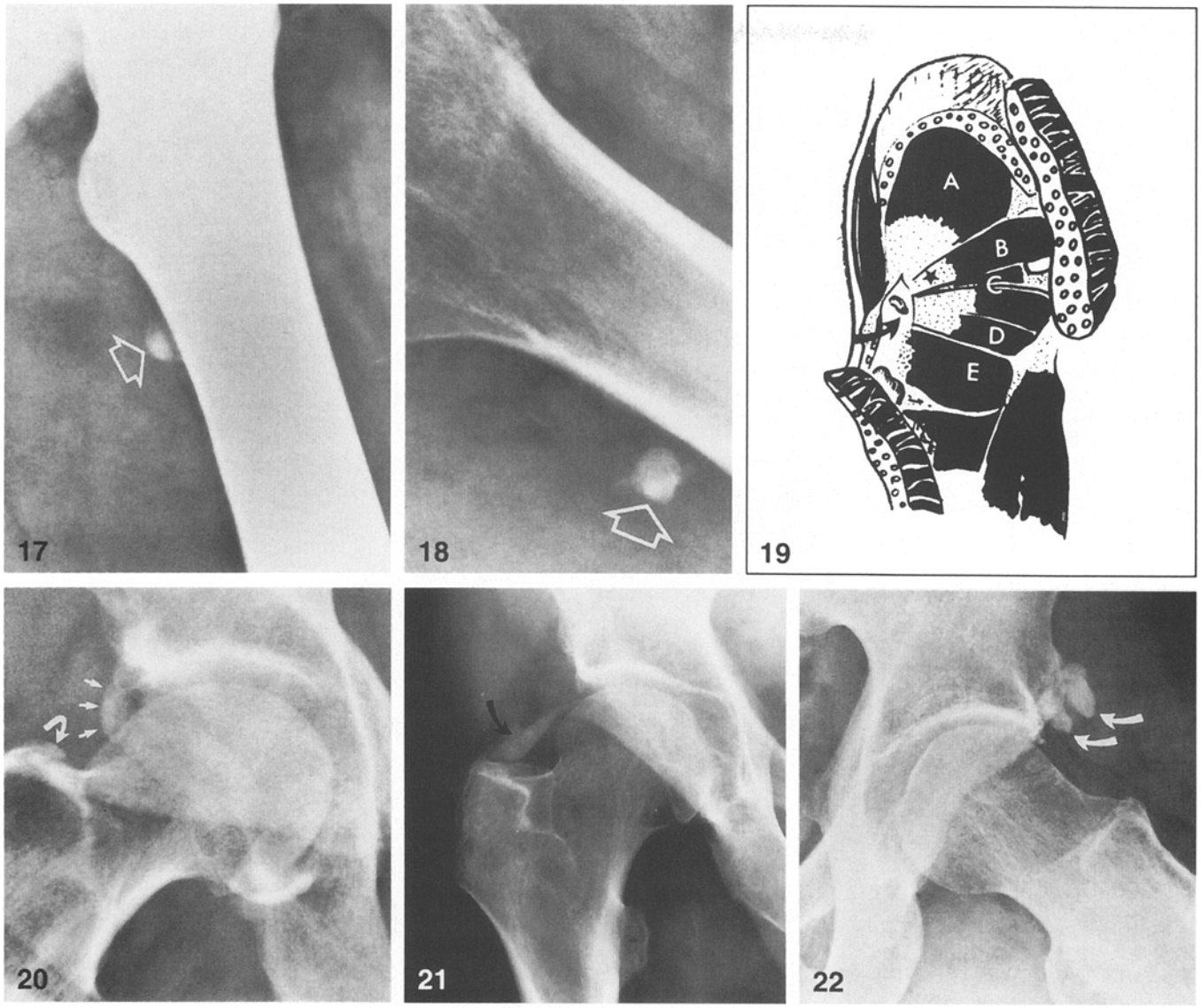

Fig. 17. Calcific tendinitis: gluteus maximus

Fig. 18. Calcific tendinitis: gluteus maximus. "Frog leg" view of femur

Fig. 19. Gluteal muscles with their insertions on the greater trochanter. (From [24]. Used with permission). *A*, gluteus minimus muscle; *B*, piriformis muscle; *C*, gemellus superior and obturator muscles; *D*, gemellus inferior muscle; *E*, quadratus femoris muscle

Fig. 20. Calcific tendinitis: gluteus minimus and rectus femoris

Fig. 21. Calcific tendinitis: piriformis

Fig. 22. Calcific tendinitis: rectus femoris. (From [19]. Used with permission)

Gluteus maximus. This large muscle, which provides the mass of the buttock, originates from the posterior gluteal line of the ilium, the aponeurosis of the erector spinae, the dorsal aspect of the sacrum and coccyx, the sacrotuberous ligament, and the gluteal aponeurosis over the gluteus medius muscle. Fibers from all of these origins converge as they run laterally and obliquely around the greater trochanter of the femur superficial to the other muscles and bones of the hip joint. Most of the fibers insert on the iliotibial tract of the tensor fasciae latae, dorsal and distal to the greater trochanter, but some insert on the gluteal tubercle of the posterolateral upper femoral shaft (part of the linea aspera). The muscle is involved in most movements of the hip joint, particulary extension and abduction of the hip (as in walking). Calcific tendinitis near the tendinous insertion on the gluteal tubercle is the most common appearance and is amorphous or round. Since this region projects over the femoral shaft on the frontal radiograph of the hip, areas of calcific tendinitis are usually best seen on lateral or "frog leg" views of this joint (projection over the femoral shaft may resemble a bone island) (Fig. 17, 18). The condition may or may not be symptomatic. Characteristic associated pain often mimics radicular pain [2]. As in cases involving the pectoralis major insertion, femoral cortex erosion is often associated [13]. Gluteofemoral bursitis can present a similar radiographic appearance [29].

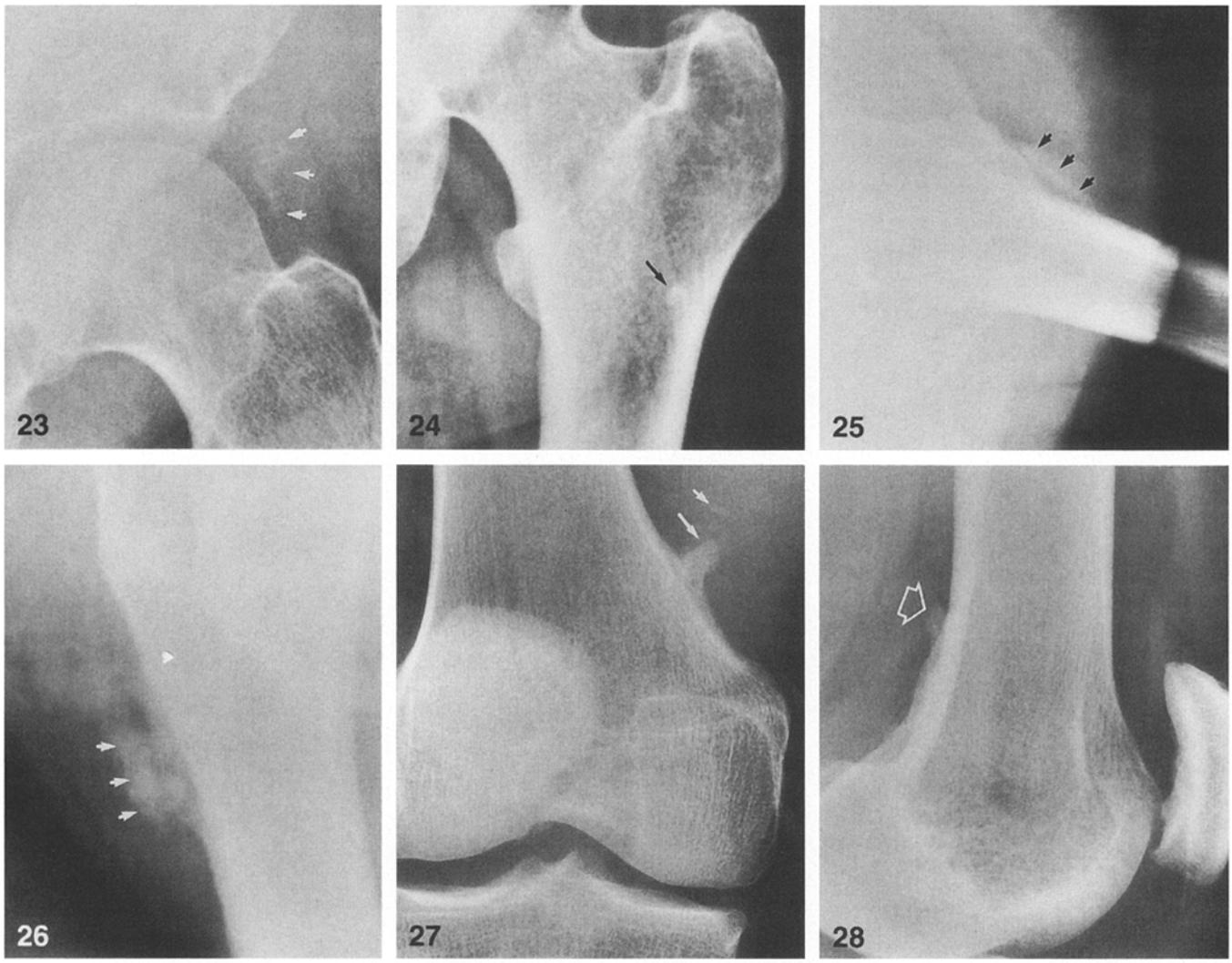

Fig. 23. Calcific tendinitis: rectus femoris

Fig. 24. Calcific tendinitis: vastus lateralis

Fig. 25. Calcific tendinitis: vastus lateralis. Lateral view of femur

Fig. 26. Calcific tendinitis: adductor magnus. (From [13]. Used with permission)

Fig. 27. Calcific tendinitis: adductor magnus insertion

Fig. 28. Calcific tendinitis: adductor magnus insertion. Lateral view

Other gluteal muscles. Several other muscles in the gluteal region may develop calcific tendinitis in their tendinous origins and insertions. The complicated musculotendinous anatomy in this area of the body makes radiographic differentiation difficult. Included in this group are the glutei medius and minimus, the piriformis, the superior and inferior gemelli, the obturator internus and externus, and the quadratus femoris. Each of these muscles inserts on the greater trochanter of the femur (Fig. 19). The glutei, like the gluteus maximus, are extensors and abductors of the hip, while the remainder of these muscles serve as lateral rotators. In these cases, calcific tendinitis is seen just superior to the greater trochanter on frontal and lateral views of the hip and often appears as a linear calcific collection (Fig. 20). A single case of presumed calcific tendinitis of the piriform muscle has been reported [21] (Fig. 21).

Quadriceps femoris. This muscle surrounds the femoral shaft almost entirely and consists of four parts. These include the rectus femoris, the vastus medialis, the vastus intermedius, and the vastus lateralis. The rectus femoris occupies the front of the thigh and originates from two heads – one directly from the anterior iliac spine and one from a groove on the ilium just superior to the acetabulum. The two heads fuse almost at a right angle posterior to the femoral neck, and the muscle band runs down the anterior thigh. The vasti arise from the lower border of the greater trochanter, the linea aspera, and the upper femoral shaft and run deep to the rectus femoris along the length of the femur. The vastus lateralis is the largest component of the muscle. The fibers from all parts of the muscle fuse to form the patellar tendon (see below). As a whole, the quadriceps femoris serves as the major extensor of the leg.

Calcific tendinitis is more commonly seen in the tendons of the rectus femoris and vastus lateralis. Calcification in the rectus femoris may appear linear, rounded, or amorphous, and is present adjacent to the superior acetabular lip (in the region of origin of one of its heads) (Figs. 22, 23). The condition typically produces hip pain, but it may be asymptomatic. When pain is not present, it is important to differentiate calcific tendinitis from the os acetabulum, a normal variant. Differentiation is usually based on the large size, characteristic ovoid shape, bony trabeculation, and painlessness of the ossicle [19]. Location relative to the acetabular roof appears to have little value in making this distinction [14]. Calcification is also seen in the tendinous origin of the vastus lateralis. The calcification may be nodular or linear and is seen along the posterior midshaft of the femur. Lateral or frog leg views of the femur tend to project the calcification away from the femoral cortex, or it may resemble a cortical bone island (Figs. 24, 25). The typical clinical picture includes development of a sudden heavy painful sensation that gradually subsides as a hardening mass arises in the posterior thigh. Associated erosion of the femoral cortex may be present [20].

Adductor magnus. The origin of this muscle is a broad one, including the rami of the ischium and inferior pubis and the inferior ischial tuberosity. The muscle occupies the posteromedial aspect of the thigh and is fan-shaped. Insertion of the muscle fibers from the pubic ramus are short and run horizontally to attach to the gluteal tuberosity near the insertion of the gluteus maximus. Those fibers from the ramus of the ischium fan out as they run down the inner thigh and attach by a broad aponeurosis to the posterior femur in the region of the linea aspera (a long, linear array of attachments). The majority of the muscle fibers arise from the ischial tuberosity, run the length of the thigh, and insert on the adductor tubercle of the medial condyle of the femur. The muscle serves primarily as a hip adductor. Calcific tendinitis may be seen in all of the insertions of the muscle. Calcification in the proximal insertion near the linea aspera is best seen on lateral views of the hip which project characteristic amorphous calcifications away from the femoral cortex. It may also be associated with femoral cortex erosion [13] (Fig. 26). Calcification in the distal insertion appears as a spur-like calcific density superior and medial to the posterior femoral condyle (Figs. 27, 28).

Knee

Quadriceps femoris, patellar insertion. This muscle can be divided into four parts: the vastus lateralis, vastus medialis, vastus intermedius, and rectus femoris (see above). This muscle group serves primarily to extend the leg at the knee. The four parts fuse to form one large tendon that inserts on the patella. Some tendinous fibers pass over the patella as the ligamentum patellae to insert on the anterior tubercle of the tibia. Calcification in this tendon may present with a clinical picture similar to that seen in gout or septic arthritis. It is important to differentiate this condition radiographically from "patellar whiskering," which is an asymptomatic hyperostotic phenomenon [16]. It appears that calcification is a stress-related occurrence and can be seen in the suprapatellar and infrapatellar parts on lateral radiographs of the tendon as linear or stippled calcification (Fig. 29).

Biceps femoris. This, together with the semitendinosus and semimembranosus muscles, makes up the "hamstrings." As the name implies, it arises from two heads. The long head arises from the upper part of the ischial tuberosity and the short head from the lateral aspect of the linea aspera along the femoral shaft. The heads join in the mid-thigh and run laterally down the femur from the front of the thigh before tapering into the "lateral hamstring" tendon. This tendon splits around the fibular collateral ligament to insert on the head of the fibula. The muscle serves as a major flexor of the thigh. The etiology of calcific tendinitis in this tendon is not clear. As the long head runs laterally across the sciatic nerve, tendinitis may be associated with pain that resembles sciatica or with focal pain at the site of attachment. A case report describes relief of sciatic pain with surgical removal of the amorphous calcific focus [8]. This calcification is easily visualized on radiographs just superior to the fibular head (Figs. 30, 31).

Ankle and foot

Gastrocnemius and soleus. The two heads of the gastrocnemius, the lateral and medial, arise from their respective femoral condyles. The larger medial head arises on the superior surface of the medial condyle and the lateral head from the inferolateral surface of the lateral condyle. The heads fuse in an aponeurosis on the anterior surface of the muscle and make up the greater part of the "calf muscle." The soleus originates just deep to this muscle as an aponeurosis from the posterior aspect of the head and upper fibula, the medial aspect of the mid-tibia, and fibrous tissue between tibia and fibula. The muscle is small and soon fuses with the distal tendon of the gastrocnemius to form the calcaneal or Achilles tendon on the posterior aspect of the ankle to insert on the posterior calcaneus. The muscles of the calf serve primarily as plantar flexors of the foot, but the gastrocnemius is also an important flexor of the knee. Calcific tendinitis in this tendon is apparently due to trauma and is seen best on lateral or oblique radiographs (Fig. 32).

Peroneus longus. This muscle arises primarily from the end of the lateral upper fibula. It runs down the lateral aspect of the fibula and ends in a long tendon that runs behind the lateral malleolus, across the lateral calcaneus and lateral cuboid, and obliquely over the sole of the foot to insert on the medial cuneiform and the lateral side of the first metatarsal. Together with the peroneus brevis, the peroneus longus serves to evert the foot. The etiology of its calcification is unclear, but its formation

Fig. 29. Calcific tendinitis: quadriceps femoris (patellar insertion)

Fig. 30. Calcific tendinitis: biceps femoris

Fig. 31. Calcific tendinitis: biceps femoris

Fig. 32. Calcific tendinitis: calcaneal tendon

Fig. 33. Calcific tendinitis: peroneus longus

Fig. 34. Calcific tendinitis: flexor of the forefoot

Fig. 35. Calcific tendinitis: foot. (From [22]. Used with permission)

Fig. 36. Calcific tendinitis: foot (From [22]. Used with permission)

Fig. 37. Calcific tendinitis: foot (From [22]. Used with permission)

does not appear to be clearly related to a history of trauma [7]. It is seen just lateral to the calcaneus and cuboid bones. Its linear orientation along the tendon is probably seen to best advantage on oblique radiographs of the foot (Fig. 33).

Flexors of the forefoot. These cases involve the primary plantar muscles of the foot: flexor hallucis longus, flexor hallucis brevis, flexor digitorum longus, and flexor digitorum brevis. The flexor hallucis longus and flexor digitorum longus are deep crural muscles of the calf. The flexor hallucis longus arises from the inferior posterior fibula and the tibiofibular interosseus membrane, and its fibers form a tendon that runs down the posterior leg. The tendon continues around the posterior distal tibia, the posterior surface of the talus, and the inferior calcaneus (the sustentaculum tali). It continues along the plantar aspect of the foot and inserts on the plantar aspect of the base of the distal phalanx of the great toe, though there may be distal attachments to other tendons (and other toes). The flexor digitorum longus arises from the posterior tibia and widens as it descends the leg, running medial to the flexor hallucis longus. It passes obliquely around the medial malleolus of the tibia to insert on the sole of the foot and on to the fifth digit. The flexor hallucis brevis is a short intrinsic muscle of the foot arising from a Y-shaped head, one limb primarily from the plantar aspect of the cuboid and one from a division of the tendon of the tibialis posterior. This muscle divides and attaches to the medial and lateral aspects of the base of the proximal phalanx of the hallux (a sesamoid bone is usually present at each site of attachment). The flexor digitorum brevis, together with the abductores hallucis and digiti minimi, arises from the plantar calcaneus (the plantar aponeurosis) and divides into four tendons. At the bases of the four proximal phalanges, these tendons divide again and insert on the medial and lateral aspects of the middle phalanges of each digit. As a group, all of these muscles serve as the primary flexors of the forefoot. When calcific tendinitis affects them, clinical findings may be suggestive of infectious processes. When findings are present near the first tarsal/metatarsal joint, the condition must be differentiated from gout [21]. These locations account for 1% of all cases of calcific tendinitis [22]. As with the hand, multiple views of the foot may be necessary to visualize calcification (Figs. 34–37).

References

1. Benanti JC, Gramling P, Bulat PI, et al (1986) Retropharyngeal calcific tendinitis: report of five cases and review of the literature. J Emerg Med 4:15–24
2. Berney JW (1972) Calcifying peritendinitis of the gluteus maximus tendon. Radiology 102:517–518
3. Bosworth BM (1941) Calcium deposits in the shoulder and subacromial bursitis: a survey of 12122 shoulders. JAMA 116:2477–2482
4. Brower AC (1977) Cortical defect of the humerus at the insertion of the pectoralis major. AJR 128:677–678
5. Cannon RB, Schmid FR (1973) Calcific periarthritis involving multiple sites in identical twins. Arthritis Rheum 16:393–396
6. Chadwick CJ (1989) Tendinitis of the pectoralis major insertion with humeral lesions: a report of two cases. J Bone Joint Surg [Br] 71:816–818
7. Cox D, Patterson FWN (1991) Acute calcific tendinitis of peroneus longus. J Bone Joint Surg [Br] 73:342
8. Dashefsky JH (1973) Calcific degeneration in the tendon of the long head of the biceps femoris. J Bone Joint Surg [Am] 55:211–212
9. Gandee RW, Harrison RB, Dee PM (1979) Peritendinitis calcerea of flexor carpi ulnaris. AJR 133:1139–1141
10. Goldman AB (1989) Calcific tendinitis of the long head of the biceps brachii distal to the glenohumeral joint: plain film radiographic findings. AJR 153:1011–1016
11. Gondos B (1957) Observations on periarthritis calcerea. AJR 77:93
12. Greene TL, Louis DS (1980) Calcifying tendinitis in the hand. Ann Emerg Med 9:438–440
13. Hayes CW, Rosenthal DI, Plata MJ, et al. (1987) Calcific tendinitis in unusual sites associated with cortical bone erosion. AJR 149:967–970
14. Kawashima A, Murayama S, Ohuchida T, et al (1988) Paraacetabular periarthritis calcerea: Its radiologic manifestations. Skeletal Radiol 17:476–482
15. Keats TE (1967) Inferior accessory ossicle of the anterior arch of the atlas. AJR 101:834–836
16. Macurak RB, Goldman JA, Hirsh E, et al (1980) Acute calcific quadriceps tendinitis. South Med J 73:322–325
17. Moyer RA, Bush DC, Harrington TM (1989) Acute calcific tendinitis of the hand and wrist: a report of 12 cases and a review of the literature. J Rheumatol 16:198–202
18. Newmark H (1981) Chronic calcific tendinitis of the neck. Skeletal Radiol 7:207–208
19. Pope TL, Keats TE (1992) Case report 733. Skeletal Radiol 21:271–272
20. Ramon FA, Degryse HR, De Schepper AM, et al (1991) Calcific tendinitis of the vastus lateralis muscle: a report of three cases. Skeletal Radiol 20:21–23
21. Resnick D, Niwayama G (1981) Diagnosis of bone and joint disorders, vol 2. Saunders, Philadelphia, pp 1575–1597
22. Rhodes RA, Stelling CB (1986) Calcific tendinitis of the flexors of the forefoot. Ann Emerg Med 15(6):751–753
23. Selby CL (1984) Acute calcific tendinitis of the hand: an infrequently recognized and frequently misdiagnosed form of periarthritis. Arthritis Rheum 27:337–340
24. Stark P, Hildebrant-Stark HE (1983) Calcific tendinitis of the piriform muscle. Fortschr Rontgenstr 138:111–112
25. Uhthoff HK, Sarkar K, Maynard JA, et al. (1976) Calcifying tendinitis. A new concept of its pathogenesis. Clin Orthop Rel Res 118:164–168
26. ViGario GD, Keats TE (1970) Localization of calcific deposits in the shoulder. AJR 108:806–811
27. Vizkelety T, Aszoudi K (1968) Bilateral calcareous bursitis at the elbow. J Bone Joint Surg [Br] 50:644–652
28. Welfing J (1964) Les calcifcations de l'epaule. I. Diagnostic clinique. Rev Rhum Mal Osteoartic 31:265–271
29. Wepfer JF (1983) Calcific tendinitis of the gluteus maximus tendon (gluteus maximus tendinitis). Skeletal Radiol 9:198–200