Κρύσταλλοι BCP- (HADD): Συνήθεις εντοπίσεις, διάγνωση με απλή ακτινογραφία και υπέρηχο

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ΠΑΝΕΠΙΣΤΗΜΙΑΚΟ
ΝΟΣΟΚΟΜΕΙΟ ΗΡΑΚΛΕΙΟΥ

No conflict of interest

ΔΟΜΗ ΟΜΙΛΙΑΣ

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- ***Συμπτωματολογία, συνήθεις εντοπίσεις –απεικόνιση με plane x-ray, US, CT και MRI***
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Κρύσταλλοι BCP (Basic calcium phosphate) :

- HA (Hydroxyapatite)
- Tricalcium phosphate
- Octacalcium phosphate (OCP)

- Μόνον οι εναποθέσεις HA έχουν κλινική σημασία

- Εναπόθεση κυρίως σε τένοντες (repetitive stress-degeneration) αλλά και σε συνδέσμους, θυλάκους, αρθρική κάψα και μετανάστευση (migration) σε οστά-μύες.[1]

- Milwaukee shoulder : Ξεχωριστή μορφή ιδιαίτερα καταστροφικής αρθρίτιδας των ώμων

- Οι κρύσταλλοι BCP ανευρίσκονται και εντός των αρθρώσεων με ΟΑ και θεωρούνται επιταχυντές της νόσου (disease accelerators) [2]

1.Ea HK et al. Calcium pyrophosphate dihydrate and basic calcium phosphate crystal-induced arthropathies: update on pathogenesis, clinical features, and therapy. Curr Rheumatol Rep.2004

2. Nalbant S, *et al.*: Synovial fluid features and their relations to osteoarthritis severity: new findings from sequential studies. *Osteoarthritis Cartilage* 2003, 11:50–54.

Repetitive stress/micro-injuries
Degeneration
Compromised healing capacity
Local ischaemia

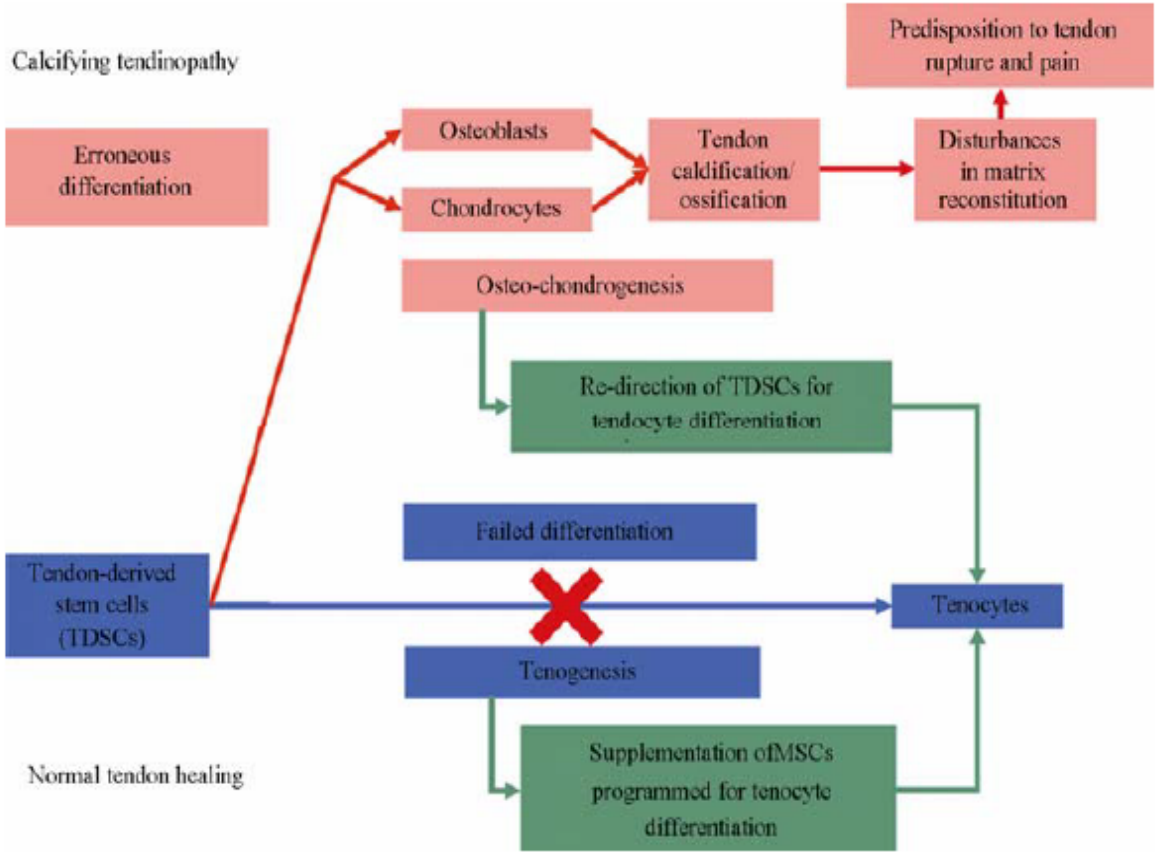

Figure. Hypothetical model showing the erroneous differentiation of TDSCs in the pathogenesis of calcifying tendinopathy and new treatment possibilities. After acute injury, TDSCs would proliferate and differentiate into tenocytes (tenogenesis) in normal tendon healing. However, in the presence of overuse or the accumulation of micro-injuries as a result of compromised healing capacity of tendon cells to normal daily activities, the TDSCs would differentiate into chondrocytes or osteoblasts (osteo-chondrogenesis) instead of tenocytes with compromised capacity for tendon healing. The deposition of erroneous extracellular matrix and calcific deposits would weaken the tendon, resulting in failed healing and caused activity-related tendon pain.

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Rui YF et al. Does erroneous differentiation of tendon-derived stem cells contribute to the pathogenesis of calcifying tendinopathy? Chin Med J (Engl). 2011 Feb;124(4):606-10

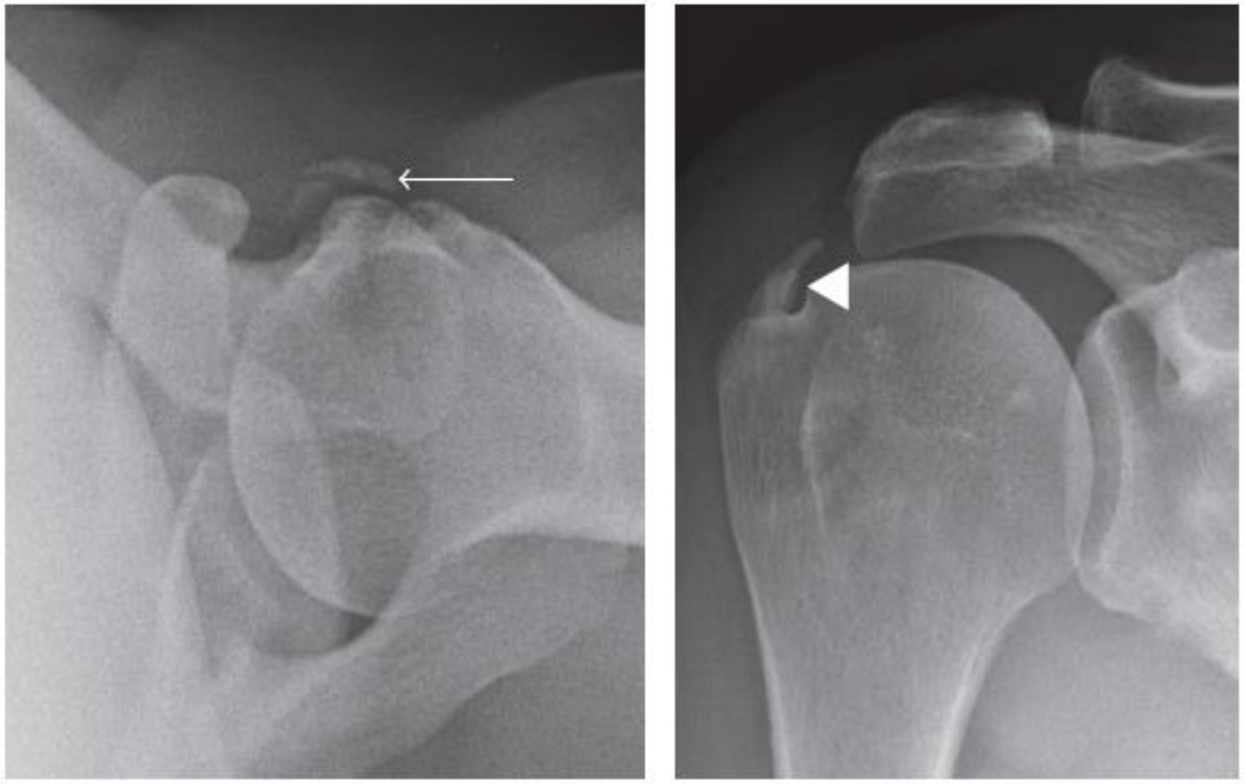
Κλινικά σύνδρομα

- Ασυπτωματική εναπόθεση (70%)
- Ασβεστοποιός τενοντίτιδα
- Θυλακίτιδα
- Περιαρθρίτιδα
- Καταστροφική αρθρίτιδα
- Φλεγμονή μαλακών μορίων

Ea HK et al. Calcium pyrophosphate dihydrate and basic calcium phosphate crystal-induced arthropathies: update on pathogenesis, clinical features, and therapy. Curr Rheumatol Rep.2004

- Κυρίως γυναίκες μεταξύ 30-60 ετών
- Πιο συχνά προσβάλλονται ώμοι-ισχία
- Ασαφοποίηση της εναπόθεσης χωρίς ξεκάθαρα όρια αντιστοιχεί συνήθως στην οξεία φάση
- Συνήθως το μέγεθος της εναπόθεσης δεν σχετίζεται με την ένταση του κλινικού συνδρόμου
- Οι περισσότεροι ασθενείς (70%) ανταποκρίνονται στην συντηρητική θεραπεία

Cho NS et al. Radiologic course of the calcific deposits in calcific tendinitis of the shoulder: does the initial radiologic aspect affect the final results?J Shoulder Elbow Surg. 2010 Mar;19(2):267-72.



(a) (b)

FIGURE 1: Radiographic appearance of calcific tendinopathy. (a) Fluffy, ill-defined, and inhomogeneous appearance of calcifications (arrow) typical seen in acute symptomatic patients. (b) Discrete, homogeneous, and well-defined appearance of calcifications (arrowhead) typically seen in asymptomatic or chronic symptomatic patients.

Nicholas M. Beckmann. *Review Article* .Calcium Apatite Deposition Disease: Diagnosis and Treatment. Radiology Research and Practice Volume 2016

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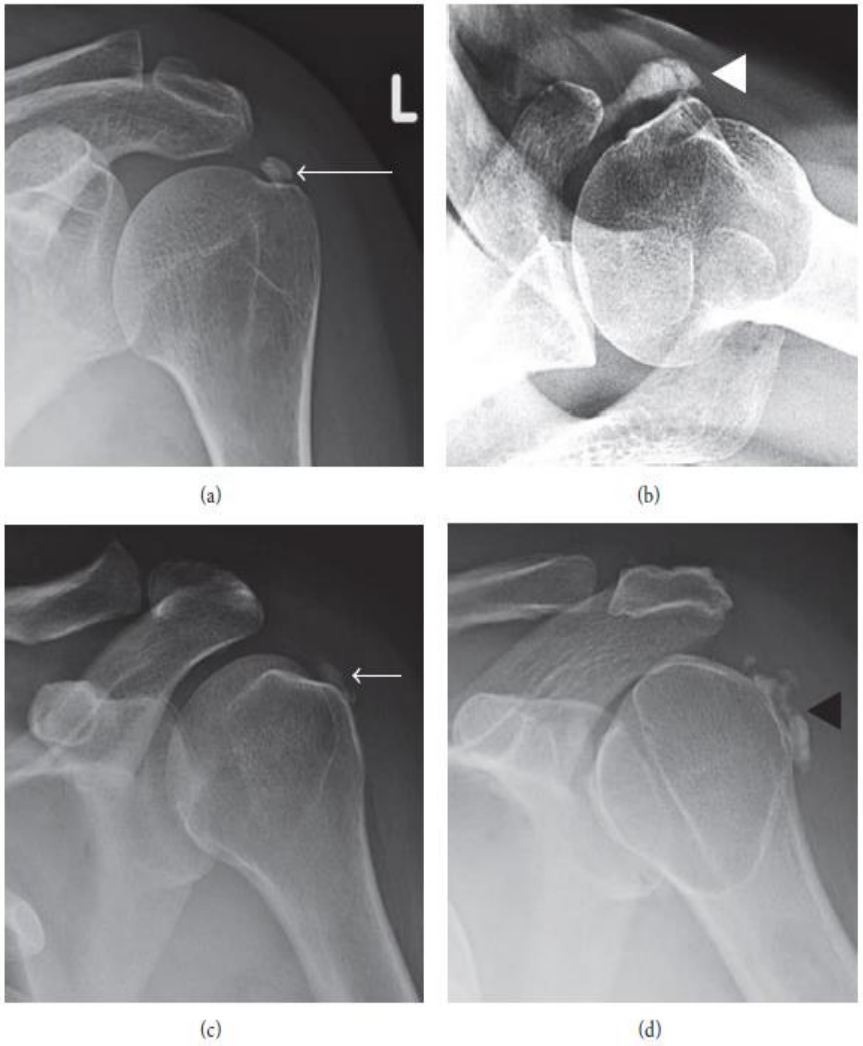

FIGURE 8: Calcific tendinopathy of the rotator cuff. (a) Calcific tendinopathy of the supraspinatus (long arrow) is best seen on AP shoulder radiograph in external rotation. (b) Calcific tendinopathy of the subscapularis (white arrowhead) is best appreciated on axillary view of the shoulder. (c) and (d) AP views of the shoulder in internal rotation are best for appreciating calcific tendinopathy of the infraspinatus (short arrow) and teres minor (black arrowhead).

Table 1. Prevalence rates of involvement of the different rotator cuff tendons (5).

	Prevalence (%)
Supraspinatus tendon	63%
Supraspinatus and subscapularis tendons	20%
Subscapularis tendon	3%
Infraspinatus tendon	7%
Subacromial bursa	7%

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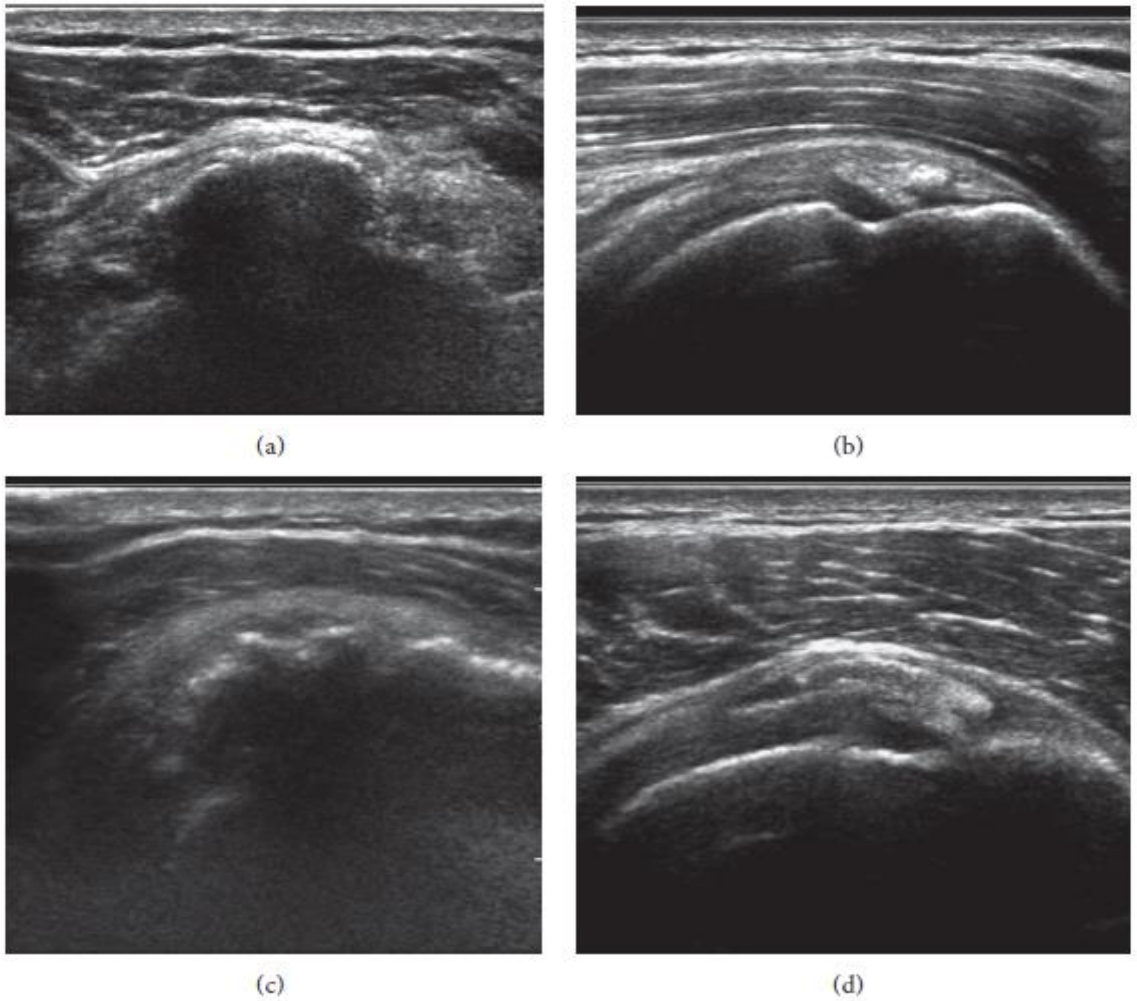

FIGURE 4: Ultrasound appearance of calcific tendinopathy. (a) Arc morphology: echogenic arc of calcification with deep acoustic shadowing. (b) Nodular morphology: single echogenic focus of calcification without acoustic shadowing. (c) and (d) Fragmented morphology: two or more echogenic foci of calcification with (image (c)) or without (image (d)) acoustic shadowing.

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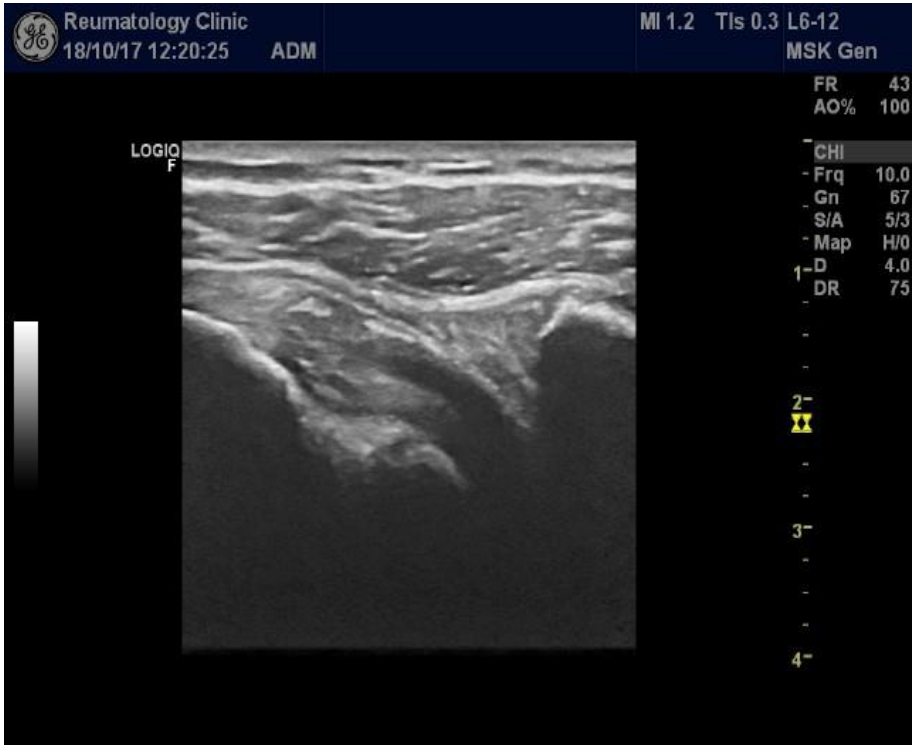
Subscapularis calcifications.

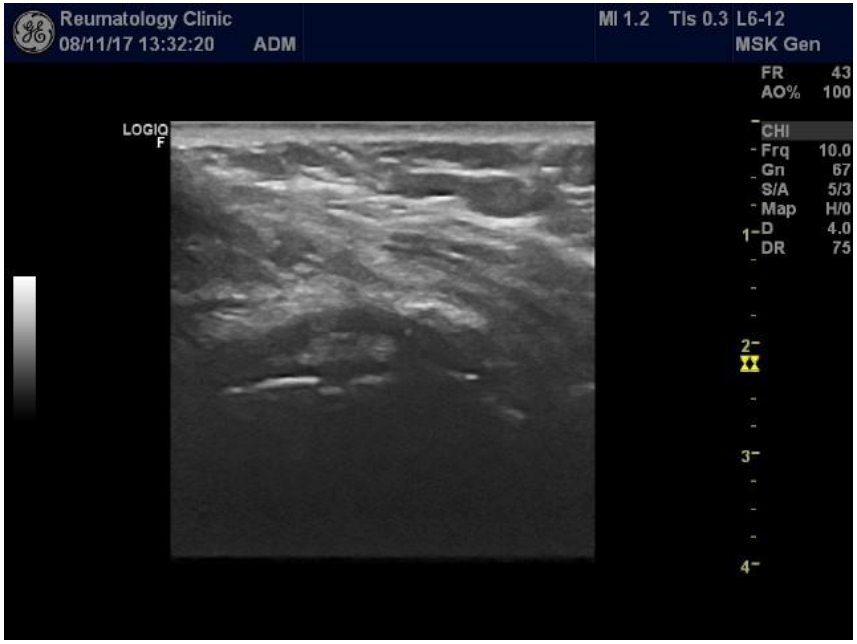
Transverse view

Longitudinal view

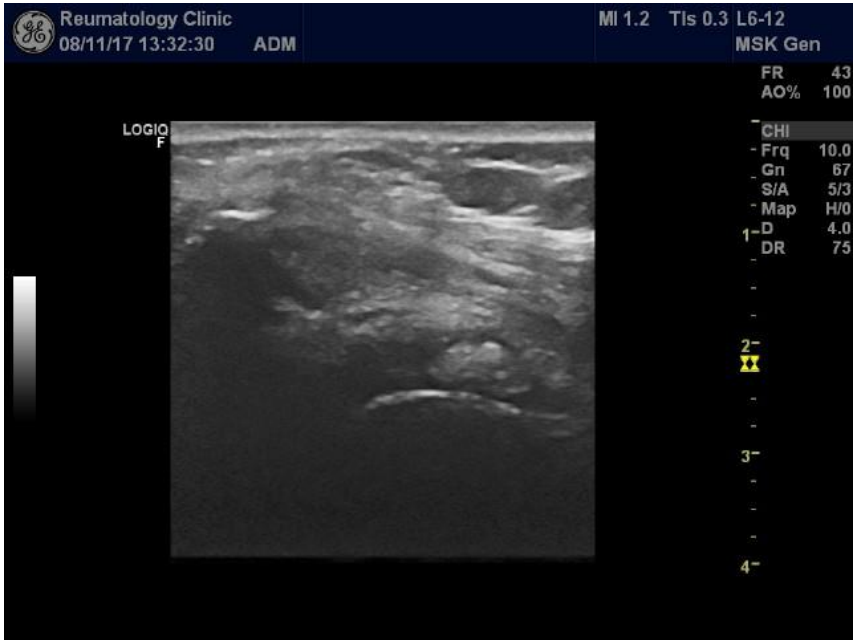


Infraspinatus calcifications.

HADD deposition disease in infraspinatus tendon (transverse view)



HADD deposition disease in infraspinatus tendon (longitudinal view)



A

Emily N. Vinson. Periarticular Calcifications in Two Patients With Acute Hand Pain. American Journal of Roentgenology. 2010;195: S76-S79.

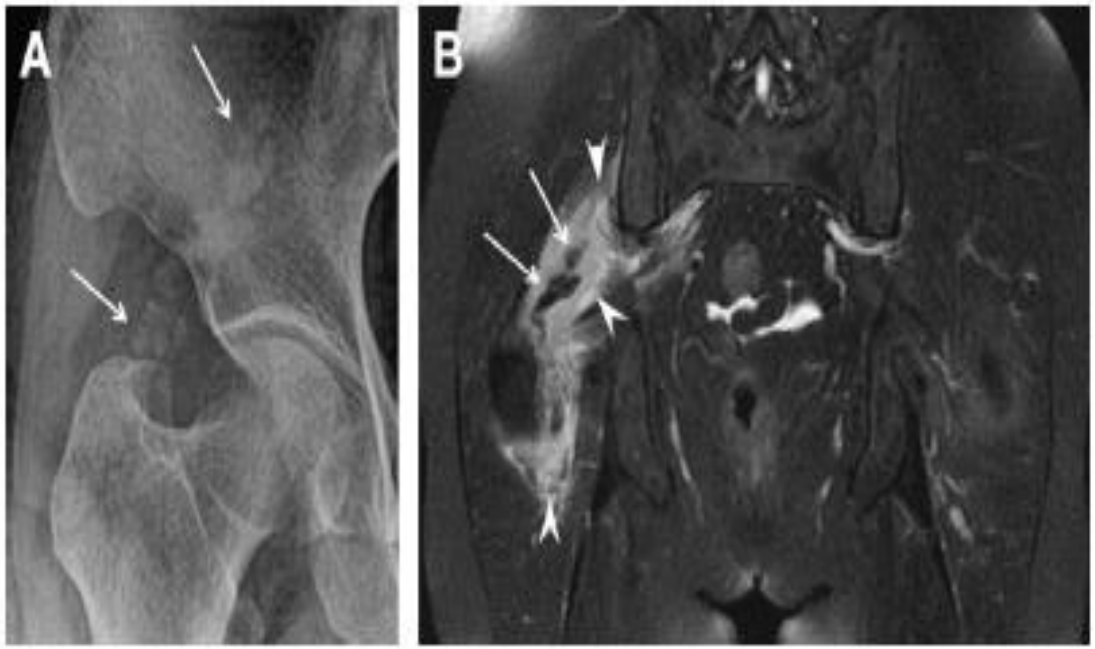


Fig. 3. Patient 5: A 62-year-old female with a 2-day history of low back, buttock, and posterolateral thigh pain; images highlight extensive calcification of the superoposterior tendon. Anteroposterior radiograph of so-called aciniform calcifications, presenting as multiple, ill-defined, ovoid deposits (*arrows*) superior to the greater trochanter (A). Fat-suppressed T2-weighted coronal MR image, with effusion (*arrowheads*) surrounding the gluteus medius muscle and numerous low-signal aciniform calcifications (*arrows*) of the superoposterior tendon (B).

Acute calcific tendinitis of the gluteus medius: An uncommon source for back, buttock, and thigh pain. N.C. Paik/Seminars in Arthritis and Rheumatism (2013)

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A 36-year-old woman presented with neck stiffness and torticollis accompanied by dysphagia and prevertebral space sensitivity on the second day.

Eur Spine J (2013) 22 (Suppl 3):S434–S438

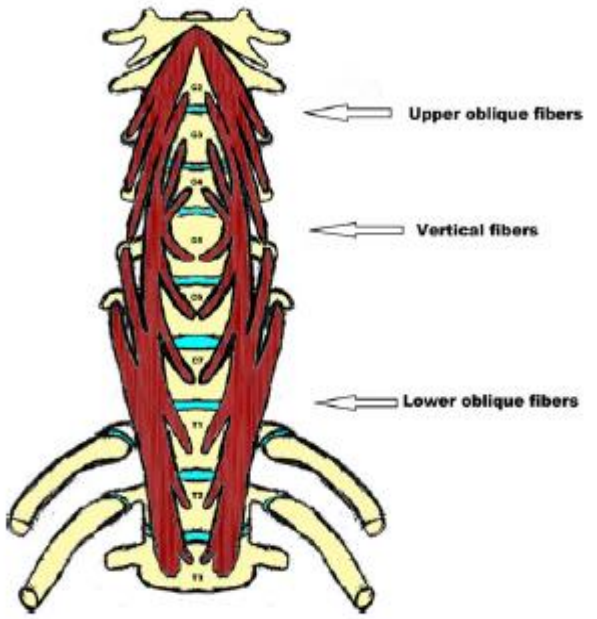


Fig. 4 Schematic illustration of the three parts of longus colli muscle

Fig. 1 Cervical spine plan X-rays, face (a) and profile (b), no specific findings were noticed

A. H. Zibis et al. Acute calcific tendinitis of the longus colli muscle: case report and review of the literature. Eur Spine J. 2013 May; 22 (Suppl 3): 434–438

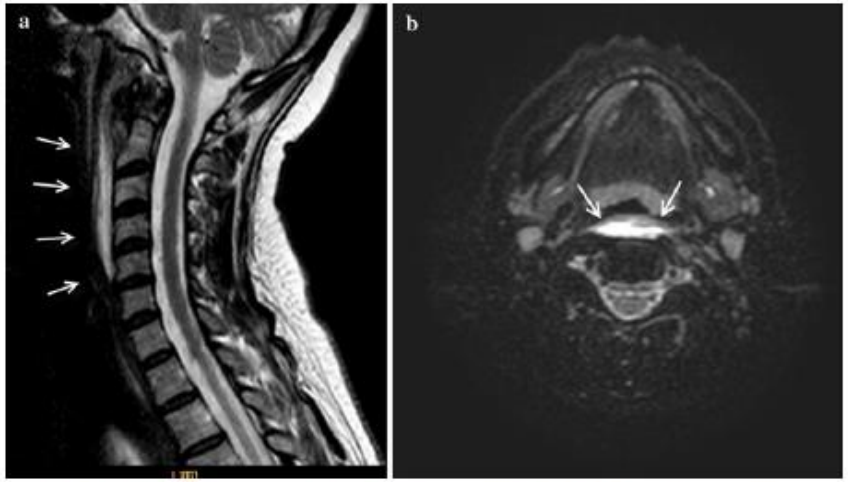


Fig. 2 **a** T2 W TSE sagittal view. **b** B-FFE transverse view. Both of them reveal an extended prevertebral oedema (*arrows*) without finding of abscess

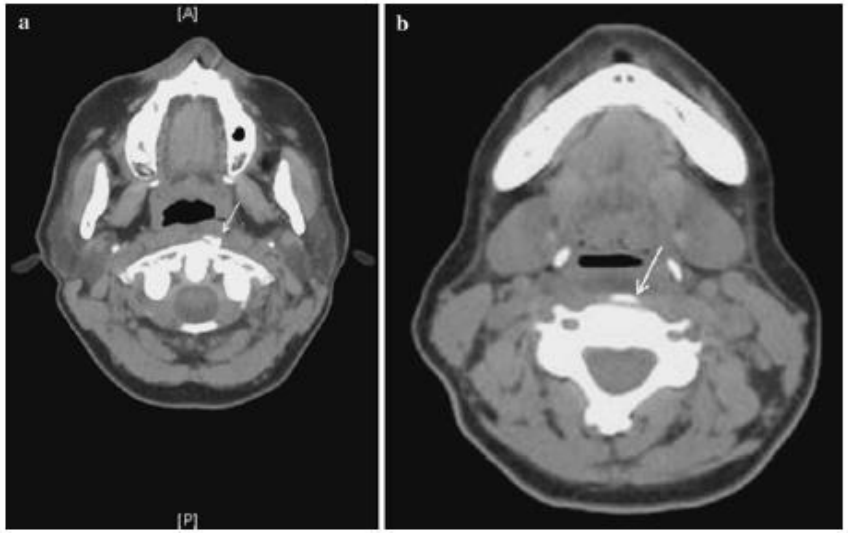
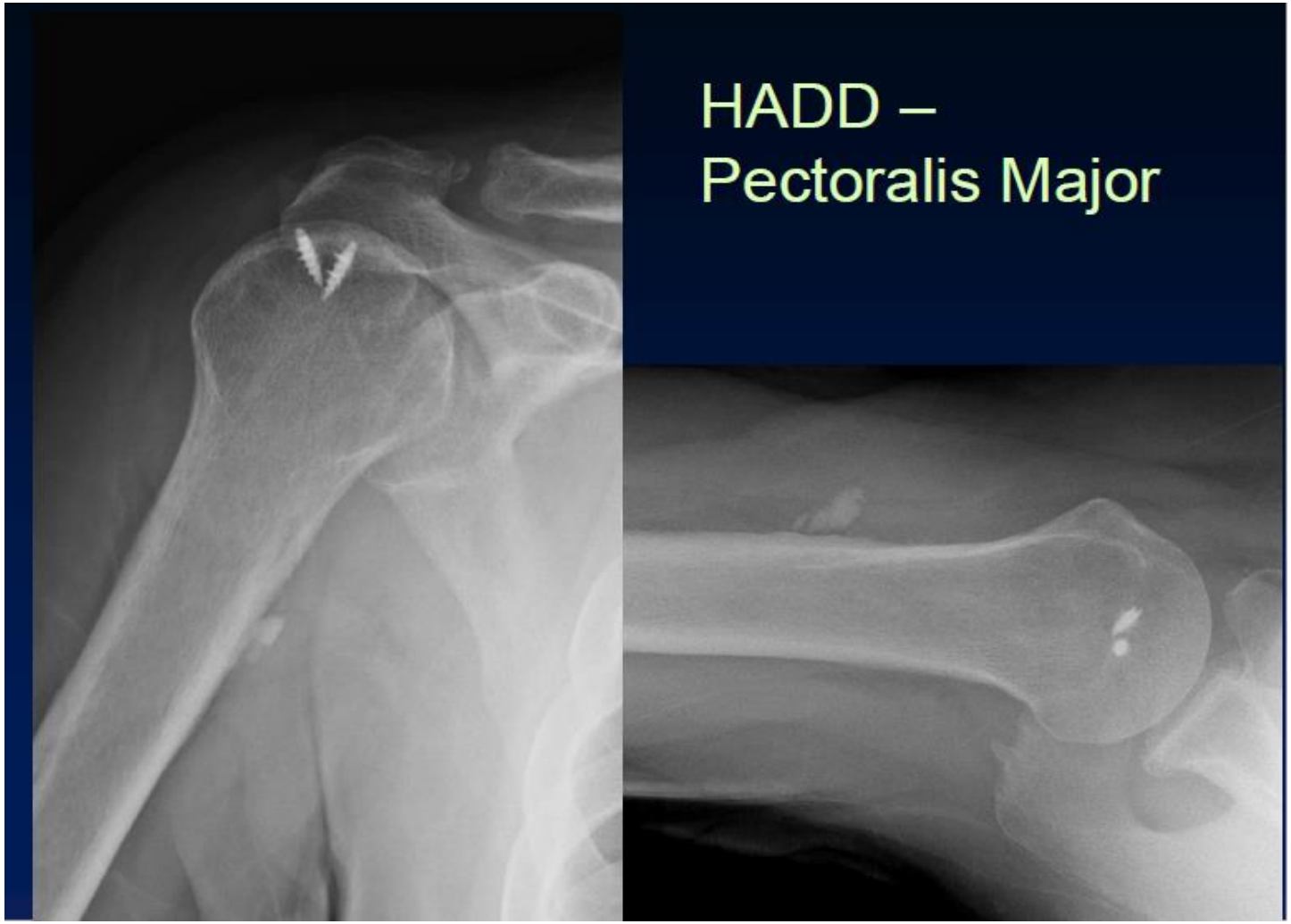


Fig. 3 Cervical CT on C1–C2 level (**a**) and C3 level (**b**) reveal multiple small punctate calcific deposits (*arrows*) in the mass of longus colli muscle

A. H. Zibis et al. Acute calcific tendinitis of the longus colli muscle: case report and review of the literature. Eur Spine J. 2013 May; 22 (Suppl 3): 434–438



References: Radiology, Leeds General Infirmary - Leeds/UK

Figure 9. A 31-year-old man with right wrist pain after trauma. (A) Initial right wrist radiograph demonstrates a well-defined calcific density in the expected region of the abductor pollicis brevis tendon (arrow). The patient was not tender at this location. (B) Radiograph performed 3 months later shows a change in the appearance of the calcification from well defined to a hazy, amorphous density (arrow). The patient was symptomatic at this location, which indicates the resorptive phase of calcific tendinitis.

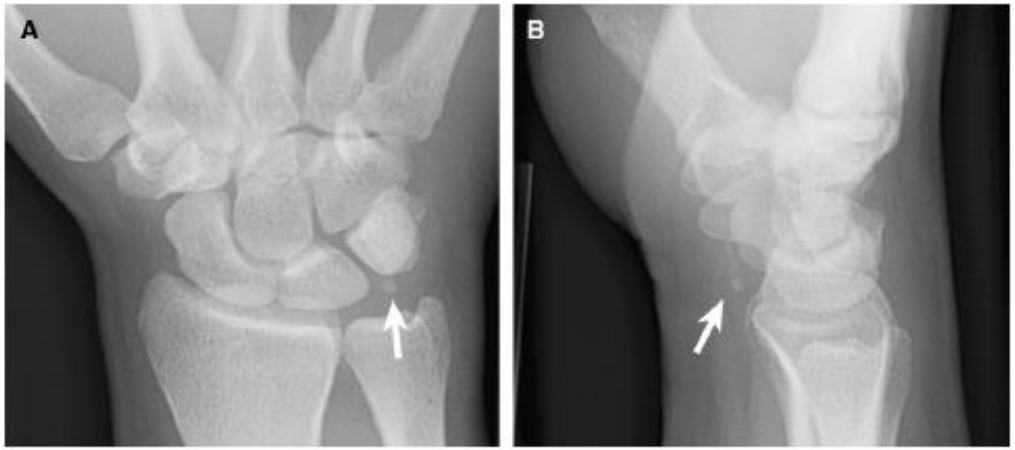


Figure 8. A 43-year-old woman with volar wrist pain. (A) AP and (B) lateral views of the wrist demonstrate several small calcifications (arrows) anterior to the pisiform at the distal attachment of the flexor carpi ulnaris tendon.

A 50-year-old female complaining of pain in the left posterior thigh was presented. The pain had lasted for 3months, while aggravated by radiating to the left heel 3 weeks before admission. Any motion of the affected lower extremity was severely restricted.
Physical examination revealed local tenderness around posterior lateral aspect of the great trochanter

Fig. 1. Anterior–posterior radiography of the pelvis showed amorphous calcification below the left trochanteric area (arrow head).

Y. Gong et al. Calcific tendinitis of the gluteus maximus tendon with sciatic pain. European Journal of Radiology Extra 76 (2010)

A 40 year old female with localized pain to dorsal hind foot exacerbated by dorsiflexion

Fig. 17: A lateral radiograph of the ankle with well defined calcification projected along the dorsal surface of the hind foot

References: Radiology, Leeds General Infirmary - Leeds/UK

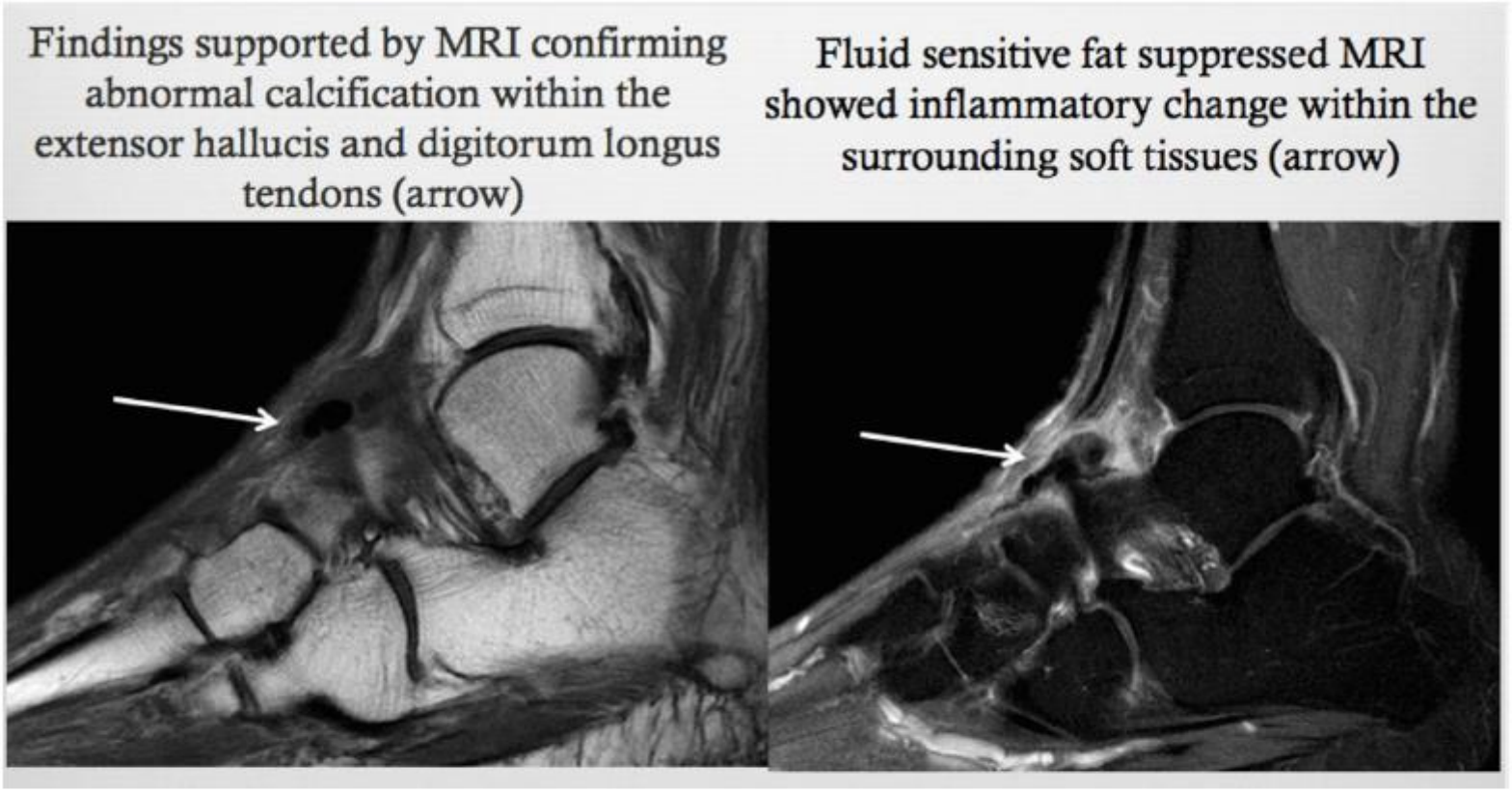


Fig. 18: Sagittal MRI confirming abnormal calcification within the extensor hallucis and digitorum longus tendons (arrow) with inflammatory change within the surrounding soft tissues (arrow)

References: Radiology, Leeds General Infirmary - Leeds/UK

Figs. 2 and 3. Anteroposterior and oblique radiograph of the ankle showing an area of amorphous fluffy irregular calcification adjacent to the medial border of navicular bone.

Fig. 1. Photograph showing swelling overlying the medial malleolus and the proximal foot with erythema.

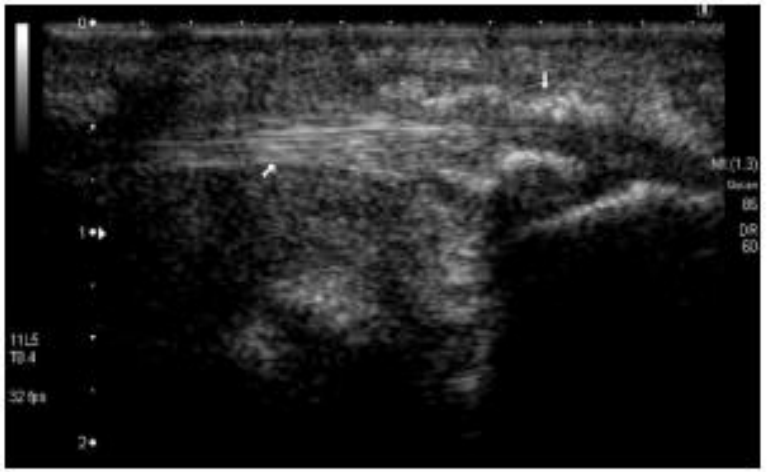
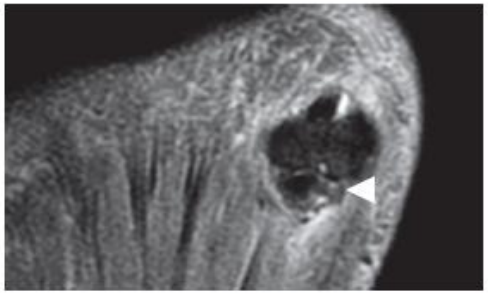


Fig. 4. Ultrasonography image showing the linear tendon (oblique arrow) with hyperechoic structure in its distal portion consistent with calcification (straightarrow).

S.G. Jakhere et al. / European Journal of Radiology Extra *(2011)*

(a)

(b)



(c)

FIGURE 16: Calcific tendinitis of the flexor hallucis brevis. (a) and (b) Amorphous calcification consistent with acute, symptomatic phase of calcific tendinitis is present just proximal to the hallucal sesamoids (arrows). (c) Long axis PD fat-saturated MR image shows heterogenous signal of the calcification (arrowhead) with mild surrounding edema, which is also consistent with acute symptomatic phase.

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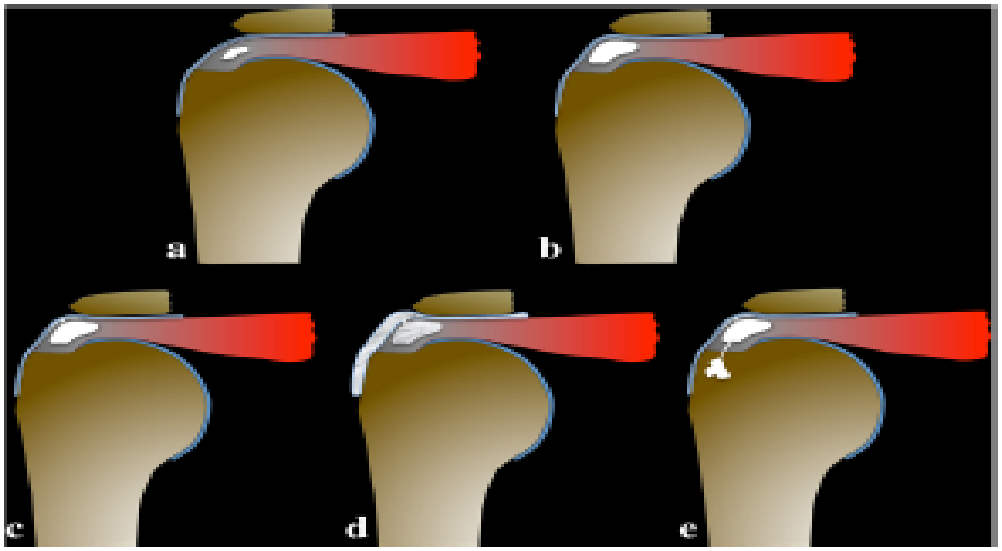


Fig. 2 Natural history of intratendinous calcium deposits of the shoulder (adapted from Moseley [9]). **a** In the silent phase, the compact intratendinous calcium deposit does not have any modifying effect on its environment. **b** At the beginning of the "mechanical" phase, the deposit increases in volume, creating a focal bulge that may lead to impingement with the acromion. **c** Calcific material disperses and partially migrates between the tendon and the adjacent synovial bursa. **d** The deposit is evacuated into the subdeltoid bursa (generally during an episode of acute pain). **e** The tendinous calcification may extrude into adjacent bone

Malghem J et al. Intraosseous migration of tendinous calcifications: cortical erosions, subcortical migration and extensive intramedullary diffusion, a SIMS series. Skeletal Radiol.2015 Oct;44(10):1403-12.

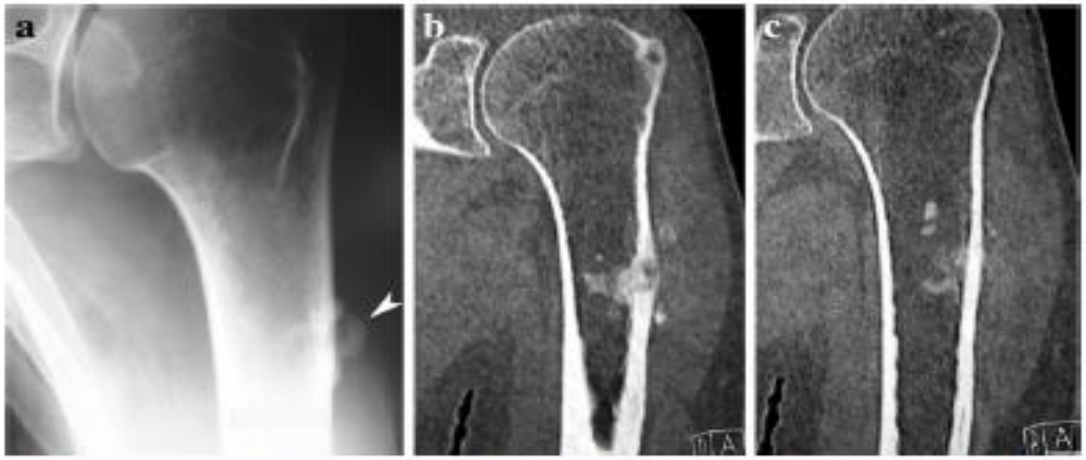


Fig. 16 Extensive intramedullary diffusion of a calcification of the pectoralis major tendon (courtesy of JD. Laredo). **a** A radiograph shows a large amorphous calcium deposit next to the humeral diaphysis (*arrowhead*). **b**, **c** CT scans performed 2 weeks later show the partial disappearance of this calcification and the presence of calcium deposits not only within a cortical lesion, but also extending several centimeters into the medullary cavity

Fig. 7 Subcortical calcium deposit demonstrated by means of ultrasound (courtesy of S. Bianchi). **a** A radiograph shows an ill-defined calcium deposit, probably in dissolution, in the region of the supraspinatus tendon. **b** Ultrasonography shows that the heterogeneous echogenic focus in the tendon (*arrow*) extends into an osseous lacuna of the superior facet of the greater tuberosity of the humerus (*arrowhead*)

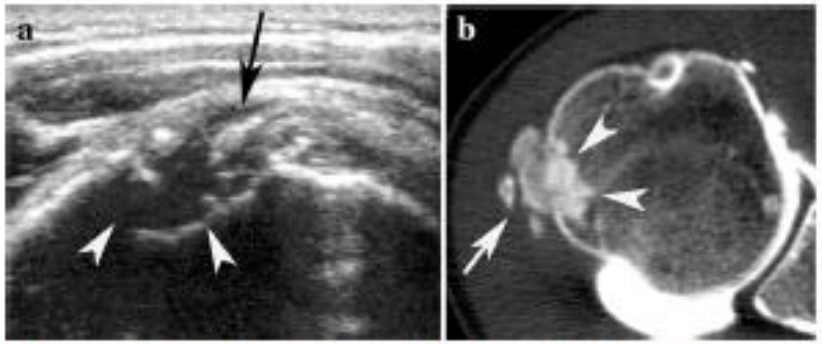


Fig. 8 Similar lesion demonstrated by ultrasound and CT (courtesy of G. Morvan). **a** Ultrasound shows a heterogeneous echogenic focus in the tendon (*arrow*) that extends into a large lesion of the superior facet of the greater tuberosity of the humerus (*arrowheads*). **b** A CT scan confirms that the large tendinous calcification (*arrow*) extended into the subcortical bone (*arrowheads*)

Malghem J et al. Intraosseous migration of tendinous calcifications: cortical erosions, subcortical migration and extensive intramedullary diffusion, a SIMS series. Skeletal Radiol.2015 Oct;44(10):1403-12.

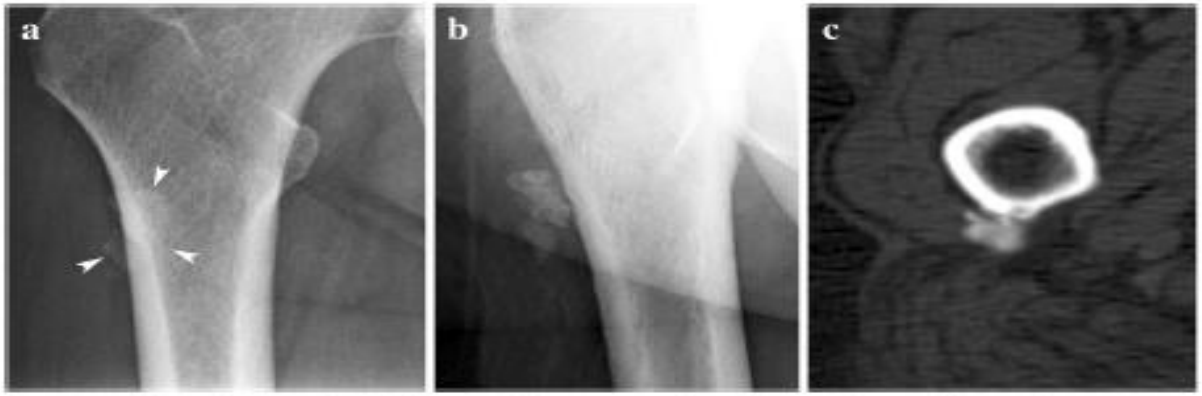


Fig. 5 Superficial femoral cortical erosion opposite calcific tendinitis at the gluteus maximus insertion. **a** A radiograph of the upper femur imprecisely shows low density calcification (*arrowheads*) partly obscured by the femur. **b** An additional radiograph with internal rotation of the hip shows the large, heterogeneous calcium deposit at the upper part of the linea aspera at the gluteus maximus insertion. **c** The corresponding CT scan shows the penetration of calcium material into a small cortical erosion

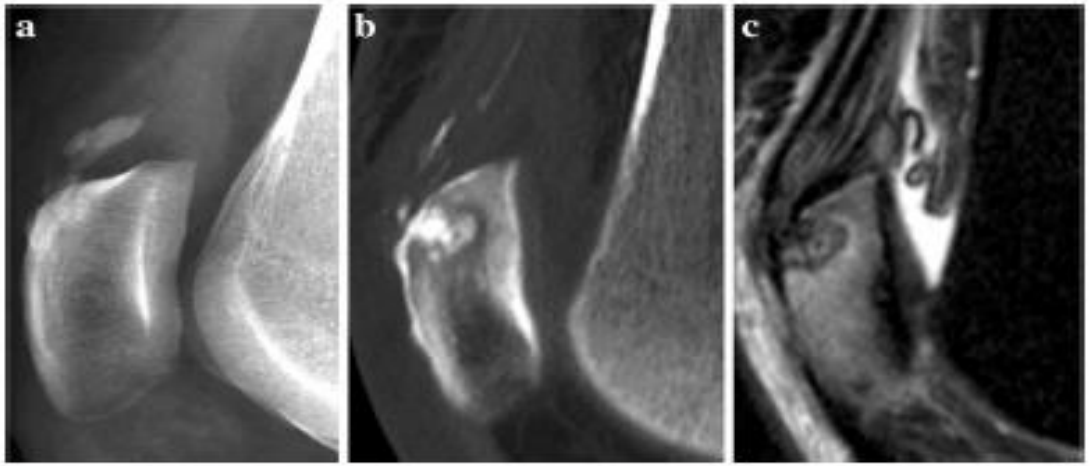


Fig. 12 Calcific intraosseous extension into the patella (courtesy of O. Hauger). **a** A radiograph of the knee shows an amorphous calcium deposit in the lower end of the quadriceps tendon. **b** A few weeks later, during an attack of acute pain, a CT scan shows that the tendinous calcification has practically disappeared and that a large calcification is occupying a subcortical lacuna in the patella. **c** An FS T2-weighted MRI scan shows the lesion's heterogeneous content, with edematous infiltration of high signal intensity in adjacent bone marrow and soft tissues

Malghem J et al. Intraosseous migration of tendinous calcifications: cortical erosions, subcortical migration and extensive intramedullary diffusion, a SIMS series. Skeletal Radiol.2015 Oct;44(10):1403-12.

An otherwise healthy 57-year-old female patient presented with a 5-month history of left-sided neck and scapular pain. The pain did not radiate to the arms. On physical examination, the patient had pain during palpation of the cervical spine and paraspinal musculature. Additionally, cervical spine extension and lateral flexion were limited. Neurological examination of the four extremities was normal.

Fig. 1 Plain radiograph showing C4–C5 interspinous calcification and a lytic lesion in the posterior arch of C4 (*arrow*)

Urrutia J et al. Calcium hydroxyapatite crystal deposition with intraosseous penetration involving the posterior aspect of the cervical spine: a previously unreported cause of neck pain. Eur Spine J.2017 May;26 (Suppl 1):53-57.

Fig. 3 **a** Axial and **b** sagittal CT scan showing laminar erosion and soft tissue calcifications

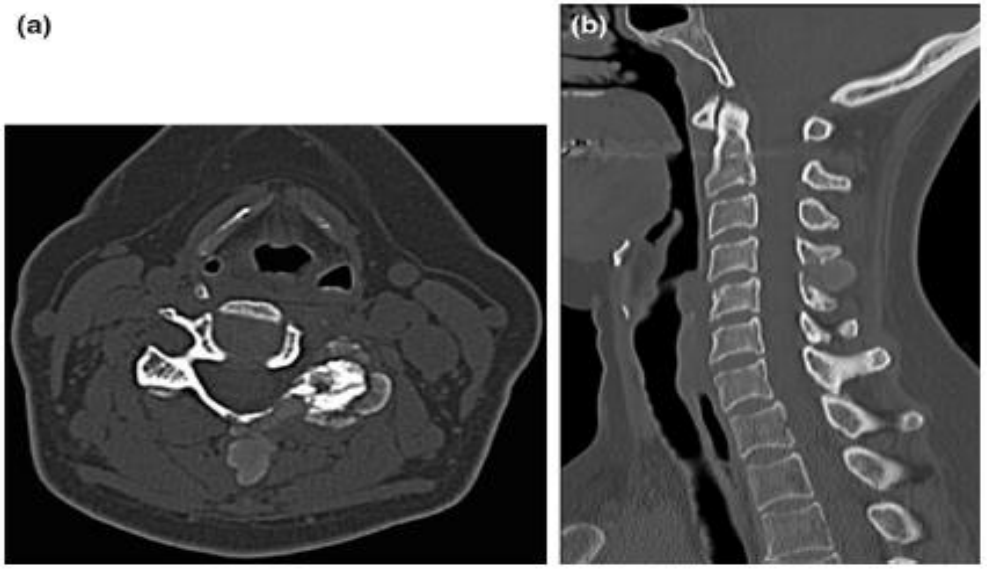
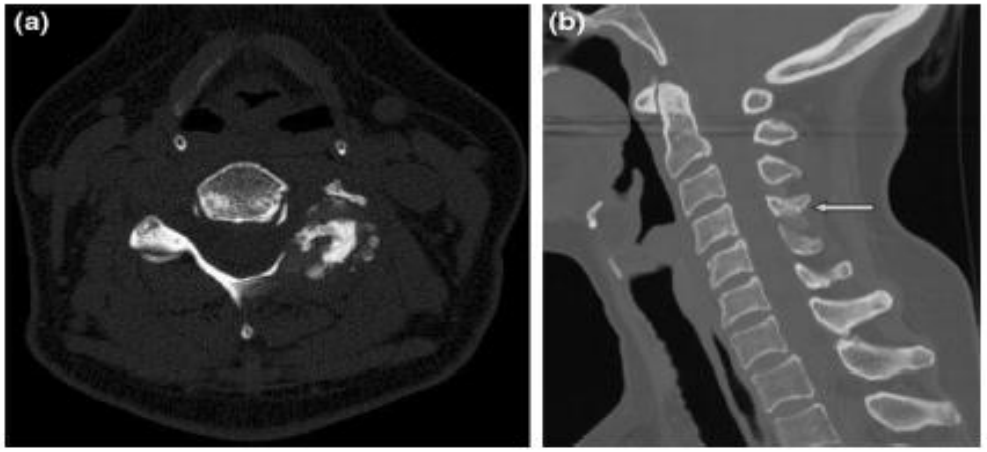


Fig. 4 **a** Axial and **b** sagittal CT scan exhibiting reparative remodeling of the posterior arch of C4



Urrutia J et al. Calcium hydroxyapatite crystal deposition with intraosseous penetration involving the posterior aspect of the cervical spine: a previously unreported cause of neck pain. Eur Spine J.2017 May;26 (Suppl 1):53-57.

ΔΟΜΗ ΟΜΙΛΙΑΣ

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- *Διαφορική διάγνωση*
- *Θεραπευτική αντιμετώπιση*

Milwaukee arthropathy

- Σπάνια μορφή καταστροφικής αρθρίτιδας που οφείλεται στην ενδοαρθρική και περιαρθρική εναπόθεση κρυστάλλων HADD και προσβάλλει κυρίως τους ώμους ηλικιωμένων γυναικών , συνήθως > 70

- Εκτεταμένη καταστροφή στις οστικές δομές με προτίμηση όμως στην βραχιόνια κεφαλή, ολικές ρήξεις των τενόντων του στροφικού πετάλου, μεγάλη υποδελτοειδική θυλακίτιδα και υμενίτιδα με μεγάλη αρθρική συλλογή της γληνοβραχιόνιας άρθρωσης .

Milwaukee arthropathy

- Στην αρχή προσβάλλεται ο ένας ώμος άλλα σύντομα και συνήθως εντός εξαμήνου προσβάλλεται και ο άλλος ώμος , ενώ στην βιβλιογραφία αναφέρεται και η προσβολή του γόνατος

- Η κλινική εικόνα και η απεικόνιση είναι χαρακτηριστικές σε αμφίβολες περιπτώσεις η χρώση του αρθρικού υμένα με alizarin red (ερυθρό της αλιζαρίνης) μπορεί να θέσει την διάγνωση

Figure 6.
Milwaukee Shoulder. AP radiograph of normal left shoulder (A). Several months later, Grashey view of the same shoulder (B) demonstrates interval subarticular osseous destruction and capsular calcifications.

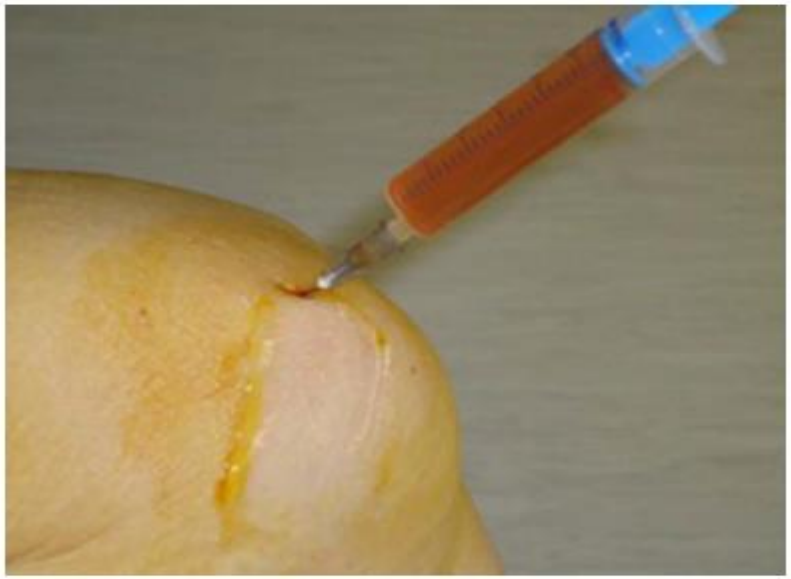


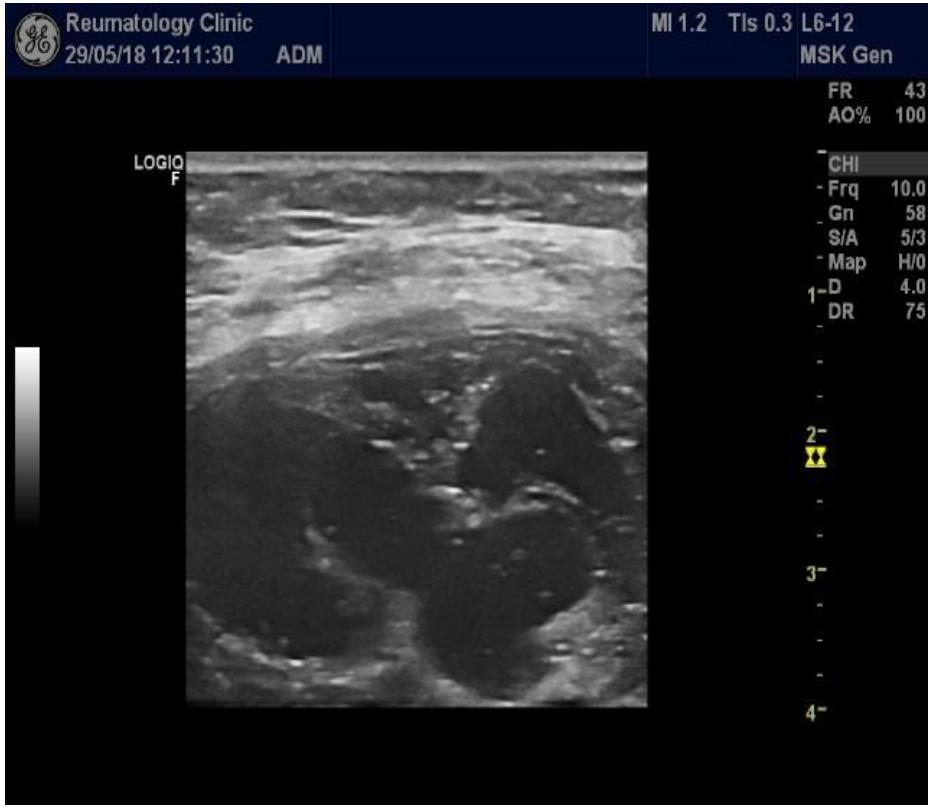
Figure 4 Subacromial bursa aspiration yielded over 200 mL of a haemorrhagic synovial fluid, which exhibited a non-inflammatory cell count (leucocytes 800/mm^3).

Figure 1 Clinical aspect of the patient. Note the presence of bilateral swelling of the shoulders.

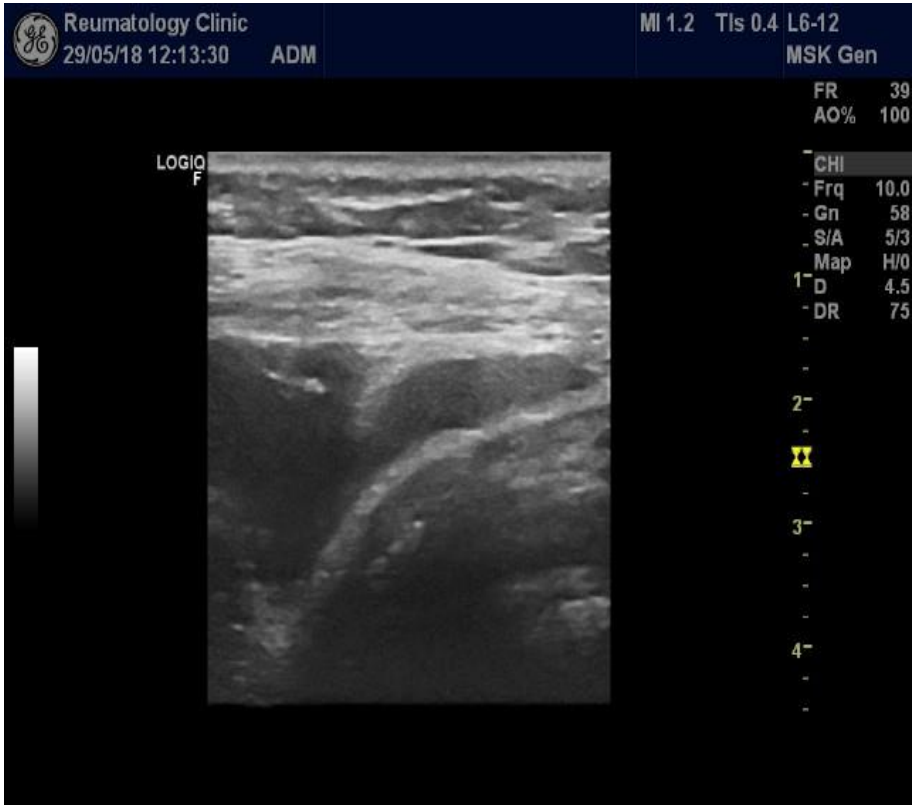
Santiago T, et al. BMJ Case Rep 2014.

Milwaukee shoulder

SASD bursitis



GH synovitis



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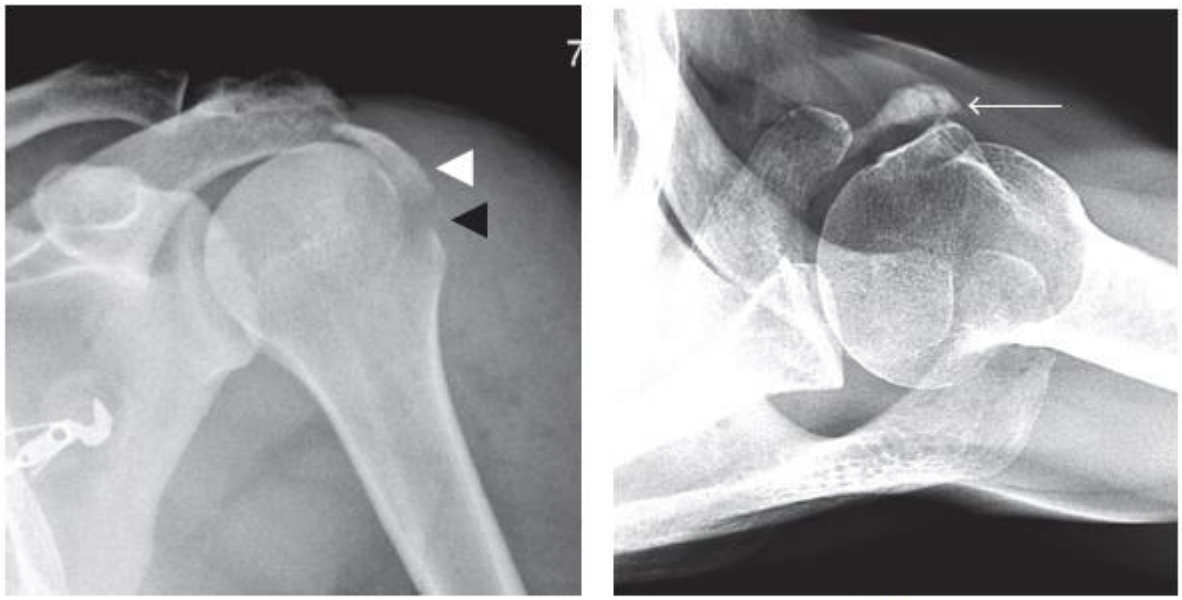

(a) (b)

FIGURE 18: Fracture mimicking calcific tendinitis. (a) A large displaced avulsion fracture of the greater tuberosity is present (white arrowhead). The avulsion somewhat resembles calcific tendinopathy, although incomplete cortication of the avulsion fragment in addition to an adjacent donor site (black arrowhead) allows the diagnosis of avulsion fracture to be made. (b) Calcific tendinopathy of the subscapularis (arrow) resembling an avulsion of the rotator cuff. However, calcific tendinopathy has a rounded and more amorphous appearance of the calcification with no fracture donor site being present.

Nicholas M. Beckmann. *Review Article* .Calcium Apatite Deposition Disease: Diagnosis and Treatment. Radiology Research and Practice Volume 2016

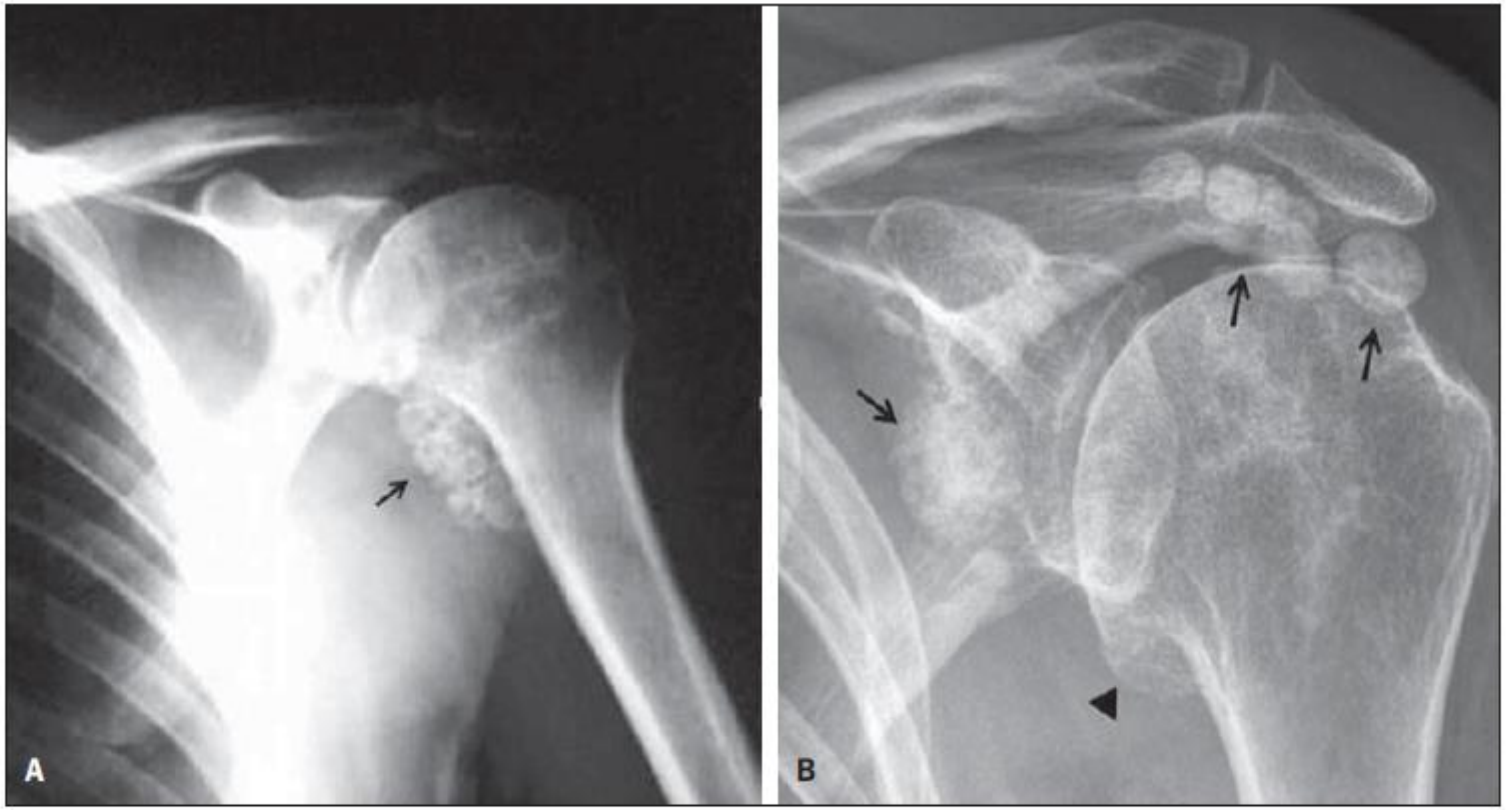

Figure 1. A: *Primary synovial osteochondromatosis*. Radiography, anteroposterior view of the shoulder demonstrating multiple, typical, ring-shaped calcifications similar in size and shape, located at the level of the axillary recess of the glenohumeral joint (arrow). **B:** *Secondary synovial osteochondromatosis*. Radiography, anteroposterior view of the shoulder demonstrating osteodegenerative changes characterized by the presence of osteophytes in the inferior articular margin of the humeral head (arrowhead) and presence of multiple juxtarticular rounded-shaped calcifications with varied sizes (arrows).

Terazaki CRT, Trippia CR, Trippia CH, Caboclo MFSF, Medaglia CRM. Synovial chondromatosis of the shoulder: imaging findings. Radiol Bras. 2014 Jan/Fev;47(1):38–42.

Σε ορισμένες περιπτώσεις λόγω οιδήματος μαλακών μορίων και ύπαρξης σημείων φλεγμονής στην διαφορική διάγνωση τίθενται και οι λοιμώξεις όπως στην παρακάτω περίπτωση ασθενούς με οδυνοφαγία και δυσφαγία που στην διαφορική διάγνωση τέθηκε και η πιθανότητα οπισθοφαρυγγικού αποστήματος (retropharyngeal abscess)

FIGURE 7: Calcific tendinitis of the longus colli. (a) Sagittal CT showing rounded calcification anterior to the dens just below the C1 anterior arch (arrow). Prevertebral edema causes anterior bowing of the pharyngeal mucosa (arrowhead). (b) Prevertebral edema is more conspicuous on sagittal T2 fat-suppressed image (arrowhead). The calcification of the longus colli tendon is not well appreciated on MRI.

Nicholas M. Beckmann. *Review Article* .Calcium Apatite Deposition Disease: Diagnosis and Treatment. Radiology Research and Practice Volume 2016

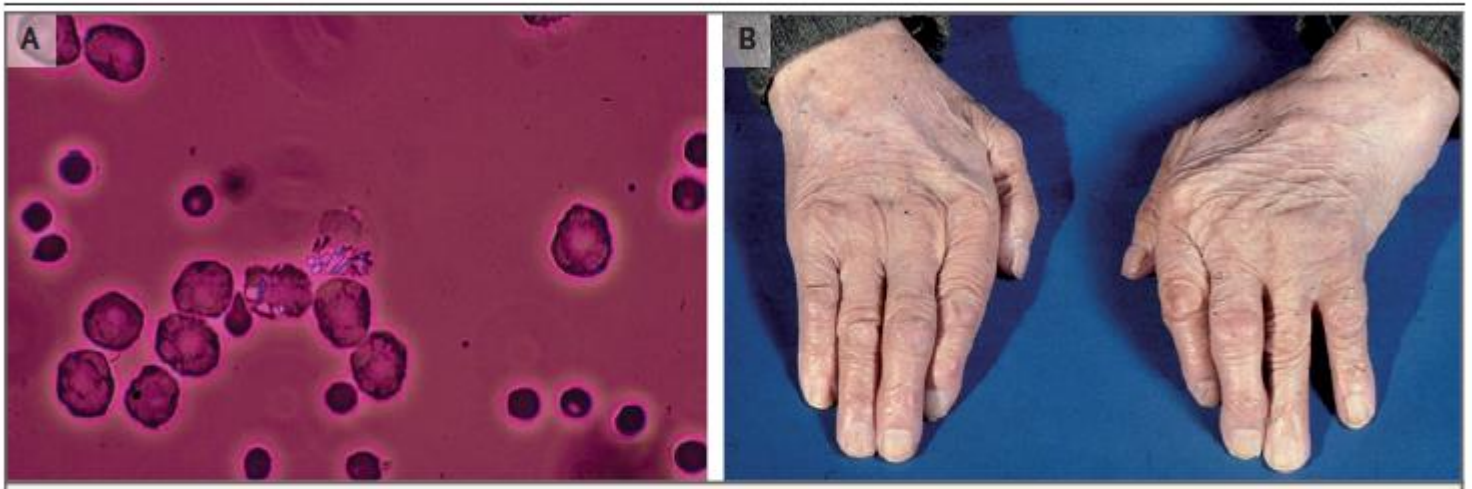

Figure 1. Calcium Pyrophosphate Deposition (CPPD).

Rhomboid, birefringent calcium pyrophosphate (CPP) crystals are seen under polarizing light microscopy in this sample of synovial fluid that was obtained from a patient with acute CPP crystal arthritis of the wrist (Panel A). The hands of an elderly patient with CPPD disease show swelling in the left wrist and the third proximal interphalangeal joint of the left hand (Panel B).

Ann K. Rosenthal and Lawrence M. Ryan. Review Article .Calcium Pyrophosphate Deposition Disease. N Engl J Med 2016; 374:2575-2584

CPPD versus HADD

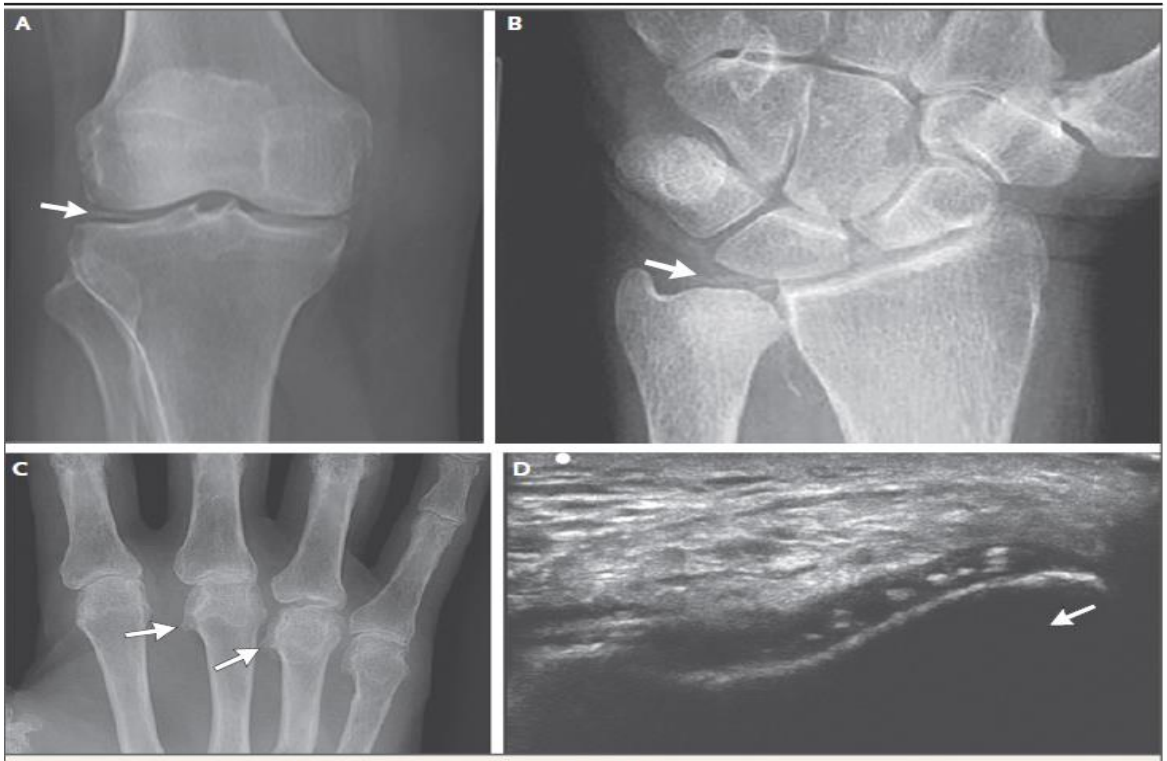

Figure 2. Imaging of Chondrocalcinosis in Patients with CPPD Disease.
Panel A shows a radiograph of a knee with meniscal chondrocalcinosis (arrow). Panel B shows a radiograph of a wrist with chondrocalcinosis of the triangular cartilage (arrow). Panel C shows a radiograph of a hand with hooklike osteophytes (arrows). Panel D shows an ultrasonographic image of a right knee, which was obtained with the transducer in the anatomical axial plane, with the knee flexed 90 degrees. The probe was pointed at the femoral cartilage on the "V" of the patellar groove. Chondrocalcinosis is seen in the substance of the cartilage; the arrow indicates the direction of the probe.

Ann K. Rosenthal and Lawrence M. Ryan. Review Article .Calcium Pyrophosphate Deposition Disease. N Engl J Med 2016; 374:2575-2584

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Table 1: Therapeutic options for CPPD and BCP deposition diseases compared to those available in gout.

	Gout	CPPD	BCP
Guidelines	ACR (2012) EULAR (2006) BSR (2007)	EULAR (2011)	None
Local treatment of the flare	Intra-articular corticosteroid injection	Intra-articular corticosteroid injection	Periarticular corticosteroid injection-calcification aspiration-shockwave therapy
Efficacy of colchicine in flares	Yes	Yes	Limited data
Loading dose of colchicine	Yes	No	—
Efficacy of NSAIDs in flares	Yes	Yes	Yes
Efficacy of systemic corticosteroids in flares	Yes	Yes	Limited data
First-line preventive treatments	Xanthine oxydase inhibitors	None	None
Second-line preventive treatment	Uricosurics	Little data on colchicine	—
Third-line preventive treatment	Recombinant uricase	Little data on methotrexate and hydroxychloroquine	—
Efficacy of anti-interleukine-1 treatments	Established	Possible	Possible

CPPD: calcium pyrophosphate deposition; BCP: basic calcium phosphate; ACR: american college of rheumatology; EULAR: European league against rheumatic diseases; BSR: British society for rheumatology.

Tristan Pascart et al. Treatment of Nongout Joint Deposition Diseases: An Update. Arthritis . Volume 2014.

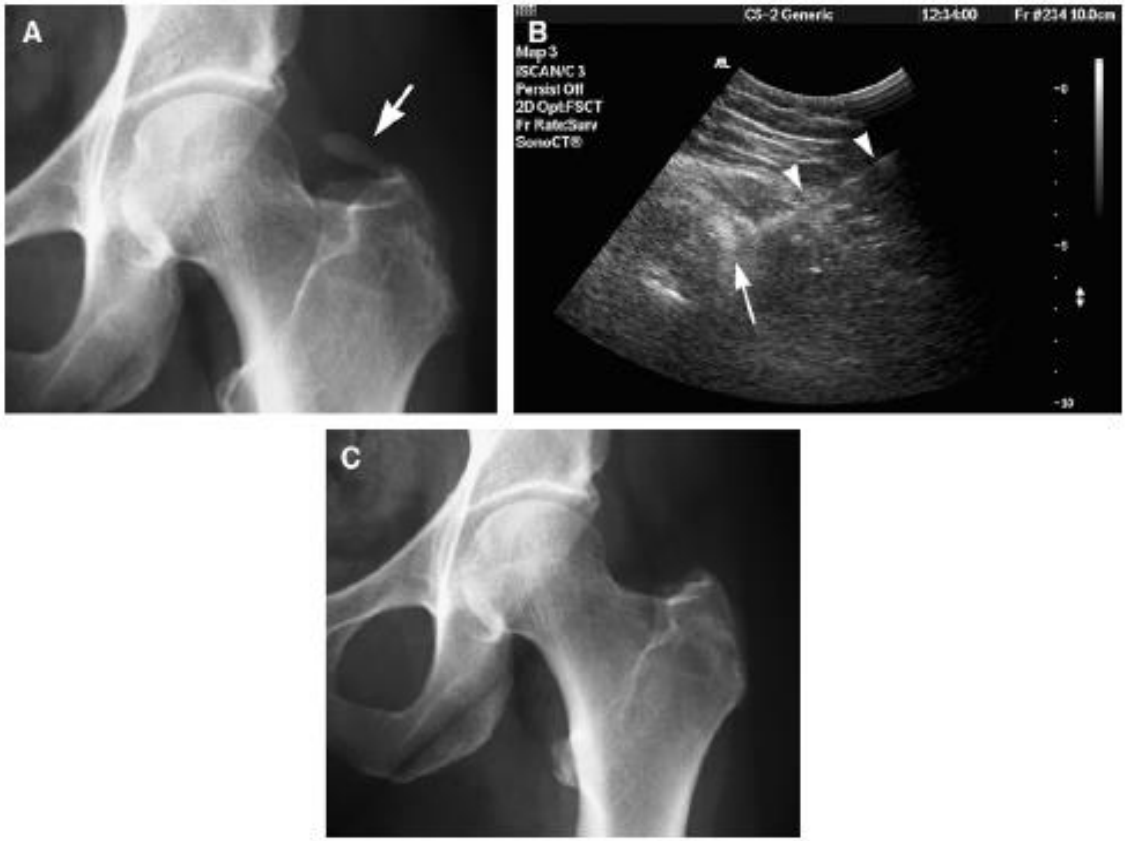

Figure 17. (A) A 57-year-old woman with pain in the left hip for the past 2 years. Radiograph shows calcific tendinitis next to the greater trochanter (arrow). (B) Calcification (arrow) was treated by means of sonographically guided lavage and aspiration by using a 20-gauge needle (arrowheads). (C) After treatment, the calcification disappeared and symptoms resolved.

Calcific tendinitis: a pictorial review / Canadian Association of Radiologists Journal (2009).

Klontzas ME , Vassalou EE ,Karantanas AH. Calcific tendinopathy of the shoulder with intraosseous extension: outcomes of ultrasound-guided percutaneous irrigation. Skeletal Radiol.2017 Feb;46(2):201-208

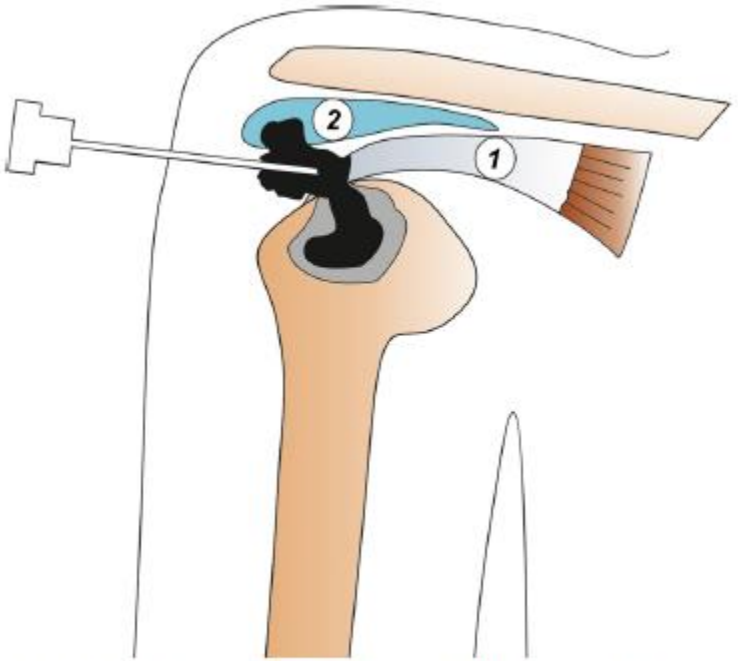

Fig. 3 Illustration presenting the ultrasound-guided treatment technique. A single-needle barbotage of the intra- and peritendinous calcifications (*1*) is performed, followed by a subacromial, bursal (*2*) injection

1. Grade 1—no improvement
2. Improvement of less than 50%
3. Improvement of between 50 and 70%
4. More than 70% improvement

Table 1 Mean improvement scores of the two groups

Group	3 weeks	3 months	6 months	1 year
A	1 (1-2)	1 (1-2)	1 (1-1.25)	1 (1-1)
B	3 (2-3)	4 (2-4)	4 (3-4)	4 (4-4)

Values represent median scores (interquartile range)

Outcomes of ultrasound-guided treatment in cases of RCCT- Rotator cuff calcific tendinopathy (with intraosseous extension) are significantly less favorable than in purely tendinous or peritendinous disease.

ΕΥΧΑΡΙΣΤΩ ΓΙΑ ΤΗΝ ΠΡΟΣΟΧΗ ΣΑΣ