Dactylitis: A pictorial review of key symptoms

A. Hamard, R. Burns, A. Miquel, J.M. Sverzut, V. Chicheportiche, M. Wybier, V. Bousson

▶ **To cite this version:**

A. Hamard, R. Burns, A. Miquel, J.M. Sverzut, V. Chicheportiche, et al.. Dactylitis: A pictorial review of key symptoms. Diagnostic and Interventional Imaging, 2020, 101 (4), pp.193-207. 10.1016/j.diii.2020.01.005 . hal-03350929

HAL Id: hal-03350929
https://hal.umontpellier.fr/hal-03350929

Submitted on 22 Aug 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

Version of Record: https://www.sciencedirect.com/science/article/pii/S2211568420300061
Manuscript_86c9ea61afe4dec545b4a3aeb363eb2e

Dactylitis: a pictorial review of key symptoms

Short title:

Imaging of dactylitis

A. Hamard [1,2*], R. Burns [1], A. Miquel [1], J.M. Sverzut[1], V. Chicheportiche[1], M. Wybier[1], V. Bousson[1,3]

[1] Department of Radiology, AP-HP, 75010 Paris, France

[2] Department of Radiology, EA 2415, Medical Imaging Group, Nimes University Hospital, 30029 Nîmes, France

[3] Université Paris Diderot, B30A CNRS UMR 7052, 75010 Paris, France

*Corresponding author: aymeric.hamard@chu-nimes.fr

Department of Radiology, EA 2415, Medical Imaging Group, Nimes University Hospital; Place du Professeur Robert Debré, 30029 Nîmes, France

The authors declare that they have no conflict of interest.

© 2020 published by Elsevier. This manuscript is made available under the CC BY NC user license
https://creativecommons.org/licenses/by-nc/4.0/

Abstract

Dactylitis refers to a global swelling of a finger or a toe giving it a clinical sausage-shape presentation. It is an extremely interesting symptom as it guides the rheumatologist towards a shortlist of diagnoses. However, radiologists are less familiar with dactylitis. The aim of this review is to detail and illustrate the main causes of dactylitis using standard X-ray imaging, ultrasound, computed tomography and magnetic resonance imaging in order to make radiologists more familiar with this symptom by illustrating the various conditions that are associated with dactylitis including infection, peripheral spondyloarthritis, sarcoidosis, microcrystalline deposition, osteoid osteoma, and sickle cell disease.

Keywords: Dactylitis; Infections; Spondylarthritis; sarcoidosis; Osteoid osteoma

Introduction

The term 'dactylitis' is derived from the Greek word '*daktulos*', finger, plus the suffix '*itis*' meaning inflammation. It corresponds to a global swelling of a finger or toe making it sausage-shaped[1,2] (Figure 1). The swelling of the finger or toe is relatively uniform and the swollen joints do not differentiate themselves from the neighboring swollen soft tissues.

The diagnosis of dactylitis is clinical. Dactylitis is like a clue as it guides the rheumatologist towards a shortlist of diagnoses, and the clinical appearance of dactylitis depends on the cause of the disease. However, radiologists are not familiar with dactylitis. The aim of this review was to illustrate and detail the main etiologies of dactylitis using X-rays, ultrasound, computed tomography (CT) and magnetic resonance imaging (MRI) in order to help radiologists become familiar with this symptom.

The prototype condition, which may present with dactylitis is infection. It is the first diagnosis that should be systematically considered as it bears heavy consequences. In specific circumstances, the possibility of infection due to tuberculous or syphilis may be evoked. Secondly, dactylitis may be the initial symptom of spondyloarthritides. The third possible diagnosis is sarcoidosis and the fourth is an inflammatory reaction related to microcrystalline deposition diseases. The fifth diagnosis to consider is osteoid osteoma of the phalanx. Finally, sickle cell dactylitis, also known as "hand-foot" syndrome, is a diagnosis to bear in mind in very young children likely to be affected by this genetic disease. Indeed, dactylitis is present in 39% of patients with psoriatic arthritis, 17% with sarcoidosis, 9.5-12% with

spondyloarthritis and 5-9.6% of patients with gout [3–7]. Typically, it does not occur in patients with rheumatoid arthritis or osteoarthritis.

Diagnostic approach

Patient' history and clinical examination are of high importance: traumatic disease, congenital and dysharmonious big finger/toe are distinguished from dactylitis. Congenital big finger/toe corresponds to a localized gigantism, secondary to a growing excess by mesenchymatous proliferation, associated or not to diffuse limb abnormality. Proteus syndrom, lipomatous macrodystrophy, Klippel Trenaunay syndrom and Parkes Weber syndrom are well known and congenital big finger/toe may also be observed in Von Recklinghausen and Ollier diseases. Dysharmonious big finger/toe differs from dactylitis because it is not a global swelling. It may be secondary to bone or soft tissue tumor or pseudotumor. Regarding bone abnormalities, several diagnoses must be searched for. They include aneurysmal bone cyst, giant-cell reparative granuloma, subungual exostosis, bizarre parosteal osteochondromatous proliferation, and exceptionally acral metastasis, chondrosarcoma and Ewing's sarcoma. Soft-tissue tumors or pseudotumors include mucoid cyst, epidermoid cyst, tendon sheath benign tumors, tendon sheath synovial chondromatosis, lipoma, and benign fibrous histiocytoma. Malignant digit/toe soft tissue tumors are exceptional.

Imaging examinations are tailored depending on the most likely diagnosis. Conventional radiographs are performed in all patients: anteroposterior and oblique views of both hands must be done, with complementary lateral view of the pathologic finger. Easily accessible, ultrasonography constitutes a second step, using high-frequency linear or L-shaped hockey stick probes (10-MHz or more) for the exploration of the pathologic finger. Both hands and wrists have to be explored when suspicion of peripheral spondyloarthritis, microcrystalline deposition and sarcoidosis because of their possible bilateral involvement. MRI exploration is fundamental: bone, joints and soft tissues are analyzed. It is performed at 1.5- or 3-Tesla, using an extremity coil. The whole hand is firstly explored, using the best spatial resolution, to detect all anomalies, for example multifocal disease or spreading of an infectious disease. Then, using a smaller field of view, the pathological finger/toe is precisely analyzed. Intravenous administration of a gadolinium-based contrast agent is systematic to maximize detection of abnormalities such as abscesses and differentiate effusion from synovitis. CT examination has to be done when MRI examination fails to provide a diagnosis. CT is of high

interest in detecting microcrystalline deposit or osteoid osteoma, which may be overlooked at MRI.

Main conditions associated with dactylitis

Infection

Septic arthritis, osteomyelitis, tenosynovitis, and other soft-tissue infections may present as dactylitis. Multiple infectious agents may be responsible such as pyogenes (especially staphylococcus, streptococcus), mycobacteria or brucellosis. An acute pyogenic infection is always the first differential to consider when confronted with dactylitis, especially if fever, local inflammatory signs, or rapid onset of the disease are present (Figure 2). A delayed diagnosis may have serious consequences, especially when the infection is localized to a closed anatomical space such as a tendon sheath. Two specific causes of infectious dactylitis, tuberculosis and syphilis, deserve discussion.

Tuberculous dactylitis

Involvement of bone and joints occurs in 10-15% of patients with extrapulmonary tuberculosis [3]. Tuberculous osteomyelitis involving tubular bones of the feet and hands accounts for 4% of these patients [3] and is related to hematogenous diffusion during primary infection [8]. Tuberculous dactylitis affects children and adolescents more often than adults and is revealed by a swollen finger, which is most often painless although it may be mildly painful [8–11].

Hands are more commonly involved than feet, especially metacarpals and proximal phalanges of the index and middle fingers. Patients rarely have coexisting involvement of feet and hands [12].

X-rays may typically show expansive cystic-like cavity, resulting from bone destruction and caseous material expansion, giving the appearance of a windblown sail named ‘spina ventosa’. Other features such as periosteal reaction, non-expansive bone destruction, sequestration, sinus tracts, adjacent joint involvement and soft-tissue swelling may be seen (Figure 3) [8,10,11].

This diagnosis is often delayed (5 to 12 months) due to lack of clinical and radiographic specificity, delayed onset of symptoms and slow progression of the disease [9]. Diagnosis is

confirmed by polymerase chain reaction or culture detection of *Mycobacterium tuberculosis* from a bone biopsy.

Syphilis

Syphilitic dactylitis is an early but rare manifestation of congenital syphilis, resulting from an untreated maternal infection by *Treponema pallidum*. Newborns present with swelling of the hands and, less frequently, of the feet. Syphilitic dactylitis is also seen in adults. The incidence and prevalence of syphilis have been increasing recently and must not be forgotten in case of dactylitis. Radiographic findings are similar to those observed in tuberculous dactylitis but with more exuberant periostitis and bilateral and symmetrical involvement [3,13].

Mycobacterium marinum

Mycobacterium marinum is an atypical mycobacterium, worldwide distributed pathogen living in salt or fresh water: it is responsible for infections in oyster workers, swimmers, individuals with aquariums at home [14–16]. It usually consists in skin infection, forming cutaneous nodules which may be indolent and unrecognized [17]. But it may also involve deeper structures and progress to tenosynovitis, arthritis, and osteomyelitis [18]. Imaging is non-specific (Figure 4).

Peripheral spondyloarthritis

Traditional spondyloarthritis (classification system recognized six distinct entities: ankylosing spondylitis, enteropathic arthritis, psoriatic arthritis, reactive arthritis, undifferentiated spondyloarthritis and juvenile spondyloarthritis. The Assessment of SpondyloArthritis international Society (ASAS) has developed new classification criteria with larger categories including axial and peripheral spondyloarthritis [19,20]. Sausage-digit' concerns 9.5% of patients affected by spondyloarthritis. Although more frequent in psoriatic arthritis, it also occurs in other spondyloarthritis and is not exclusive to patients with peripheral manifestations. It has been reported in 15.38% of enteropathic arthritis [1,4,21]. Dactylitis appears among the classification criteria for spondyloarthritis as a major variable impairing the quality of daily life and therefore its clinical importance should not be underestimated [2,22,23].

Psoriatic arthritis is the leading cause of dactylitis in adults. Considered as a hallmark feature in psoriatic arthritis, it is present in 16-49% of patients during the course of the disease [2,4,5,24–26]. Dactylitis mainly occurs during the early stages of the disease, and may be the only symptom of the disease for months or years [2,24]. Recurrent dactylitis appears in 44% of patients with psoriatic arthritis [25]. Psoriatic arthritis more often involves feet (preferentially the fourth toe) than hands (preferentially the fingers of the dominant hand) and has an asymmetrical distribution [2,24]. It is well known that digits showing dactylitis demonstrate greater radiological progression when compared to those without dactylitis [25].

Tender ('hot') and non-tender ('cold') forms of dactylitis are observed in patients with psoriatic arthritis; tender forms are associated with more aggressive radiological digital disease progression than non-tender forms. It is unknown whether the chronic non-tender form consists of a low-grade or resolving tender form, or the result of another pathological process [26]. Lack of pain and tenderness suggests a non-active disease. According to another hypothesis, the absence of abnormalities at imaging in non-tender forms reflects a quantitative, rather than qualitative, difference in forms [2,27].

Imaging, especially ultrasonography and MRI, helps understand the components of dactylitis in psoriatic arthritis (Figure 5). Flexor tenosynovitis is one of the most characteristic lesions detected in psoriatic dactylitis. Diffuse inflammation of extra-tendinous soft tissues, named 'pseudotenosynovitis' is also characteristic, and often associated with flexor tenosynovitis. However, entheses inflammation is the hallmark of spondyloarthritis and especially psoriatic arthritis [28]. It is currently assumed that inflammation occurs at 'functional entheses' formed by digit flexor tendons with pulleys [1,27,29]. Indeed, the pulleys, whose role is to constrain the flexor tendons, are subject to biophysical stress caused by bowstringing.

Doppler ultrasonography shows tenosynovitis, and 'pseudotenosynovitis' in non-synovial soft tissue as a response to stress at 'functional entheses', forming a 'rope on fire'. The 'rope' is represented by the flexor tendon, and the 'fire' is consistent with hyperemia in extra-tendinous non-synovial soft tissue [1,2].

MRI demonstrates predominant flexor tenosynovitis and inflammatory changes in extra-synovial soft tissues. Inflammatory changes in the pulleys have been described in recent high-resolution MRI of early dactylitis and support the hypothesis of pulleys and non-flexor tendons as initiators of tenosynovitis [30]. Extensor tenosynovitis occurs less frequently.

Other features can be found with MR imaging : abnormal enhancement at the volar and plantar plates, synovitis of the three joints of the digit, periosteal enhancement (especially of the deep flexor tendon attachment) and bone marrow edema [26,31].

X-rays of the hand may reveal the typical features of psoriatic arthritis: erosive and constructive joint changes leading to articular destruction. Findings are usually bilateral with an asymmetrical distribution of finger involvement, predominantly located at the distal interphalangeal joints and may involve an entire digit (metacarpophalangeal joint, proximal interphalangeal joint, plus distal interphalangeal joints of one digit). 'Sausage digits ' are usually associated with a higher degree of damage and progression rate than non-dactylitic digits [25]. Nails and, more particularly, the entheseal anchorage network around the distal phalanx and distal interphalangeal joint are known to be a site of inflammation [2]. When the condition spreads to the underlying distal phalanx it has been described as "psoriatic onycho-pachydermo-periostitis" (Figure 6) [32].

Sarcoidosis

Sarcoidosis is a systemic disease of unknown pathogenesis and occurs in patients under 40 years. Musculoskeletal (articular, bony or muscular) involvement is the presenting feature of the disease in 7% of patients, but mainly appears during the course of chronic multi-organ sarcoidosis [33,34]. Digital involvement occurs in 17% of patients with sarcoidosis [3].

Lesions of the small bones of the hand and foot represent 90% of bone involvement in sarcoidosis, and may manifest as dactylitis due to non-caseating granulomatosis invasion of the phalanges and adjacent soft tissues [3,33]. In rare cases, dactylitis may be the sole clinical expression of sarcoidosis [35–37]. Preferential involvement of the middle and distal phalanx of the second and third digits has been reported, but all fingers and/or toes may be involved. The presence of dactylitis is significantly associated with the presence of sarcoidosis skin lesions, especially lupus pernio [3,38–40]. Variable pain (present if acro-osteolysis occurs) and focal or diffuse swelling of the soft tissues are found at clinical examination. Nail changes can be observed when the distal phalange is affected. Pathological fractures of lytic phalanx lesions may also occur.

Bone scintigraphy (biphosphonates) is a sensitive modality providing whole body investigation [33]. It shows distribution of lesions involving the face, metacarpal/metatarsal and phalangeal bones of the hands and feet.

X-rays and CT demonstrate lytic lesions resulting from infiltration of granulomas in the perivascular Haversian canal (Figures 7 and 8). Three types of small bone sarcoidosis lesions are described: Type I consists of large bone geodes predisposing to pathological fractures; Type II, the most common, appears as small rounded pseudocystic lesions preferentially affecting the tip of the phalanges and associated with acro-osteolysis; Type III is the typical 'grid' reticulated appearance of thin cortex and thickened trabecular structures [3,34,38–41]. All three types may co-exist in the same bone. Once treated, these osteolytic 'cystic' lesions persist, corresponding to granulomas and inflammatory tissue replaced by fibrous tissue.

The most sensitive imaging method for the diagnosis of sarcoidosis is MRI that shows occult granulomatosis lesions as focal bone marrow replacement [42]. Furthermore, MRI may reveal soft tissue involvement such as dermohypodermal and tenosynovial granulomatous infiltration that may occur independently of, or as adjacent spreading of bone involvement. Dermohypodermal infiltration may appear as nodular thickening, with non-specific signal characteristics. Tenosynovial involvement shows no specific feature.

Microcrystalline deposition

Gout

Gout is characterized by deposition of monosodium urate crystals in the joints and soft tissues following chronic hyperuricemia. Gout-associated dactylitis has been reported in 5 to 9.6% of patients with gout [5,7,24,43].

Acute arthritis involving the metatarsophalangeal joint of the first toe is the inaugural feature of the disease in most patients [44]. Wrist, hand or finger involvement is a rare inaugural feature but its frequency increases throughout the course of the disease. The characteristic semiology of acute arthritis comprises sudden onset, severe pain, and signs of marked local inflammation.

Different pathogenic hypotheses have been raised regardingthe occurrence of dactylitis: in patients with tophaceous (chronic) gout, crystal deposition around the tendons and phalanges could explain the occurrence of dactylitis. During acute arthritis, non-specific joint synovitis, synovial sheath effusion and soft tissue edema might be responsible for the onset of dactylitis [7,45]. Dactylitis has been suggested as an indicator of disease severity: patients with dactylitis present more tophi and involved joints, greater uric acid serum concentration and longer disease duration than patients with non-dactylitic gout [7,43].

Ultrasonography and MRI demonstrate non-specific tendon sheath effusion and joint synovitis. In patients presenting with tophaceous gout, visualization of tophi at X-ray imaging in the subcutaneous tissue of the digit or toe involved is a key for diagnosis [7,45] (Figure 9). Digital tomosynthesis is an alternative to plain radiographs and conventional CT for evaluating radiographic damage in patients with chronic gouty arthritis [46].

Calcium hydroxyapatite

Deposition of calcium hydroxyapatite crystals in the tendons, also known as 'calcific tendinitis' is common. This may be asymptomatic or lead to acute or chronic clinical manifestations.

Calcific tendinitis has been reported in nearly every tendon. The shoulder represent the first location (60%) and the hip the second location, followed by the tendons of the fingers, toes, wrists and neck [47–51].

Acute self-resolving episodes of resorption are characterized by the sudden onset of intense pain and local inflammation, followed by a reduction in symptoms within 4-7 days [47,48,50,52].

Acute calcific tendinitis of the fingers has been reported in adults [49,53] and, more rarely, in children [51,54]. This should be considered as a possible cause of dactylitis. A recent history of trauma is usually present in 1/3 of patients [52].

X-rays show periarticular calcifications, especially within the digital flexor tendon, markedly decreasing within 2-3 weeks [48,50,52] (Figure 10). Acute synovitis of flexor sheath may be visible on ultrasonography and MRI. Periarticular calcification appearing as a low signal intensity deposit on T1- and T2-weighted MR images may be missed with MRI. The surrounding soft-tissue and bone edema are visible on the MRI, leading to a misinterpretation of more aggressive entities, especially if MRI is the first examination performed [47].

Osteoid osteomas

Osteoid osteomas (OO) are benign osteogenic tumors found in children and young adults, occurring mainly in the long bones of the lower limb and usually responsible for intense inflammatory pain. They are rarely located in the fingers or toes and may involve any phalanx [55–59].

Dactylitis is related to perilesional tissue swelling and reactive bone hyperostosis. This should be considered as a better sign than pain, which may be minimal or slightly inflammatory at the phalanx [57,59].

Imaging features do not differ from those observed in other locations. Hypertrophy and sclerotic changes of the phalanx involved are easily demonstrated either by radiographic or CT techniques. CT is the best imaging modality for identify the nidus, since the nidus is very small in size (a few millimeters). The nidus appears as a lucent area containing a central focus of mineralization, and is surrounded by a reactive bone formation [56,59]. Bone and soft tissue edema are clearly depicted on MRI (Figure 11). Depending on the site, reactive arthritis or tenosynovitis may be observed.

The correct diagnosis of OO is often delayed as osteoid osteomas are rare in these locations, often mimic other conditions such as spondyloarthritis, dactylitis or infection[55,56], and may be missed when only ultrasonography and/or MRI are performed without CT or bone scintigraphy with biphosphonates. In young patients presenting with dactylitis, osteoid osteomas should therefore be systematically considered.

Sickle cell disease

Dactylitis can be a complication of sickle cell disease (SCD), which represents the most common inherited blood disease characterized by an abnormal hemoglobin called hemoglobin S [60,61]. After the spleen, bones are the second most affected organs in SCD. Low blood flow in bones promotes erythrocyte sickling, resulting in vascular occlusion, thrombosis, infarction and necrosis.

Dactylitis of hands or feet, or both simultaneously, corresponds to an acute vaso-occlusive crisis leading to extensive areas of bone infarction. Bone infarction manifests as erythema, pain of variable intensity, and edema of the affected extremities [3,60,62]. This self-limiting episode lasts 1 to 3 weeks, and recurrences are common[3,60]. It classically occurs at the age of 6 months but sometimes sooner or later, up to the age of four years [63,64]. The occurrence of dactylitis before the age of 12 months is a predictive factor of disease severity and of an adverse outcome [63,65,66].

As fever and leukocytosis may be noticed during these acute crises, one should consider a differential diagnosis such as infection (soft tissue infection, arthritis, osteomyelitis) [60,67]. Distinction between these two entities is crucial, as their management and outcomes are quite

different. The number of digits involved is a key feature in this distinction: 'hand-foot syndrome' involves several digits whereas infection usually involves a single one.

X-rays initially only demonstrate soft tissue swelling. Osteolysis consistent with bone infarction and periosteal reaction appear within 1 to 2 weeks (Figure 12).

Conclusion

Patient' history and clinical examination are of high importance when facing dactylitis. Adapted complementary imaging examination provides the correct diagnosis among the main conditions associated with dactylitis: infection, peripheral spondyloarthritis, sarcoidosis, microcrystalline deposition, osteoid osteoma, sickle cell disease.

Conflict of interests

The authors declare that they have no conflict of interest.

Acknowledgment section

We are grateful to Frédéric Lioté, MD PhD, Rheumatology department Hôpital Lariboisière, Paris France, for Figure 1, and to Mohamed Fethi Ladeb, MD PhD, Radiology department, Kassab Orthopaedics Institute, Ksar-Said Tunisia for Figure 3. We are grateful to Sarah Kabani for editing the manuscript.

References

[1] Olivieri I, Padula A, Scarano E, Scarpa R. Dactylitis or “sausage-shaped” digit. J Rheumatol 2007;34:1217–22.

[2] McGonagle D, Tan AL, Watad A, Helliwell P. Pathophysiology, assessment and treatment of psoriatic dactylitis. Nat Rev Rheumatol 2019;15:113–22.

[3] Olivieri I, Scarano E, Padula A, Giasi V, Priolo F. Dactylitis, a term for different digit diseases. Scand J Rheumatol 2006;35:333–40.

[4] Tévar-Sánchez MI, Navarro-Compán V, Aznar JJ, Linares LF, Castro MC, De Miguel E, et al. Prevalence and characteristics associated with dactylitis in patients with early spondyloarthritis: results from the ESPeranza cohort. Clin Exp Rheumatol 2018;36:879–83.

[5] Rothschild BM, Pingitore C, Eaton M. Dactylitis: implications for clinical practice. Semin Arthritis Rheum 1998;28:41–7.

[6] Gladman DD, Ziouzina O, Thavaneswaran A, Chandran V. Dactylitis in psoriatic arthritis: prevalence and response to therapy in the biologic era. J Rheumatol 2013;40:1357–9..

[7] Andracco R, Zampogna G, Parodi M, Paparo F, Cimmino MA. Dactylitis in gout. Ann Rheum Dis 2010;69:316.

[8] Ritz N, Connell TG, Tebruegge M, Johnstone BR, Curtis N. Tuberculous dactylitis--an easily missed diagnosis. Eur J Clin Microbiol Infect 2011;30:1303–10.

[9] Sahli H, Roueched L, Sbai MA, Bachali A, Tekaya R. The epidemiology of tuberculous dactylitis: a case report and review of literature. Int J Mycobacteriology 2017;6:333–5.

[10] Burrill J, Williams CJ, Bain G, Conder G, Hine AL, Misra RR. Tuberculosis: a radiologic review. Radiographics 2007;27:1255–73.

[11] De Vuyst D, Vanhoenacker F, Gielen J, Bernaerts A, De Schepper AM. Imaging features of musculoskeletal tuberculosis. Eur Radiol 2003;13:1809–19.

[12] Thatoi P, Parida M, Barik R, Das B. Multifocal tubercular dactylitis: a rare presentation of skeletal tuberculosis in an adult. J Clin Diagn Res JCDR 2017;11:OD23–4.

[13] Yoon CJ, Chung HW, Hong SH, Kim CJ, Kang HS. MR findings of tuberculous dactylitis: case report. Eur J Radiol 2001;39:163–7.

[14] Vemulakonda LA, Tschen JA. Slow-growing and linearly spreading cutaneous lesion: often misdiagnosed Mycobacterium Marinum infection. Cureus 2019;11:e4154.

[15] Hosseini Fard SM, Yossefi MR, Esfandiari B, Sefidgar SAA. Mycobacterium marinum as a cause of skin chronic granulomatous in the hand. Casp J Intern Med 2011;2:198–200.

[16] Bouceiro-Mendes R, Ortins-Pina A, Fraga A, Marques T, Viveiros M, Machado D, et al. Mycobacterium marinum lymphocutaneous infection. Dermatol Online J 2019;25.

[17] Gonzalez-Santiago TM, Drage LA. Nontuberculous mycobacteria: skin and soft tissue infections. Dermatol Clin 2015;33:563–77.

[18] Holden IK, Kehrer M, Andersen AB, Wejse C, Svensson E, Johansen IS. Mycobacterium marinum infections in Denmark from 2004 to 2017: a retrospective study of incidence, patient characteristics, treatment regimens and outcome. Sci Rep 2018;8:6738.

[19] Chang EY, Chen KC, Huang BK, Kavanaugh A. Adult inflammatory arthritides: what the radiologist should know. Radiographics 2016;36:1849–70.

[20] Larbi A, Fourneret B, Lukas C, Baron M-P, Molinari N, Taourel P, et al. Prevalence and topographic distribution of spinal inflammation on MR imaging in patients recently diagnosed with axial spondyloarthritis. Diagn Interv Imaging 2017;98:347–53.

[21] Peluso R, Costa L, Caso F, Del Puente A, Di Minno MND, Manguso F, et al. Dactylitis in enteropathic spondyloarthritis. Clin Exp Rheumatol 2016;34:842–7.

[22] Coates LC, Kavanaugh A, Mease PJ, Soriano ER, Laura Acosta-Felquer M, Armstrong AW, et al. Group for research and assessment of psoriasis and psoriatic arthritis 2015 treatment recommendations for psoriatic arthritis. Arthritis Rheumatol Hoboken NJ 2016;68:1060–71.

[23] Ferguson EG, Coates LC. Optimisation of rheumatology indices: dactylitis and enthesitis in psoriatic arthritis. Clin Exp Rheumatol 2014;32:S-113-117.

[24] Kaeley GS, Eder L, Aydin SZ, Gutierrez M, Bakewell C. Dactylitis: a hallmark of psoriatic arthritis. Semin Arthritis Rheum 2018;48:263–73.

[25] Brockbank J, Stein M, Schentag C, Gladman D. Dactylitis in psoriatic arthritis: a marker for disease severity? Ann Rheum Dis 2005;64:188–90.

[26] Healy PJ, Groves C, Chandramohan M, Helliwell PS. MRI changes in psoriatic dactylitis--extent of pathology, relationship to tenderness and correlation with clinical indices. Rheumatol 2008;47:92–5.

[27] Girolimetto N, Costa L, Mancarella L, Addimanda O, Bottiglieri P, Santelli F, et al. Symptomatic psoriatic dactylitis is associated with ultrasound determined extra-synovial inflammatory features and shorter disease duration. Clin Rheumatol 2019;38:903–11.

[28] Fournié B. Pathology and clinico-pathologic correlations in spondyloarthropathies. Jt Bone Spine Rev Rhum 2004;71:525–9.

[29] McGonagle D. Imaging the joint and enthesis: insights into pathogenesis of psoriatic arthritis. Ann Rheum Dis 2005;64:ii58-60.

[30] Tan AL, Fukuba E, Halliday NA, Tanner SF, Emery P, McGonagle D. High-resolution MRI assessment of dactylitis in psoriatic arthritis shows flexor tendon pulley and sheath-related enthesitis. Ann Rheum Dis 2015;74:185–9.

[31] Tehranzadeh J, Ashikyan O, Anavim A, Shin J. Detailed analysis of contrast-enhanced MRI of hands and wrists in patients with psoriatic arthritis. Skeletal Radiol 2008;37:433–42.

[32] Boisseau-Garsaud AM, Beylot-Barry M, Doutre MS, Beylot C, Baran R. Psoriatic onycho-pachydermo-periostitis: a variant of psoriatic distal interphalangeal arthritis? Arch Dermatol 1996;132:176–80.

[33] Aptel S, Lecocq-Teixeira S, Olivier P, Regent D, Teixeira PG, Blum A. Multimodality evaluation of musculoskeletal sarcoidosis: Imaging findings and literature review. Diagn Interv Imaging 2016;97:5–18.

[34] Nessrine A, Zahra AF, Taoufik H. Musculoskeletal involvement in sarcoidosis. J Bras Pneumol Publicacao Of Soc Bras Pneumol E Tisilogia 2014;40:175–82.

[35] Rodriguez-Gomez M, Fernandez-Sueiro JL, Willisch A, Fernandez-Dominguez L, Lopez-Barros G, Vega-Vazquez F. Multifocal dactylitis as the sole clinical expression of sarcoidosis. J Rheumatol 2000;27:245–7.

[36] Ugwonali OFC, Parisien M, Nickerson KG, Scully B, Ristic S, Strauch RJ. Osseous sarcoidosis of the hand: pathologic analysis and review of the literature. J Hand Surg 2005;30:854–8.

[37] González-Cantero Á, Sánchez-Moya A-I, Martínez-Lorenzo E, Pérez-Hortet C, Schoendorff-Ortega C. Subcutaneous sarcoidosis with dactylitis. J Cutan Med Surg 2018;22:506.

[38] Karkowski L, Carassou P, Debourdeau P, Crevon L, Pavic M. A finger osteolysis. Rev Med Interne 2008;29:63–4.

[39] Mori T, Yamamoto T. Dactylitis in sarcoidosis. J Dermatol 2017;44:e340–1.

[40] Moore SL, Teirstein AE. Musculoskeletal sarcoidosis: spectrum of appearances at MR imaging. Radiographics 2003;23:1389–99.

[41] Duckworth AD, Hill AT, Beggs I, Patton JT, Salter DM, Porter DE. Sarcoidosis presenting as a proximal phalangeal bony swelling-a case and review of the literature. Hand N Y N 2010;5:90–4.

[42] Rayner CK, Burnet SP, McNeil JD. Osseous sarcoidosis - a magnetic resonance imaging diagnosis. Clin Exp Rheumatol 2002;20:546–8.

[43] Andracco R, Zampogna G, Parodi M, Cimmino MA. Risk factors for gouty dactylitis. Clin Exp Rheumatol 2009;27:993–5.

[44] Richette P, Bardin T. Gout. Lancet Lond Engl 2010;375:318–28.

[45] Popp JD, Dean Bidgood W, Lawrence Edwards N. Magnetic resonance imaging of tophaceous gout in the hands and wrists. Semin Arthritis Rheum 1996;25:282–9.

[46] Blum A, Noël A, Regent D, Villani N, Gillet R, Gondim Teixeira P. Tomosynthesis in musculoskeletal pathology. Diagn Interv Imaging 2018;99:423–41.

[47] Siegal DS, Wu JS, Newman JS, Del Cura JL, Hochman MG. Calcific tendinitis: a pictorial review. Can Assoc Radiol J J Assoc Can Radiol 2009;60:263–72.

[48] Claudepierre P, Rahmouni A, Bergamasco P, Montazel JL, Larget-Piet B, Chevalier X. Misleading clinical aspects of hydroxyapatite deposits: a series of 15 cases. J Rheumatol 1997;24:531–5.

[49] Fuerst M, Zustin J, Lammers L, Rüther W. Periarticular mineralization of the finger. Z Rheumatol 2008;67:327–8, 330–1.

[50] Wiper JD, Garrido A. Acute calcific tendinitis. N Engl J Med 2008;359:2477–2477.

[51] Walocko FM, Sando IC, Haase SC, Kozlow JH. Acute calcific tendinitis of the index finger in a child. Hand 2017;12:NP84–7.

[52] Doumas C, Vazirani RM, Clifford PD, Owens P. Acute calcific periarthritis of the hand and wrist: a series and review of the literature. Emerg Radiol 2007;14:199–203.

[53] Ali SN, Kelly JL. Acute calcific tendinitis of the finger - a case report. Hand Surg Int J Devoted Hand Up Limb Surg Relat Res J Asia-Pac Fed Soc Surg Hand 2004;9:105–7.

[54] Hansen U, Battista V. Pediatric trigger finger from calcific tendonitis. J Hand Surg 2007;32:1558–9.

[55] Vlaic J, Lamot L, Simunic S, Harjacek M, Bojic D. Unusual localization and presentation of osteoid osteoma mimicking juvenile spondyloarthritis: a case report. BMC Musculoskelet Disord 2019;20:17.

[56] Nasab SAM, Pipelzadeh M. Osteoid osteoma of proximal phalanx of the index finger of the right hand. Open J Med Imaging 2011;01:50.

[57] De Smet L, Spaepen D, Zachee B, Fabry G. Painless osteoid osteoma of the finger in a child. Case report. Chir Main 1998;17:143–6.

[58] Chen SC, Caplan H. An unusual site of osteoid osteoma in the proximal phalanx of a finger. J Hand Surg 1989;14:341–4.

[59] Braun S, Chevrot A, Tomeno B, Delbarre F, Pallardy G, Moutounet J, et al. Phalangeal osteoid osteoma (13 cases). Rev Rhum Mal Osteoartic 1979;46:225–33.

[60] da Silva Junior GB, Daher EDF, da Rocha FAC. Osteoarticular involvement in sickle cell disease. Rev Bras Hematol E Hemoter 2012;34:156–64.

[61] Habibi A, Bachir D, Godeau B. Acute complications in sickle cell disease. Rev Prat 2004;54:1548–56.

[62] Borhade MB, Kondamudi NP. Sickle cell crisis. StatPearls, Treasure Island (FL): StatPearls Publishing; 2018.

[63] Foucan L, Ekouevi D, Etienne-Julan M, Salmi LR, Diara J-P, Paediatric Cohort of Guadeloupe. Early onset dactylitis associated with the occurrence of severe events in children with sickle cell anaemia. The paediatric cohort of Guadeloupe (1984-99). Paediatr Perinat Epidemiol 2006;20:59–66.

[64] Stevens MC, Padwick M, Serjeant GR. Observations on the natural history of dactylitis in homozygous sickle cell disease. Clin Pediatr 1981;20:311–7.

[65] Silva IV, Reis AF, Palaré MJ, Ferrão A, Rodrigues T, Morais A. Sickle cell disease in children: chronic complications and search of predictive factors for adverse outcomes. Eur J Haematol 2015;94:157–61.

[66] Solé-Ribalta A, Vilà-de-Muga M, Català-Temprano A, Luaces-Cubells C. Dactylitis, early onset of drepanocytosis and a predictor of a poor prognosis. An Pediatr Barc Spain 2003 2015;82:267–8.

[67] Sinkin JC, Wood BC, Sauerhammer TM, Boyajian MJ, Rogers GF, Oh AK. Salmonella osteomyelitis of the hand in an infant with sickle cell disease. Plast Reconstr Surg Glob Open 2015;3:e298.

FIGURE LEGENDS

Figure 1. A 43-year old man with psoriatic arthritis. Photograph shows dactylitis of the 3rd right toe. Note nail psoriasis associated.

Figure 2. A 47-year-old woman complaining of progressive onset of thumb swelling with intense inflammatory pain. A, T1-weighted MR image of the thumb in the axial plane shows superficial and deep soft-tissue thickening (curved arrows). (B), T1 -weighted fat suppressed MR image of the thumb in the axial plane obtained after intravenous administration of a gadolinium-based contrast material shows superficial and deep soft-tissue heterogeneous, inflammatory enhancement (curved arrows), with abscesses (black arrow) around flexor tendon. (C) T1-weighted fat suppressed MR image of the thumb in the sagittal plane obtained after intravenous administration of a gadolinium-based contrast material shows superficial and deep soft-tissue heterogeneous, inflammatory enhancement (curved arrows), with abscesses (black arrow) around flexor tendon. D, T1 -weighted fat suppressed MR image of the thumb in the sagittal plane obtained after intravenous administration of a gadolinium-based contrast material shows superficial and deep soft-tissue heterogeneous, inflammatory enhancement (curved arrows), with abscesses (black arrows) around flexor tendon (white star) consistent with phlegmonous cellulitis. Staphylococcus aureus was found at bacteriological analysis.

Figure 3. A 61-year-old man with tuberculous dactylitis of the 3rd finger. T2-weighted fat-suppressed MR image in the coronal plane reveals joint effusion (white dotted arrow), bone infiltration and cortical bone destruction (black dotted arrow) of the distal phalanx, and soft-tissue inflammatory swelling (curved arrows).

Figure 4. A 24-year-old man complaining of 3rd finger swelling, a couple of days after cleaning his aquarium. A& B), X-ray demonstrates dorsal soft tissue swelling (arrows). C), T2-weighted fat-suppressed MR image in the sagittal plane shows dorsal superficial and deep soft-tissue inflammatory thickening (arrows) consistent with cellulitis without abscess. *Mycobacterium marinum* was found at bacteriological analysis.

Figure 5. A 55-year-old man with psoriatic arthritis, complaining about swelling and pain of the 4th and 5th fingers of his right hand. A) X-ray of the right hand demonstrates periosteal constructive changes along tubular bones of the 4th and 5th fingers (arrows). Psoriatic arthritis (dotted arrows) involving the interphalangeal joints of the 4th finger, the proximal interphalangeal joint of the 5th finger, and resulting in ankylosis of the distal interphalangeal joint of the 3rd finger. Articular erosions are well depicted (curved arrows). B), T1-weighted MR image of the 5th finger in the sagittal plane shows superficial and deep soft-tissue swelling and inflammation (curved arrows) and distal interphalangeal joint involvement (dotted arrow). C), T2-weighted fat-suppressed MR image of the 5th finger in the sagittal plane demonstrates bone marrow edema (black dotted arrows), distal interphalangeal joint involvement (white dotted arrow) and superficial and deep soft-tissue swelling and inflammation (curved arrows). D), T2-weighted fat-suppressed MR image of the 5th finger in the sagittal plane along flexor tendon (star) shows extra-tendinous inflammation (arrows) and superficial and deep soft-tissue swelling and inflammation (curved arrows).

Figure 6. A 50-year-old woman with psoriatic onycho-pachydermo-periostitis of the 4th and 5th toes of the left foot. Oblique X-ray reveals periosteal constructive changes of the distal phalanges (arrows) and distal interphalangeal joints destruction (dotted arrows). Note the soft tissue swelling.

Figure 7. A 44-year-old man with known face skin sarcoidosis (lupus pernio). A), Whole body bone scintigraphy reveals hands and feet lesions as well as facial skin involvement (arrows). B), X-ray of the left hand shows lytic changes: cortical (arrows) and trabecular (dotted arrows) destruction resulting in an enlargement of the nutrient foramen of the proximal phalanx of the 4th finger and of the middle phalanx of the 5th finger. Note the enlargement of the middle phalanx, and soft-tissue swelling of the 5th finger (curved arrows). C), T1-weighted MR image of the 5th left finger in the coronal plane shows multifocal bone destruction (arrows). D), T1-weighted MR image of the left 5th finger in the sagittal plane shows bone destruction (arrow), tenosynovitis of the flexor tendon (dotted arrows) and involvement of the distal interphalangeal joint (curved arrow). E), T2-weighted fat-suppressed MR image of the left 5th finger in the sagittal plane shows bone destruction (arrow), tenosynovitis of the flexor tendon (dotted arrows) and involvement of the distal interphalangeal joint (curved arrow).

Figure 8. A 39-year-old woman with known thoracic sarcoidosis, and swelling of multiple fingers and toes painless for several weeks. X-ray demonstrates asymmetrical involvement of the hands (A) and feet (B) with areas of cortical and trabecular bone destruction (arrows). Note adjacent joint involvement (dotted arrows) and soft tissue swelling (curved arrows) resulting in multiple dactylitis.

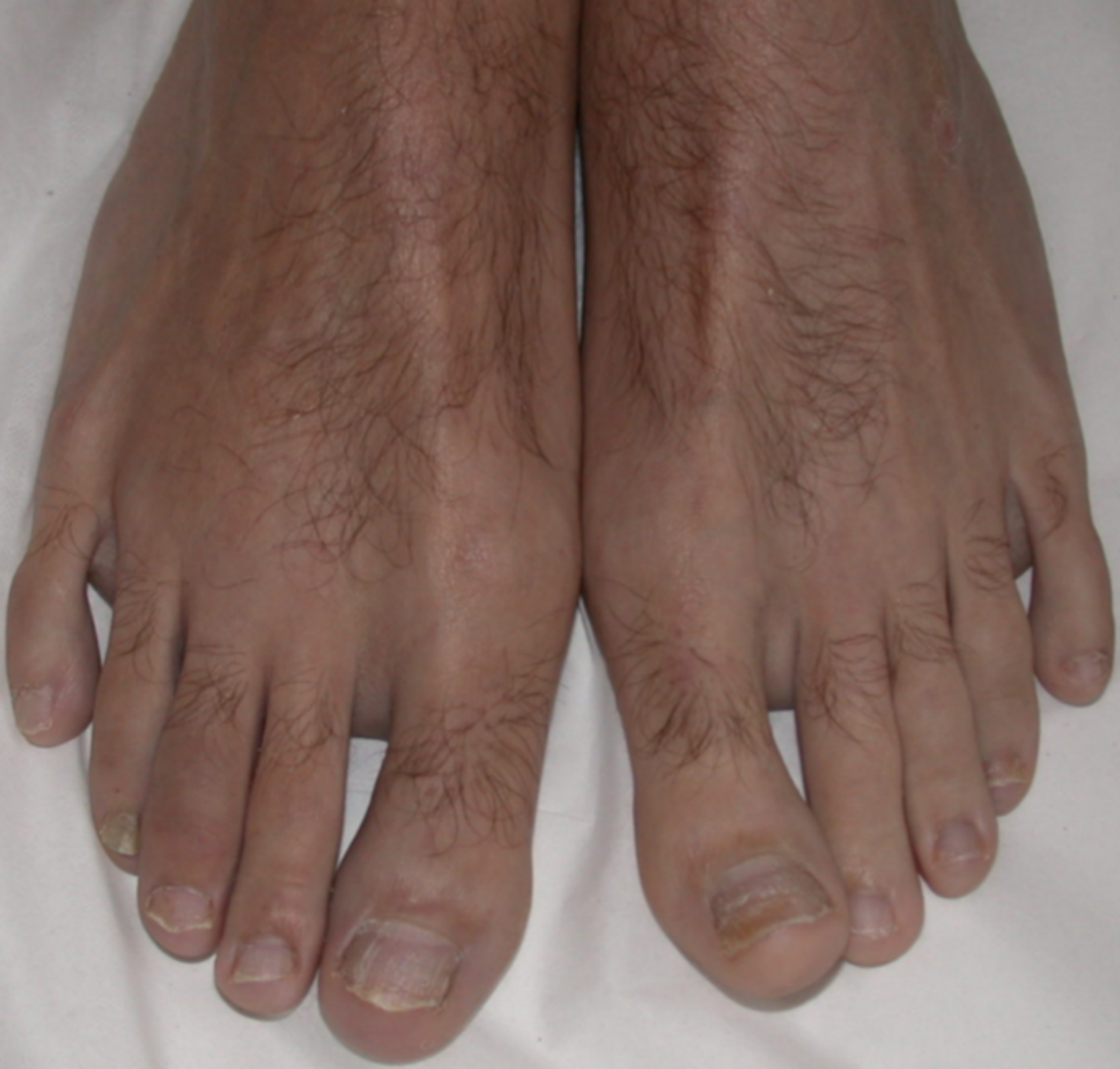
Figure 9. A 73-year-old man with known gout presenting mildly painful chronic swelling of the 2nd finger. X-ray in anteroposterior (A) and lateral (B) projections reveal soft-tissue periarticular tophi (curved arrows), responsible for extrinsic well-limited erosions of the proximal and middle phalanges (black arrow) around the proximal interphalangeal joint of the 2nd finger which appears relatively spared (dotted arrow). Note the osseous constructions (white arrows).

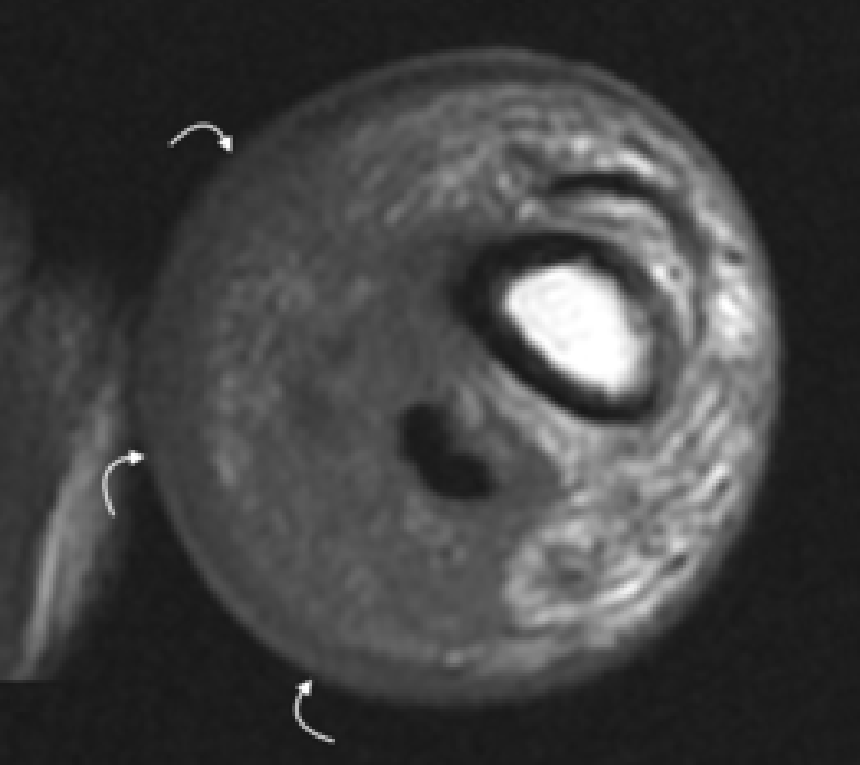
Figure 10. A 22-year-old woman presenting with a sudden onset of intense pain and swelling of the fourth finger. X-ray in anteroposterior (A) and lateral (B) projections reveal hydroxyapatite deposition in volar periarticular soft tissues (arrows) of the distal interphalangeal joint, consistent with the beginning of a calcific resorption.

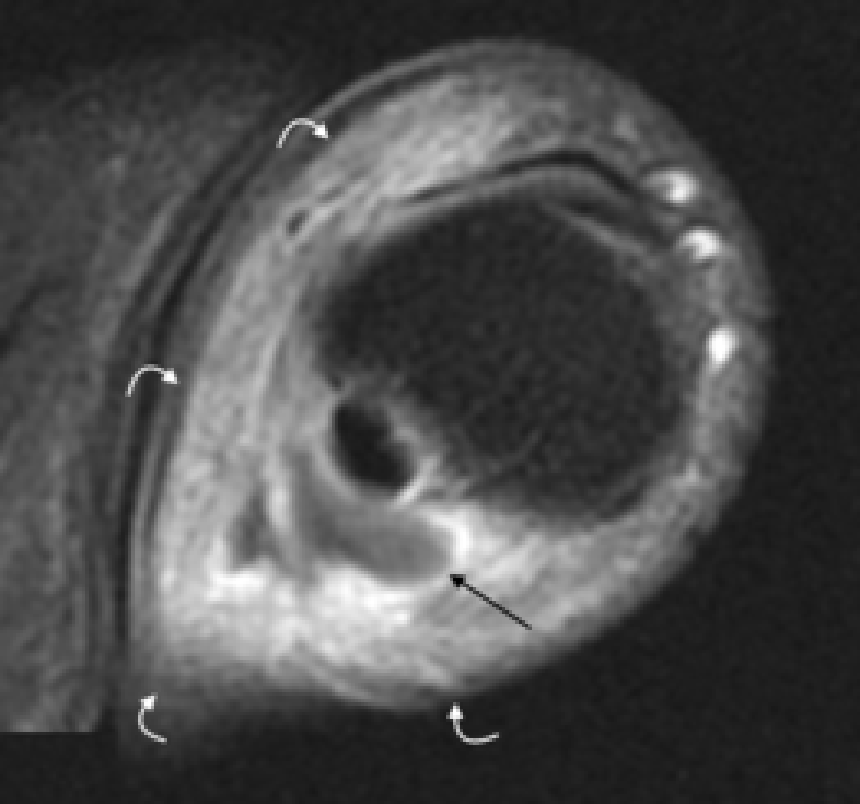
Figure 11. A 24-year-old woman complaining of forefinger pain and swelling occurring mainly at night. A), T1-weighted MR image in the sagittal plane shows discrete volar hyperostosis of the first phalanx and volar soft-tissue thickening (dotted arrow). B), T2-weighted fat-suppressed MR image in the sagittal plane shows volar soft-tissue inflammatory signal (dotted arrow), and nidus (arrow). C), T2-weighted fat-suppressed MR image in the axial plane shows volar soft-tissue inflammatory signal (dotted arrow), bone edema of the first phalanx, and nidus (arrow). D), CT images in the sagittal plane show a typical aspect of osteoid osteoma of the first phalanx with mineralized, rounded nidus with adjacent sclerotic bone reaction (arrows) and soft tissue swelling (dotted arrows). E) CT image in the coronal plane shows proximal swelling (arrows) of the 2nd finge.

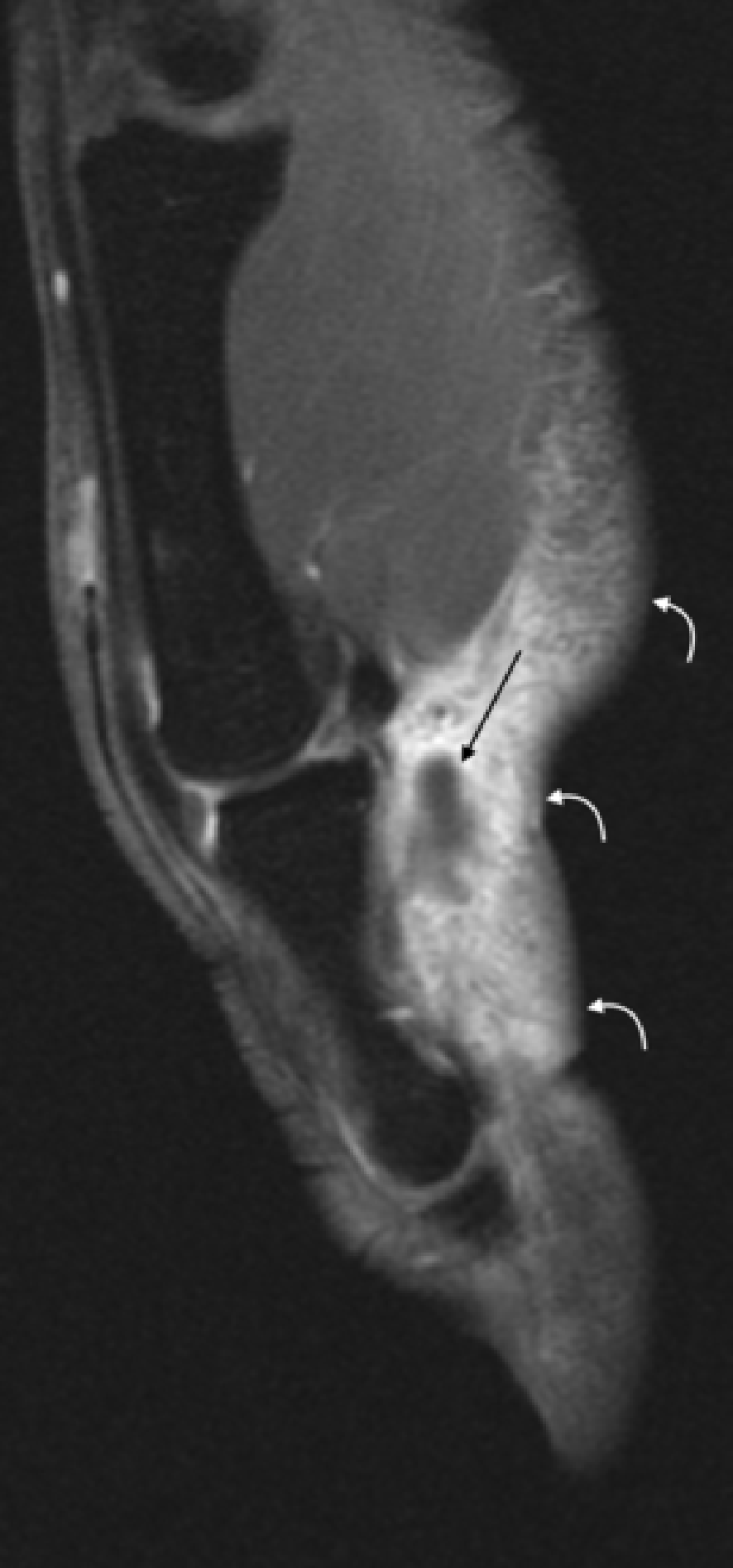
Figure 12. A one-year-old boy with sickle cell disease presenting with painful swelling of both hands for few days. X-rays of right (A) and left (B) hands demonstrate symmetrical metacarpal periosteal appositions (arrows) consistent with vaso-occlusive crisis. Note soft tissues diffuse swelling involving all fingers.

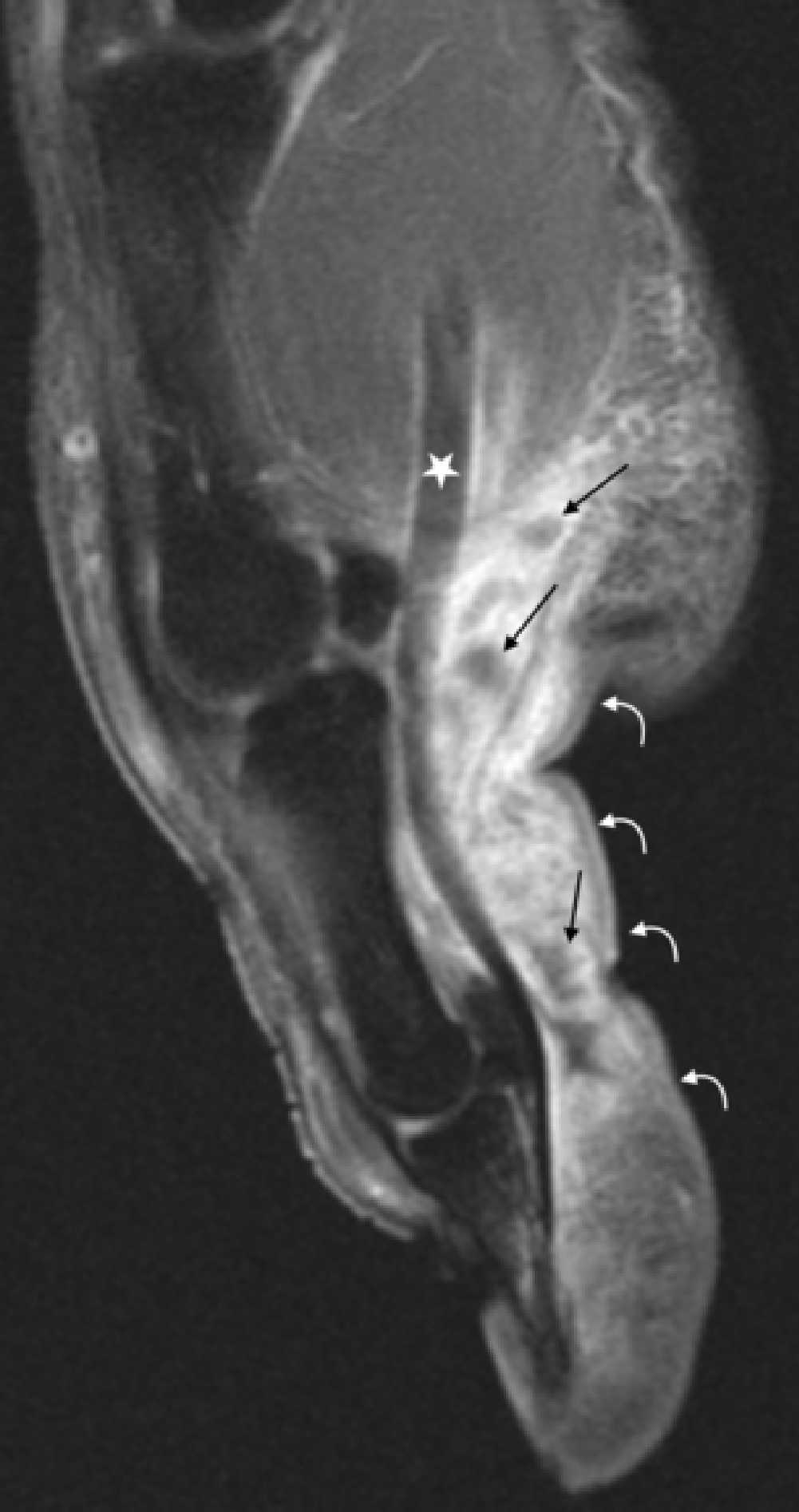
Table 1. Clinical, biological and imaging findings in most conditions associated with dactylitis.

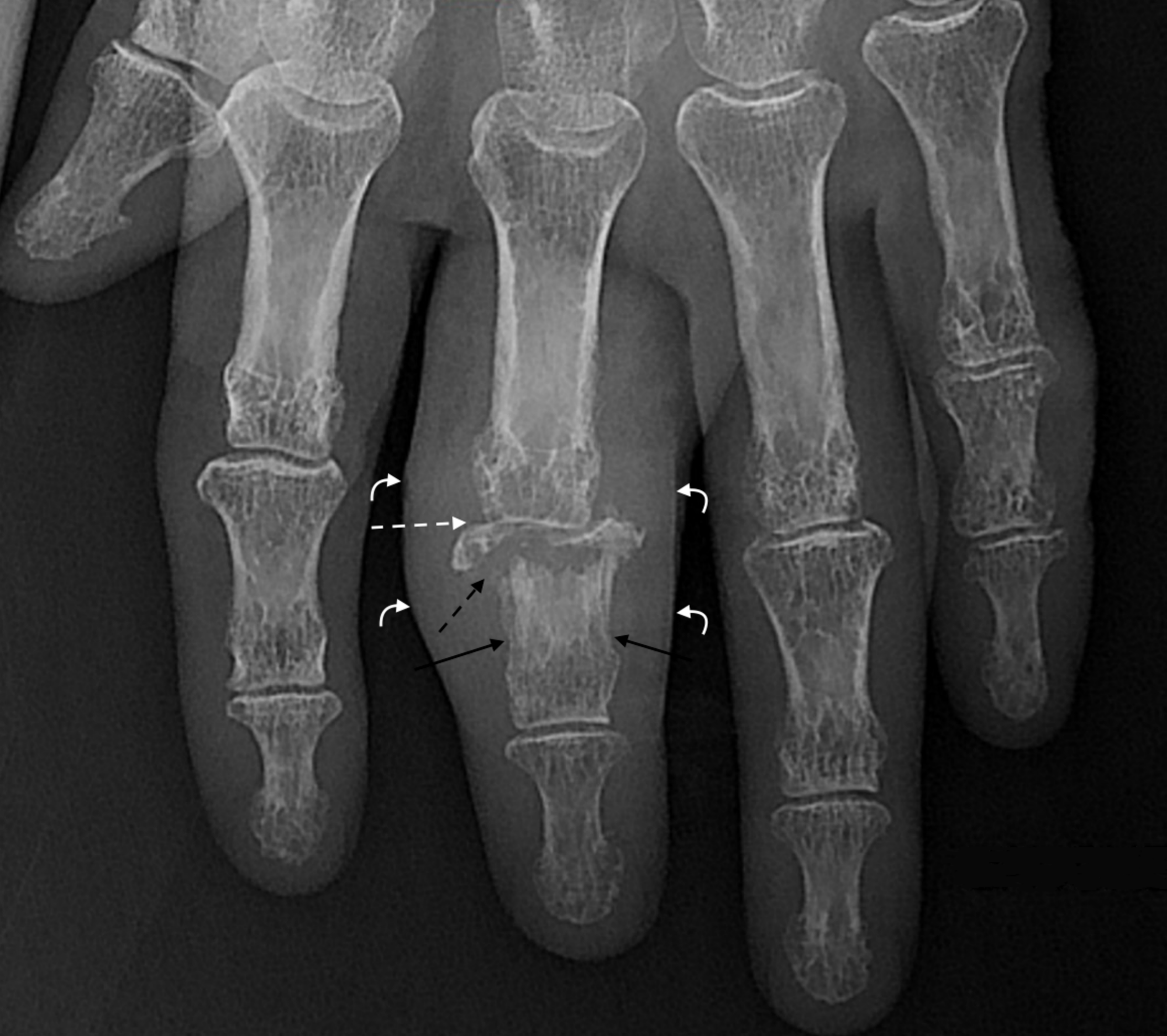


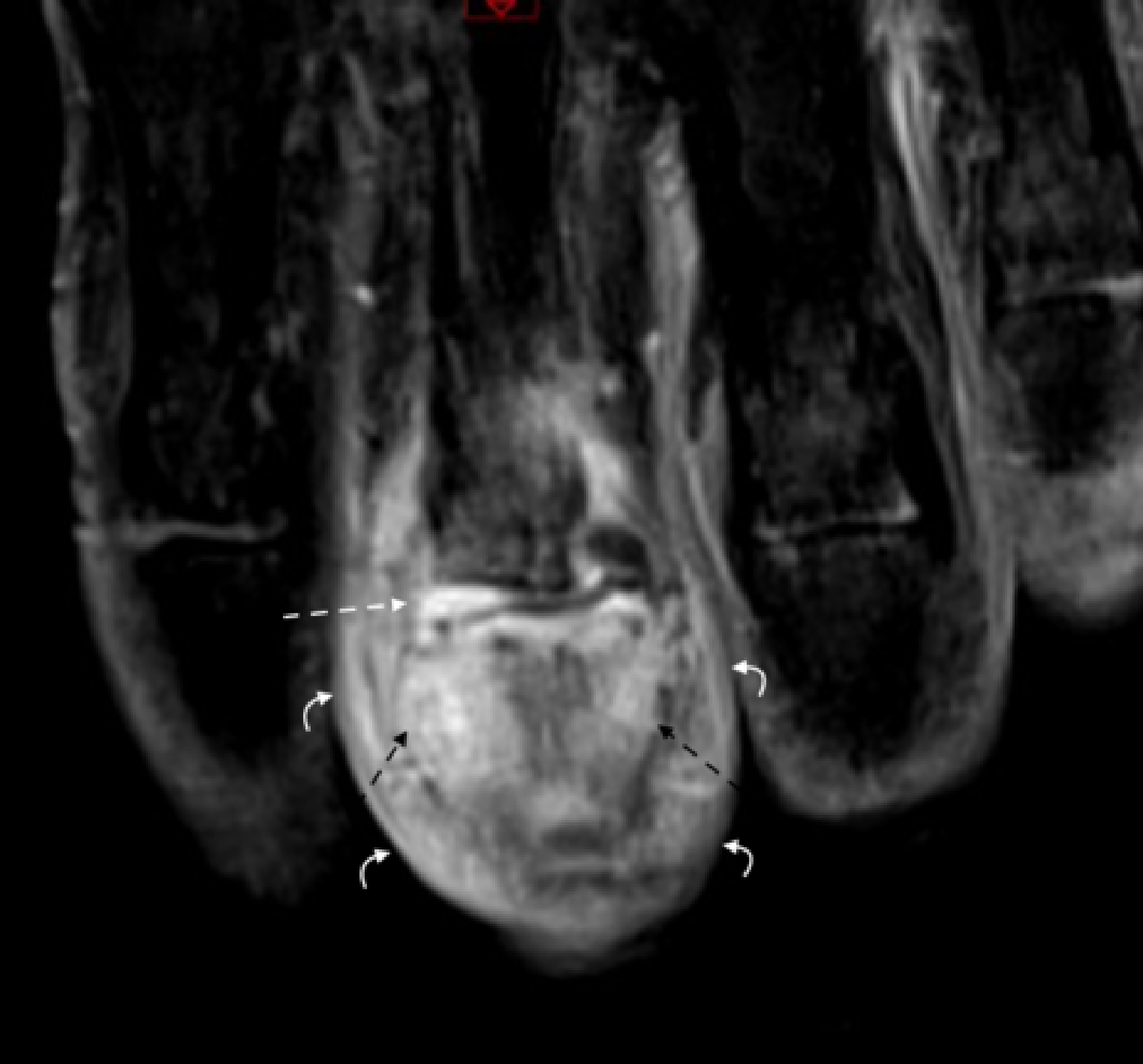


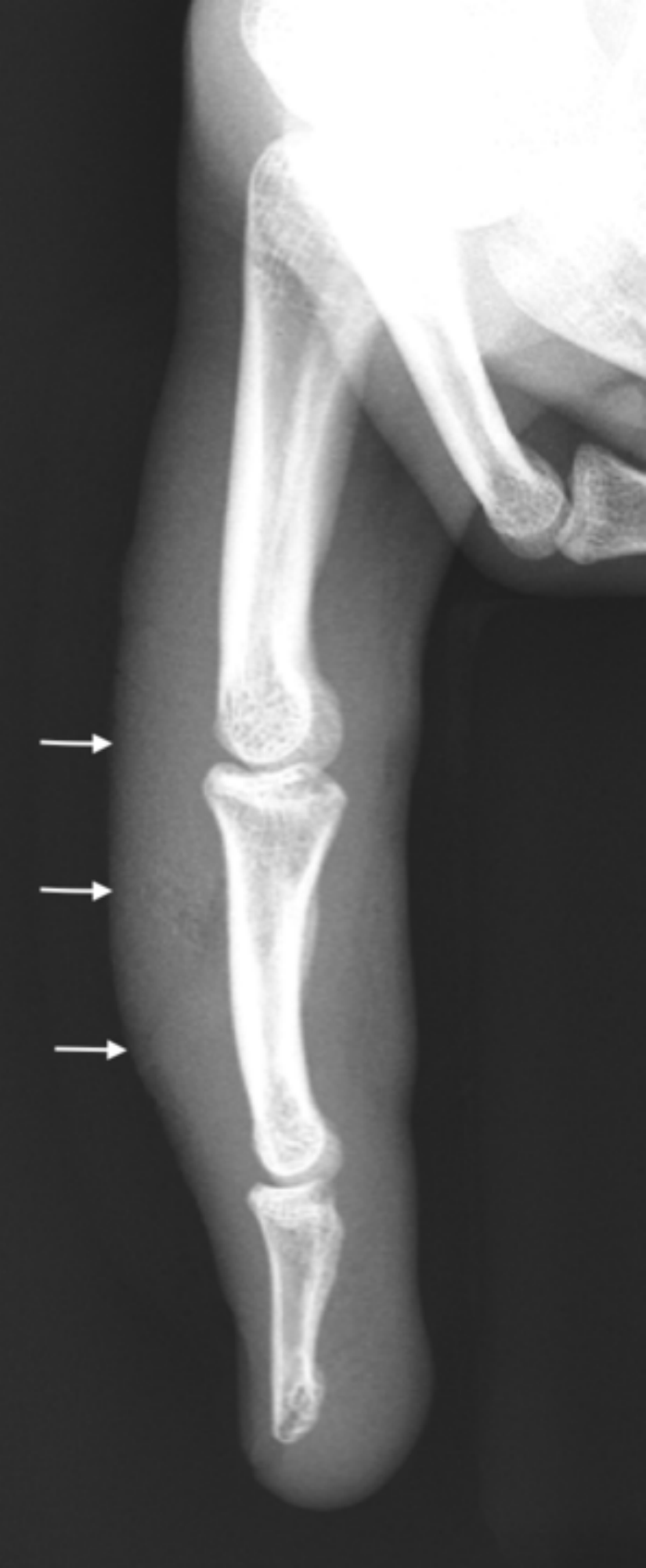


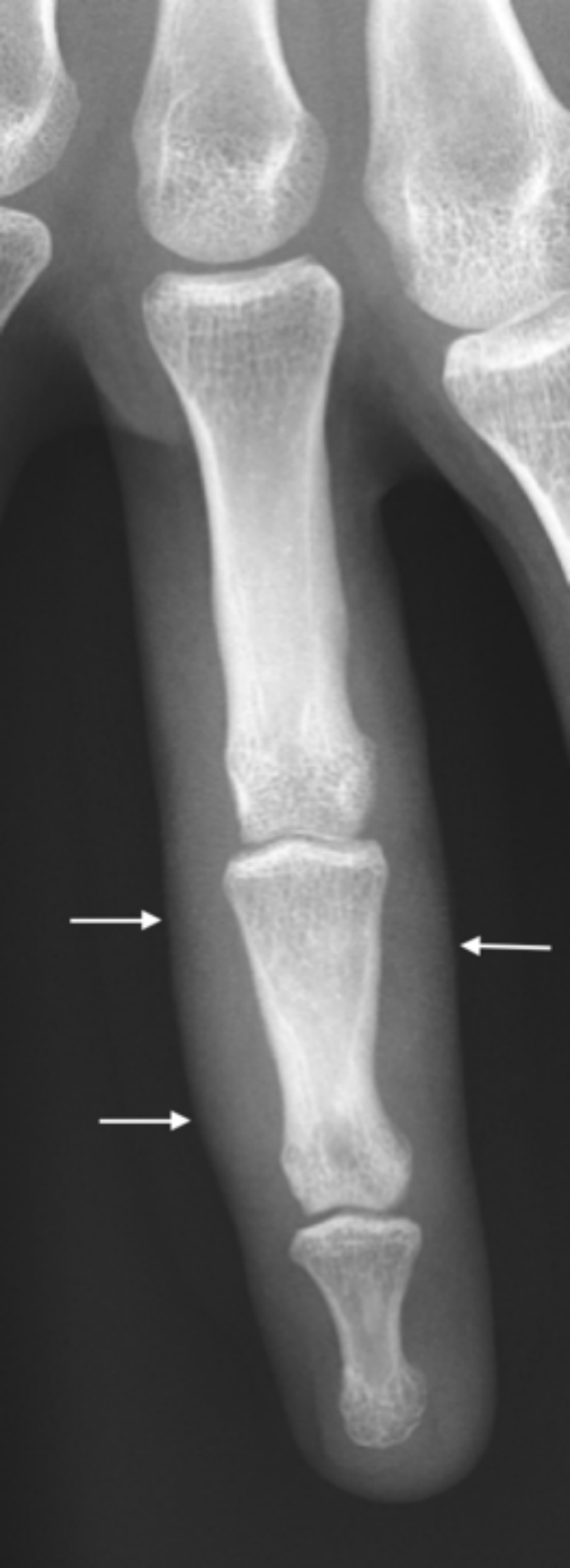


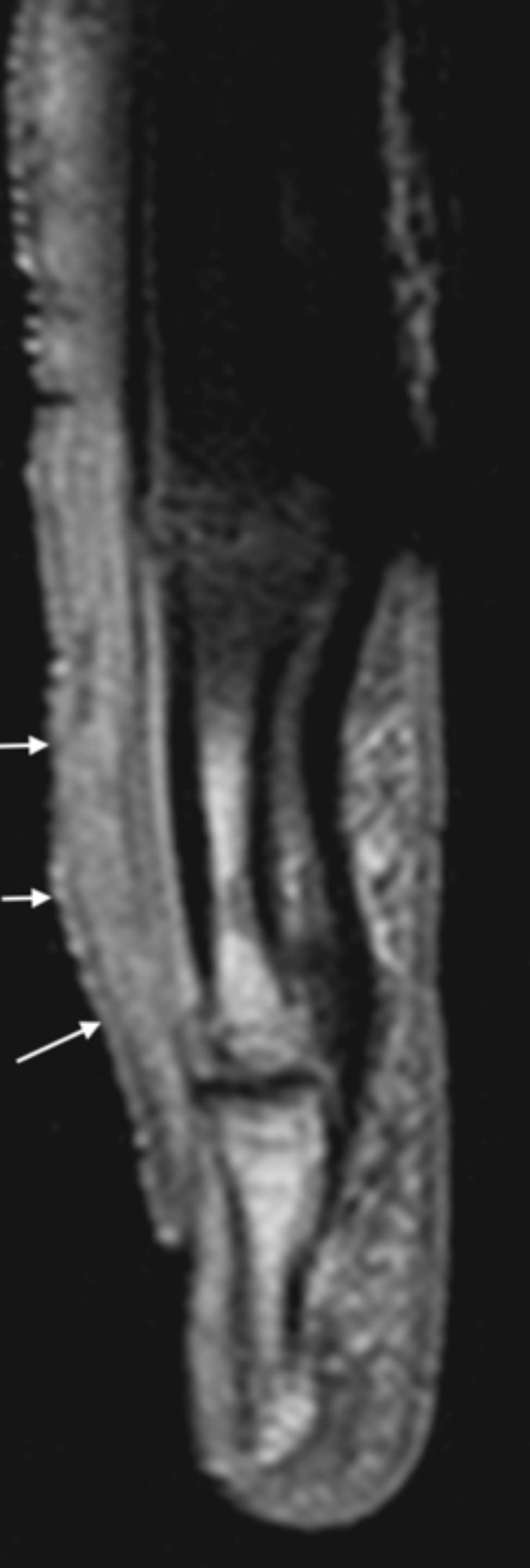


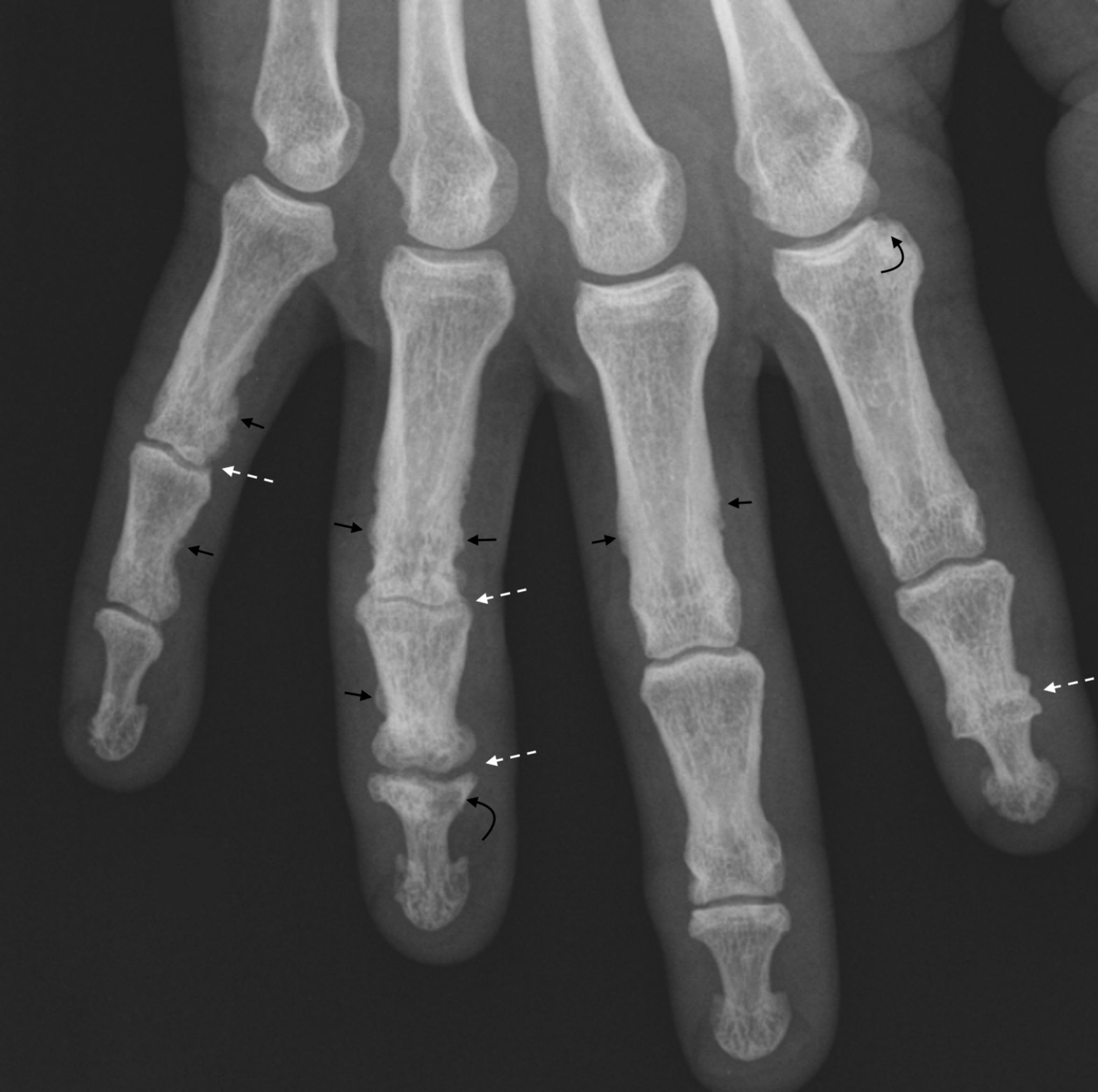


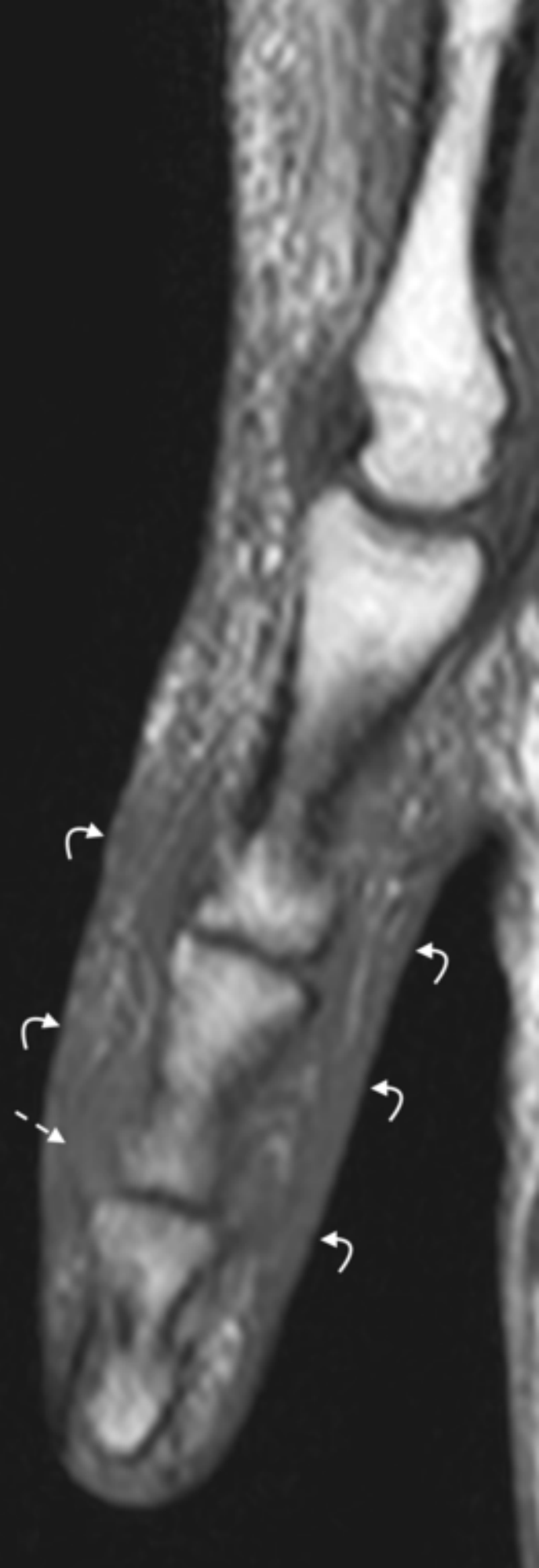


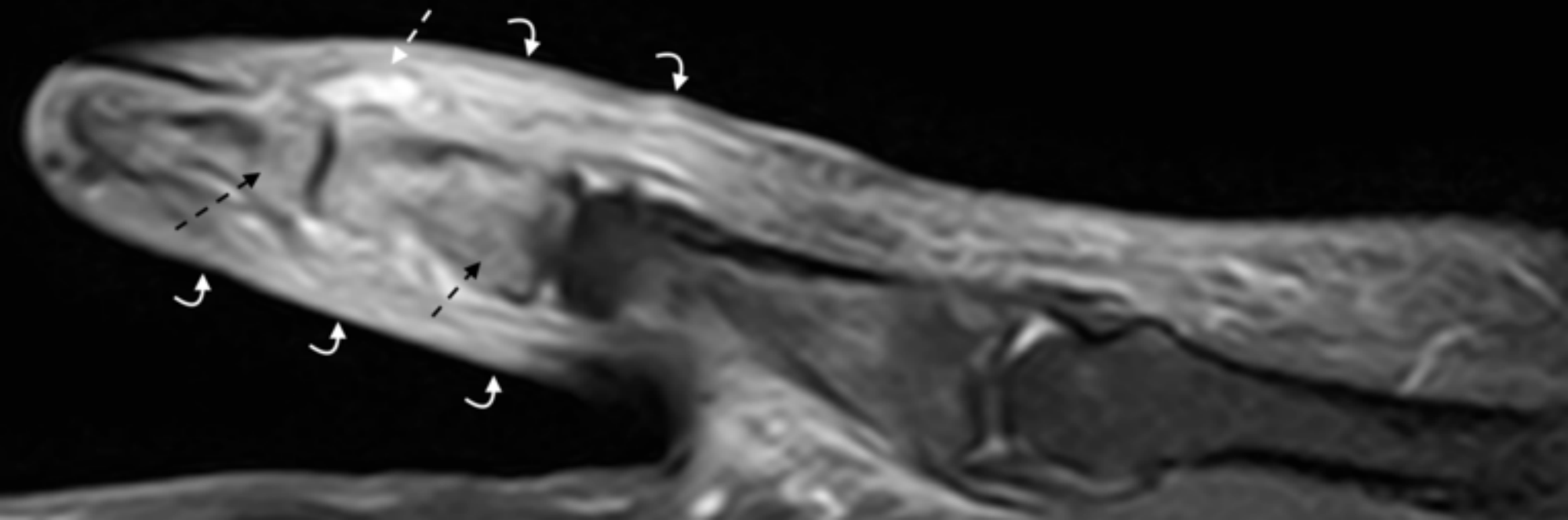


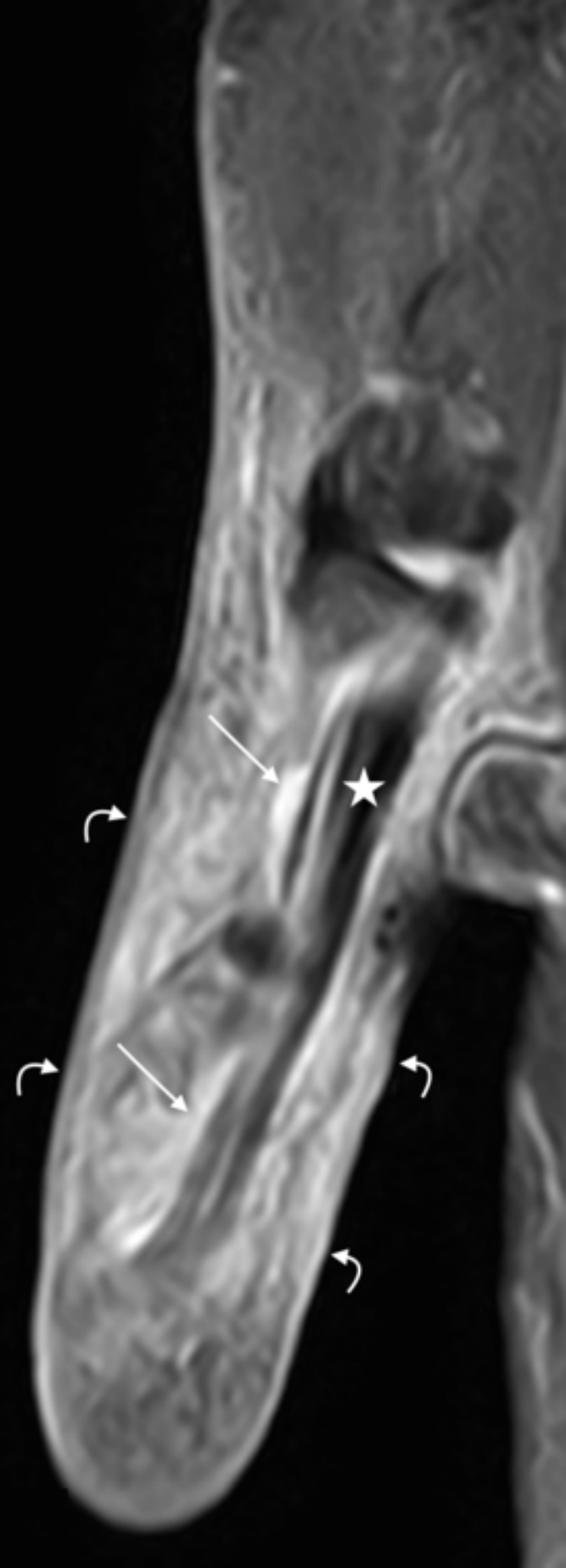


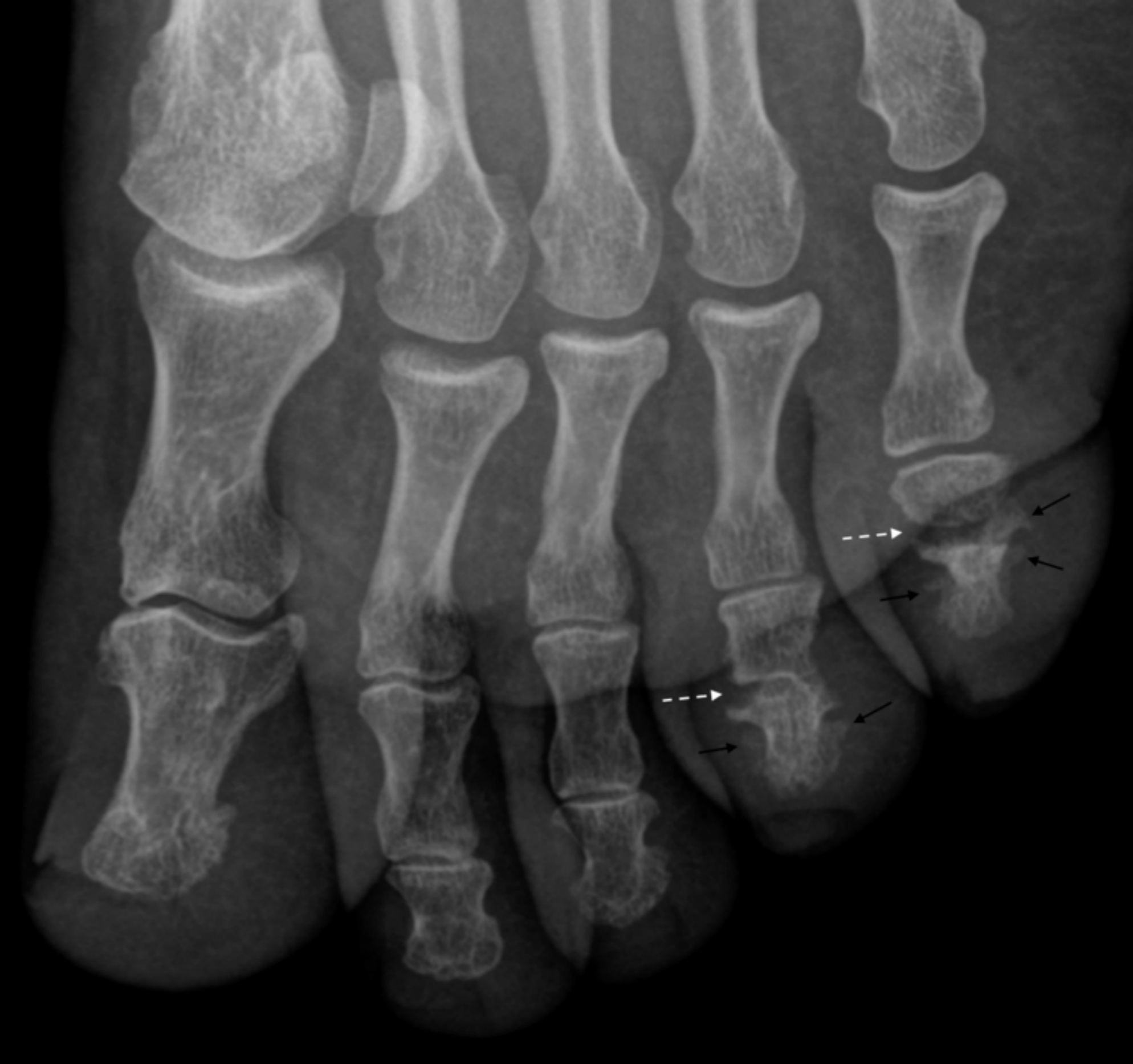


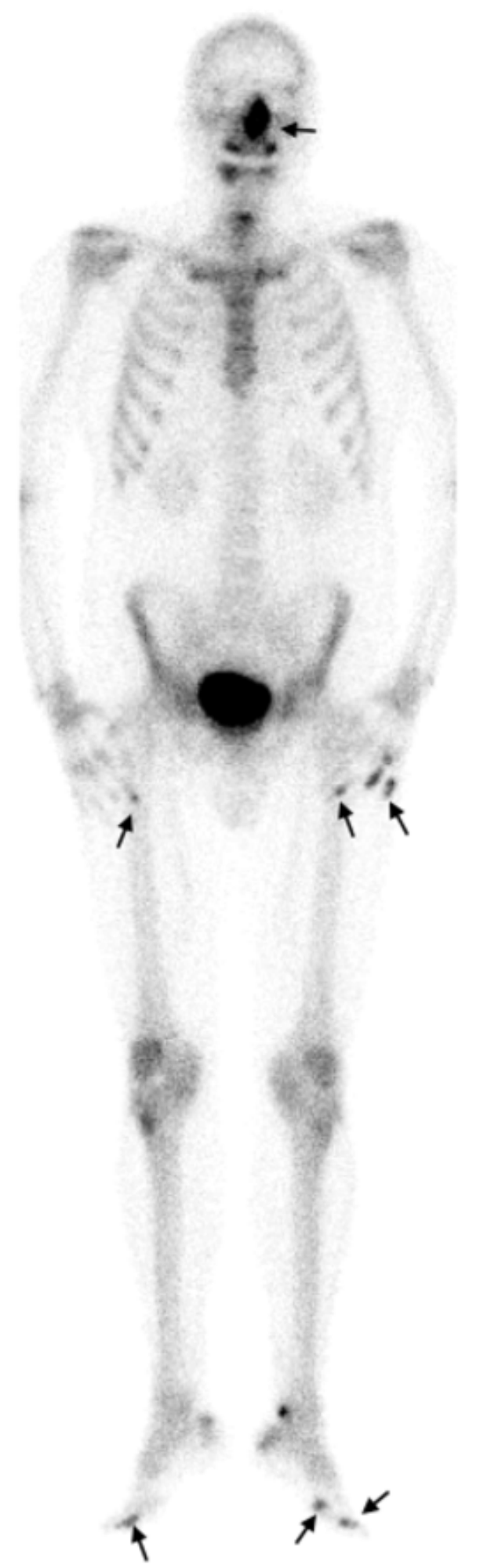


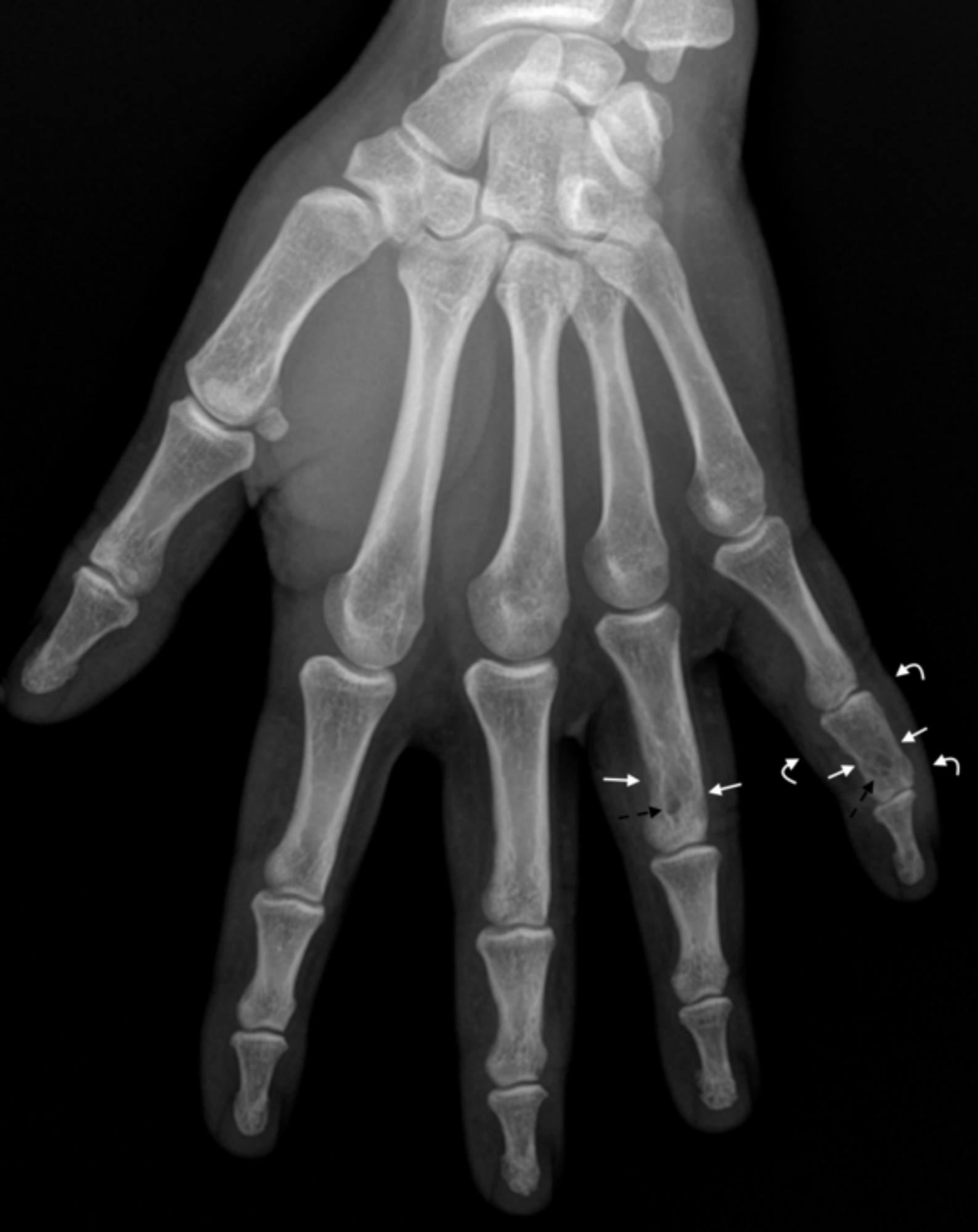


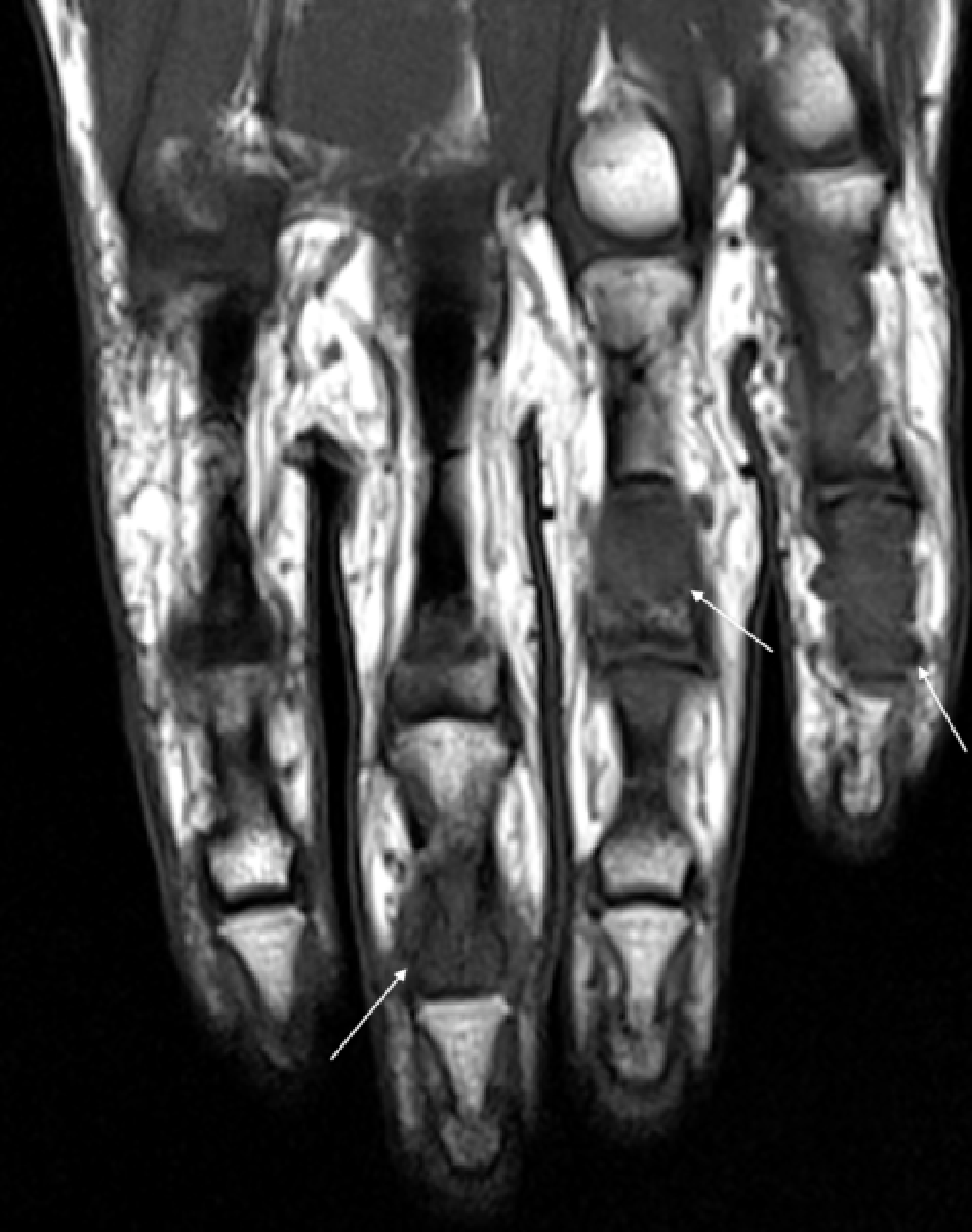


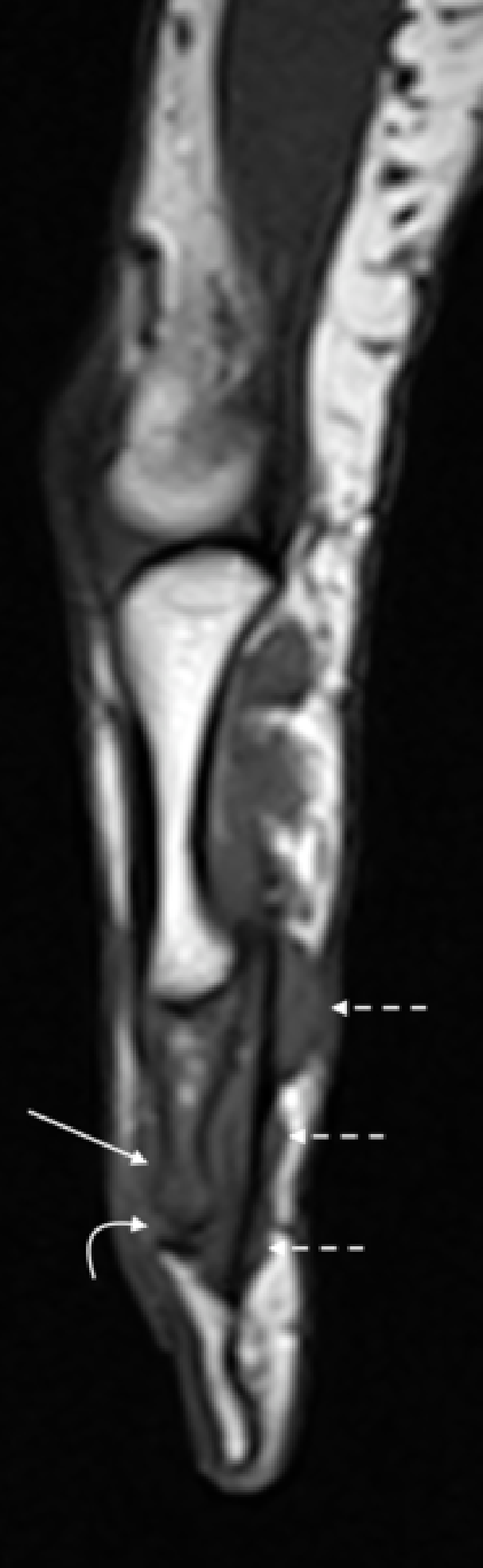


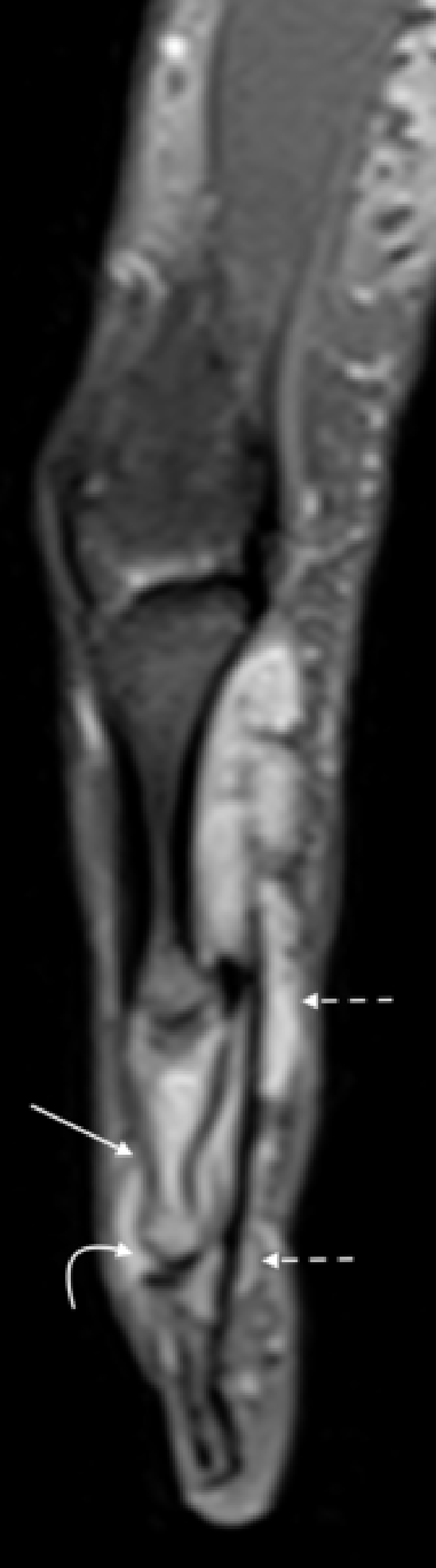


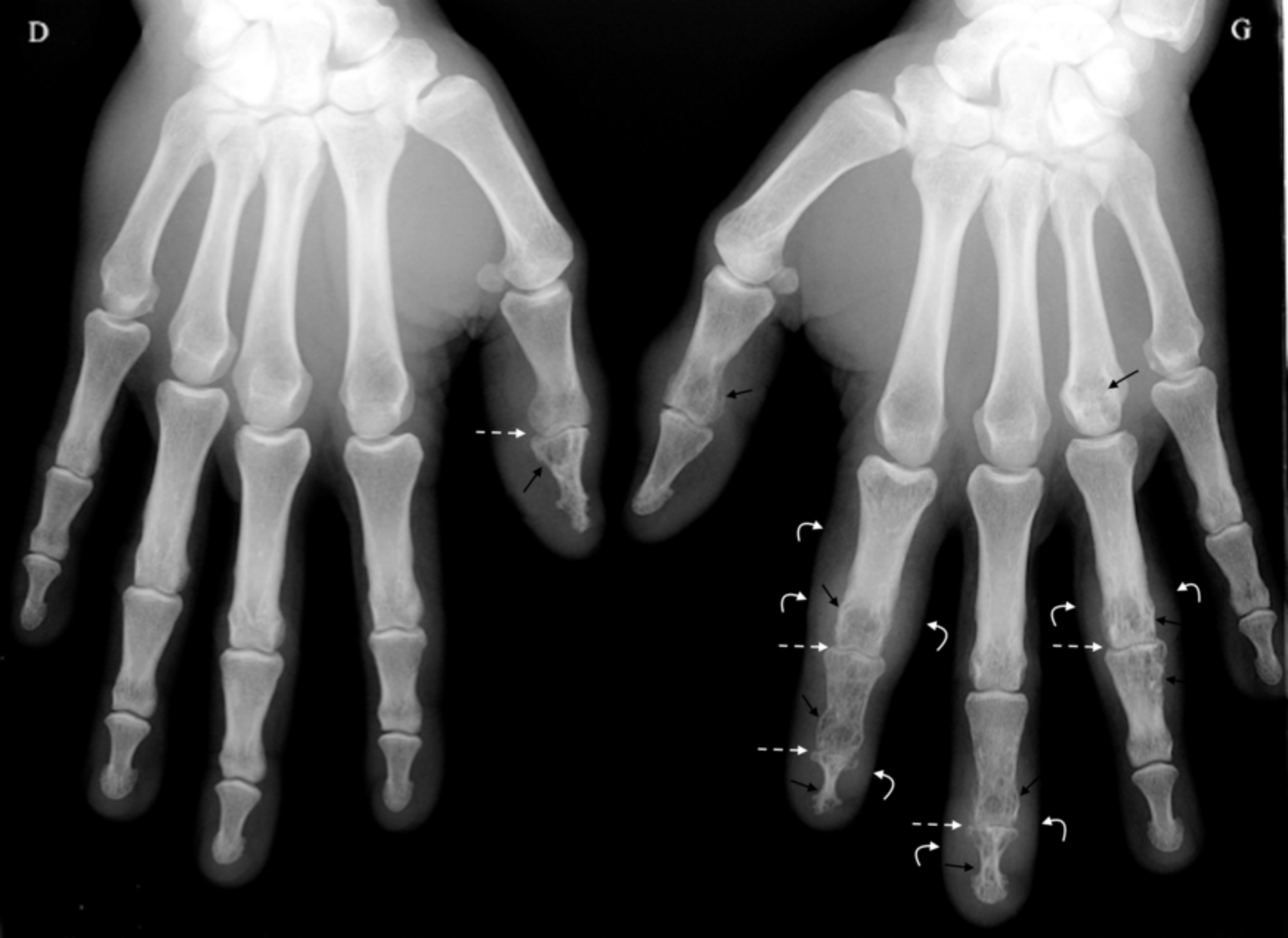


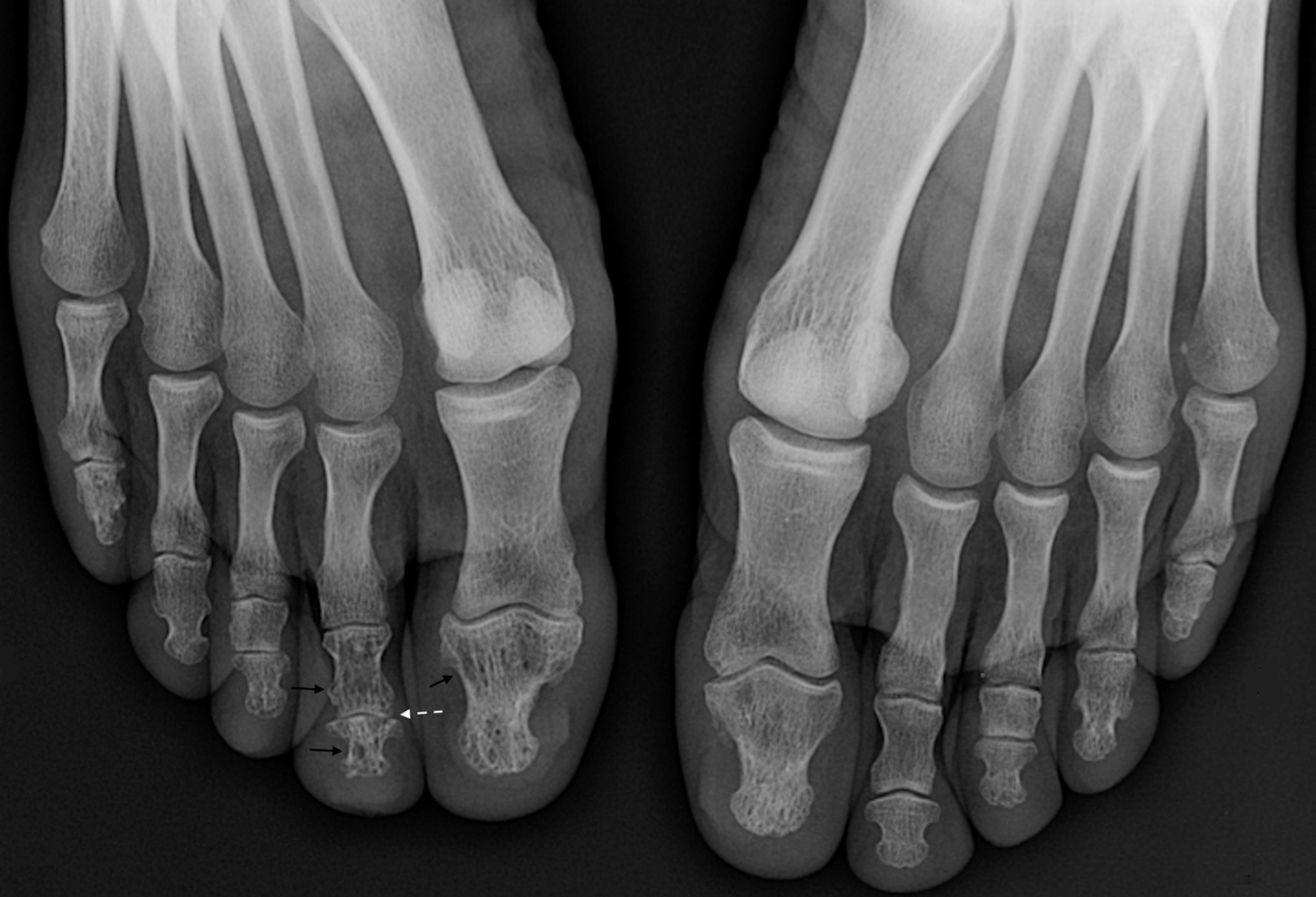


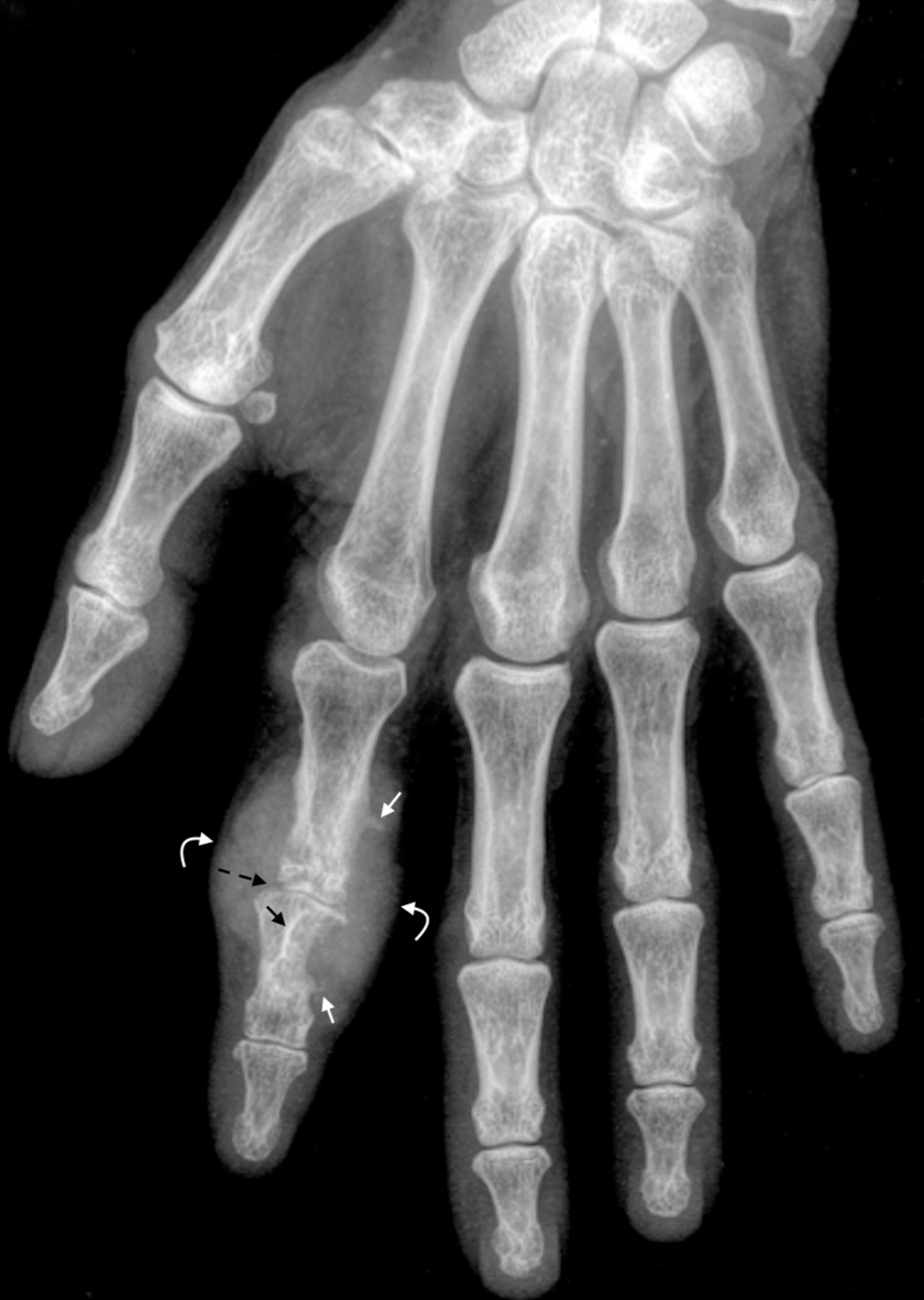


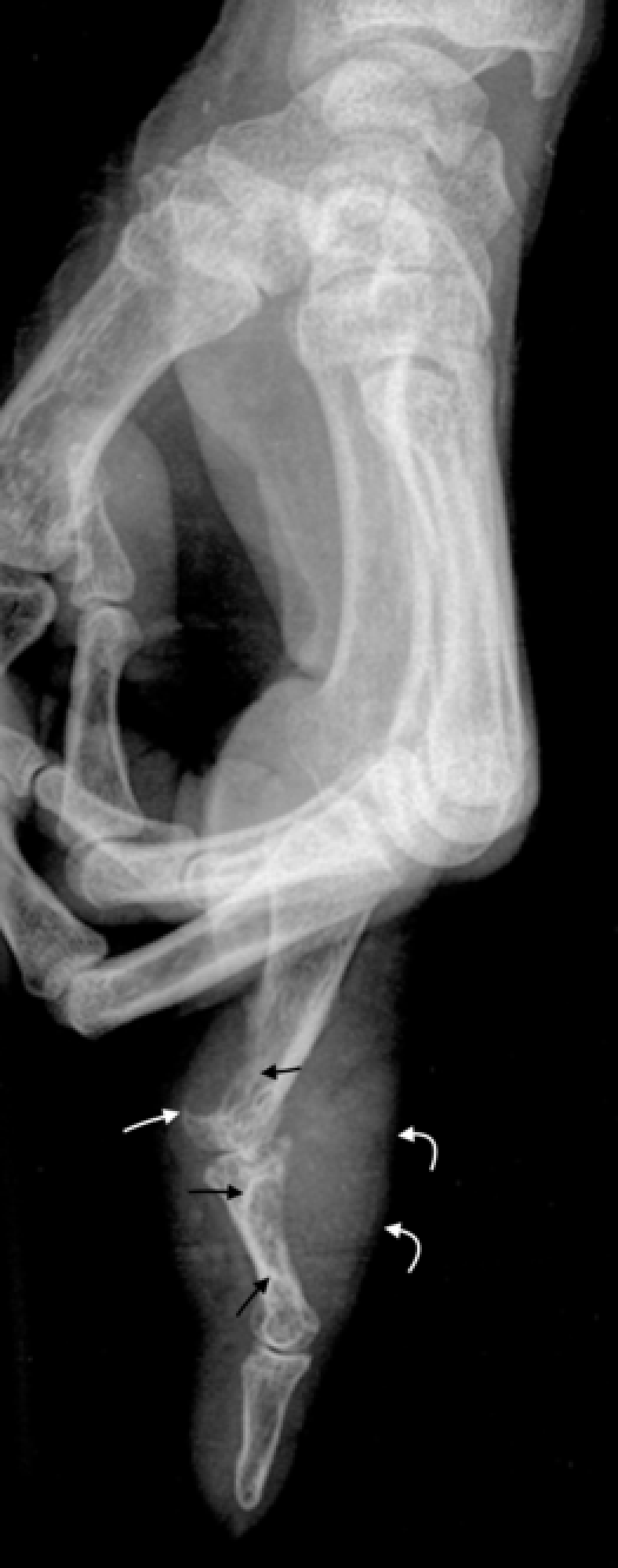


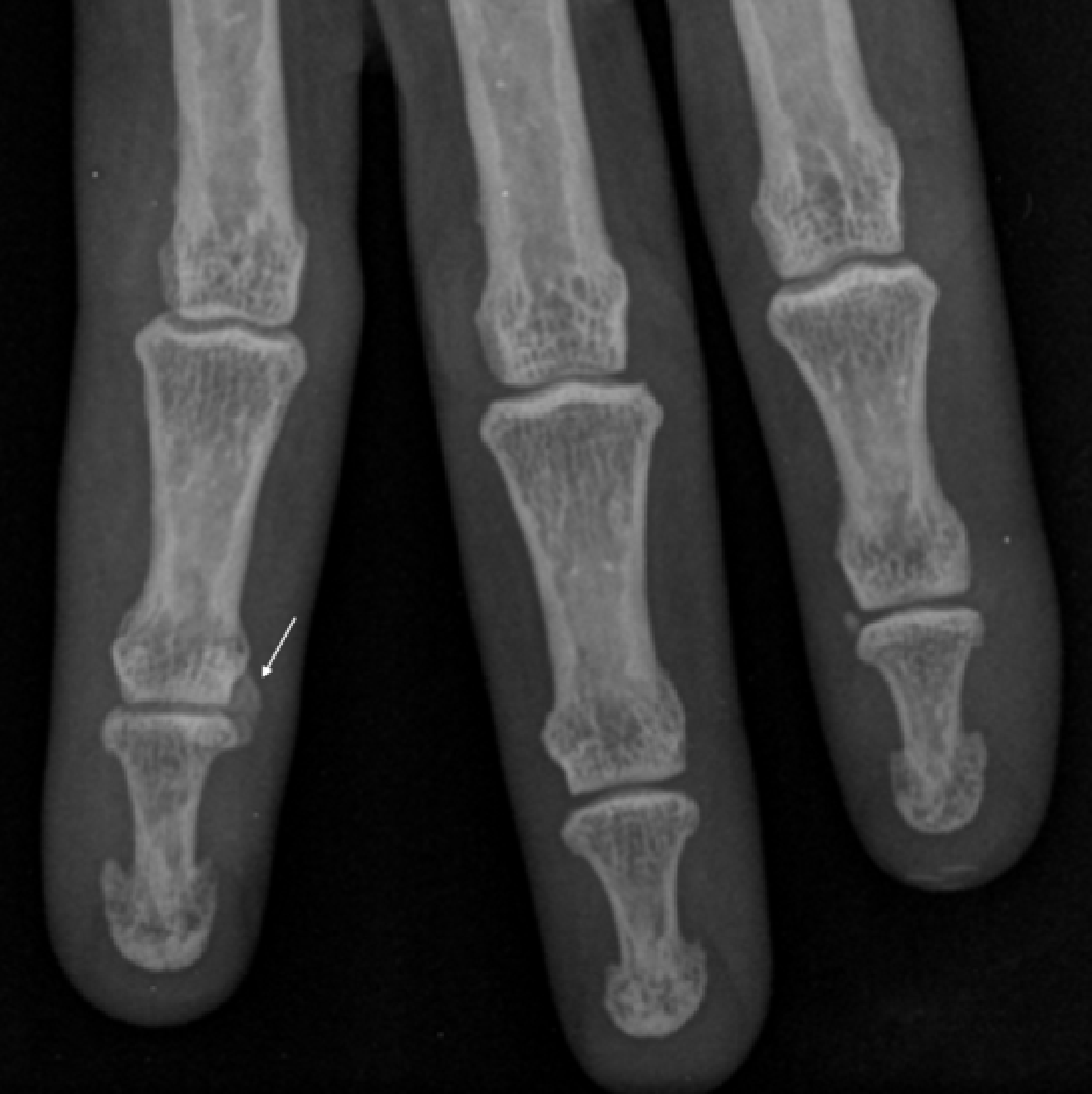


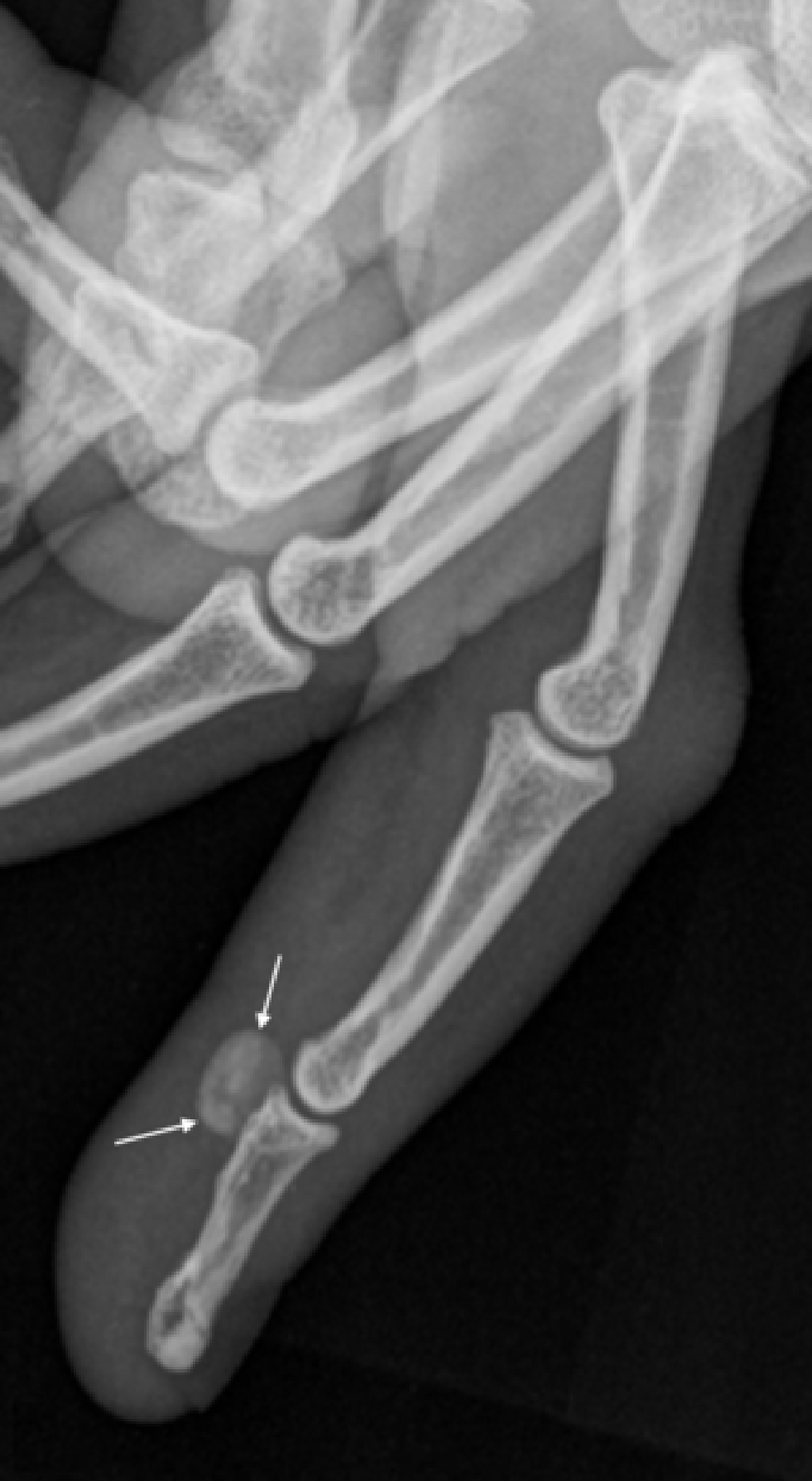

D
G

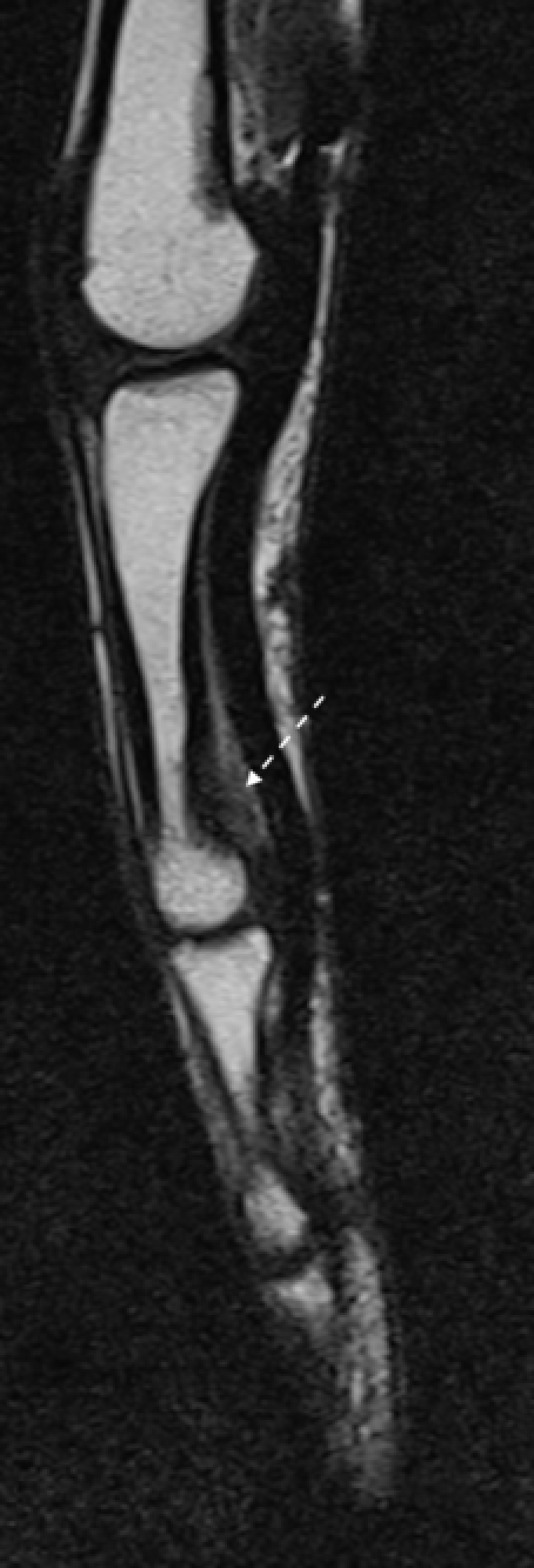


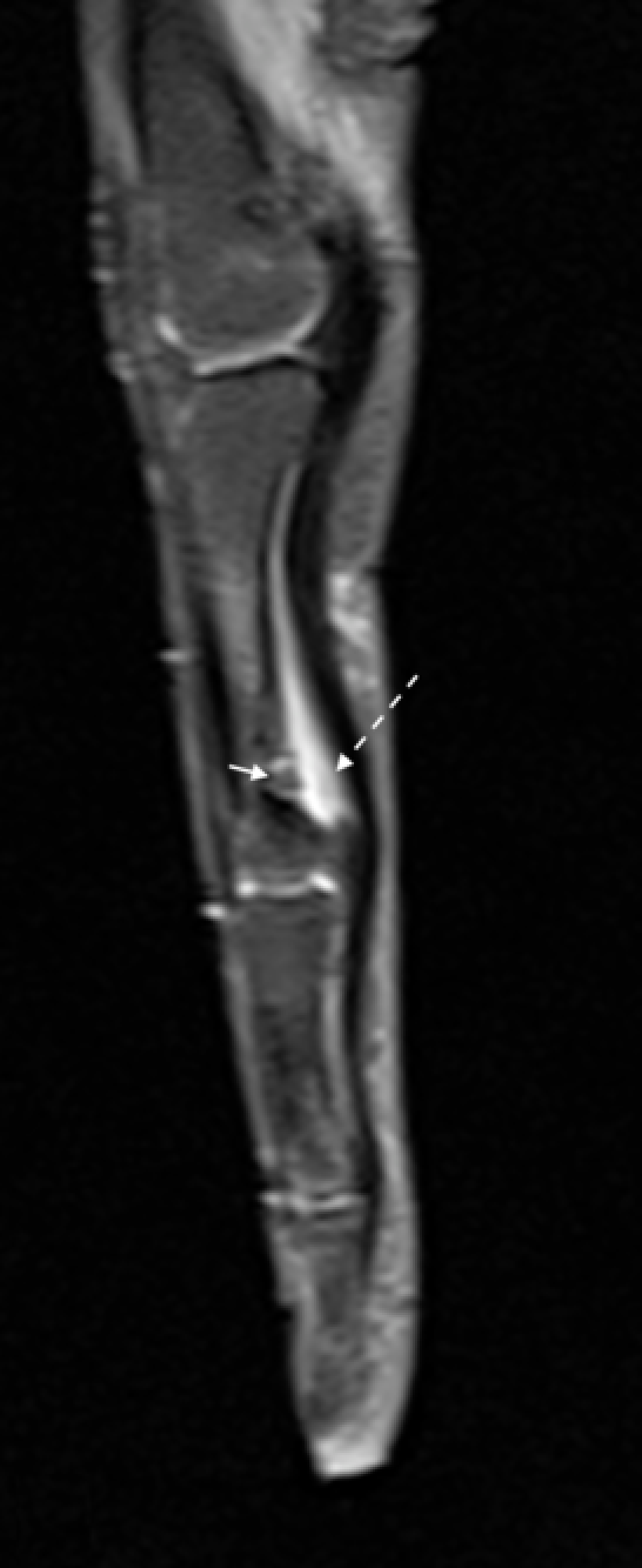


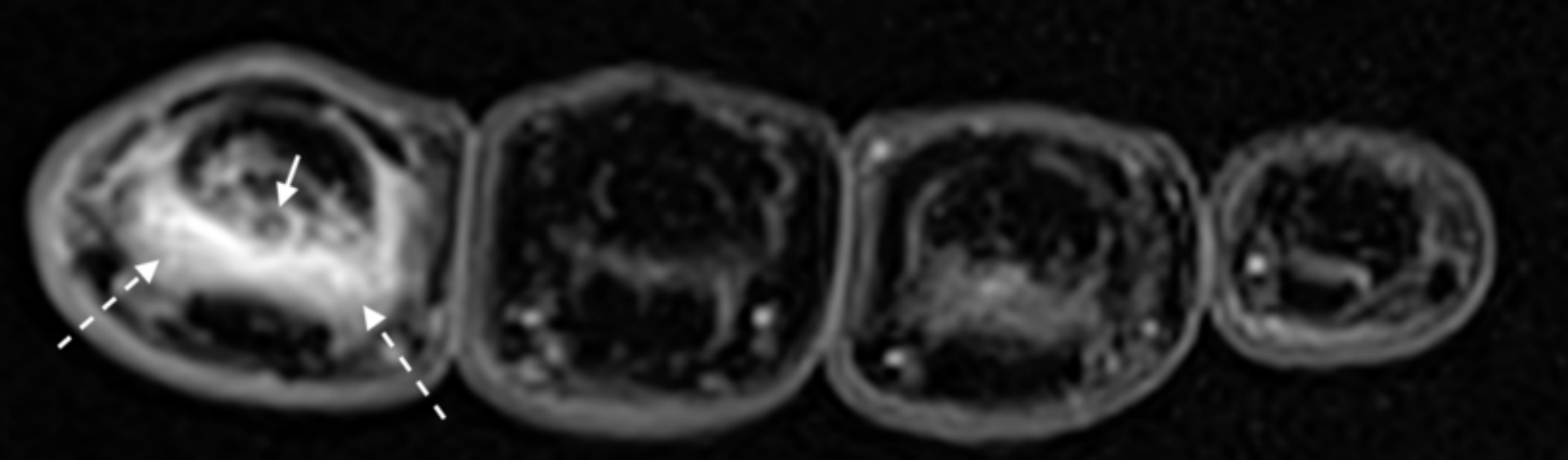


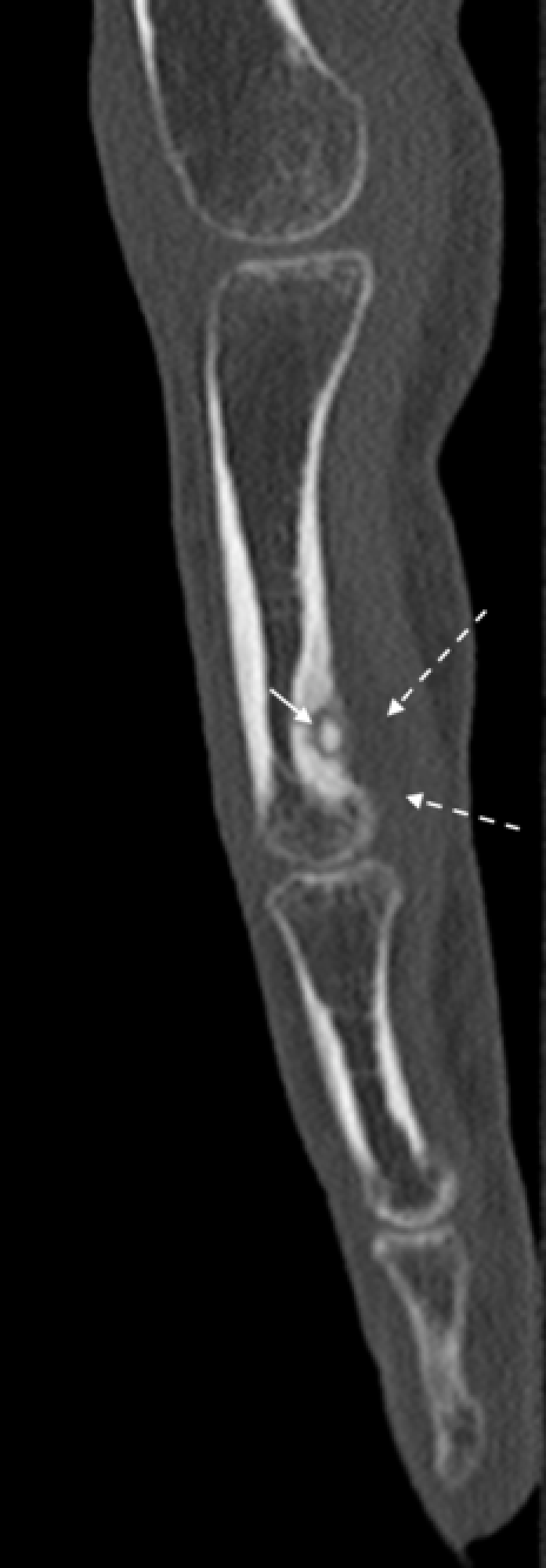


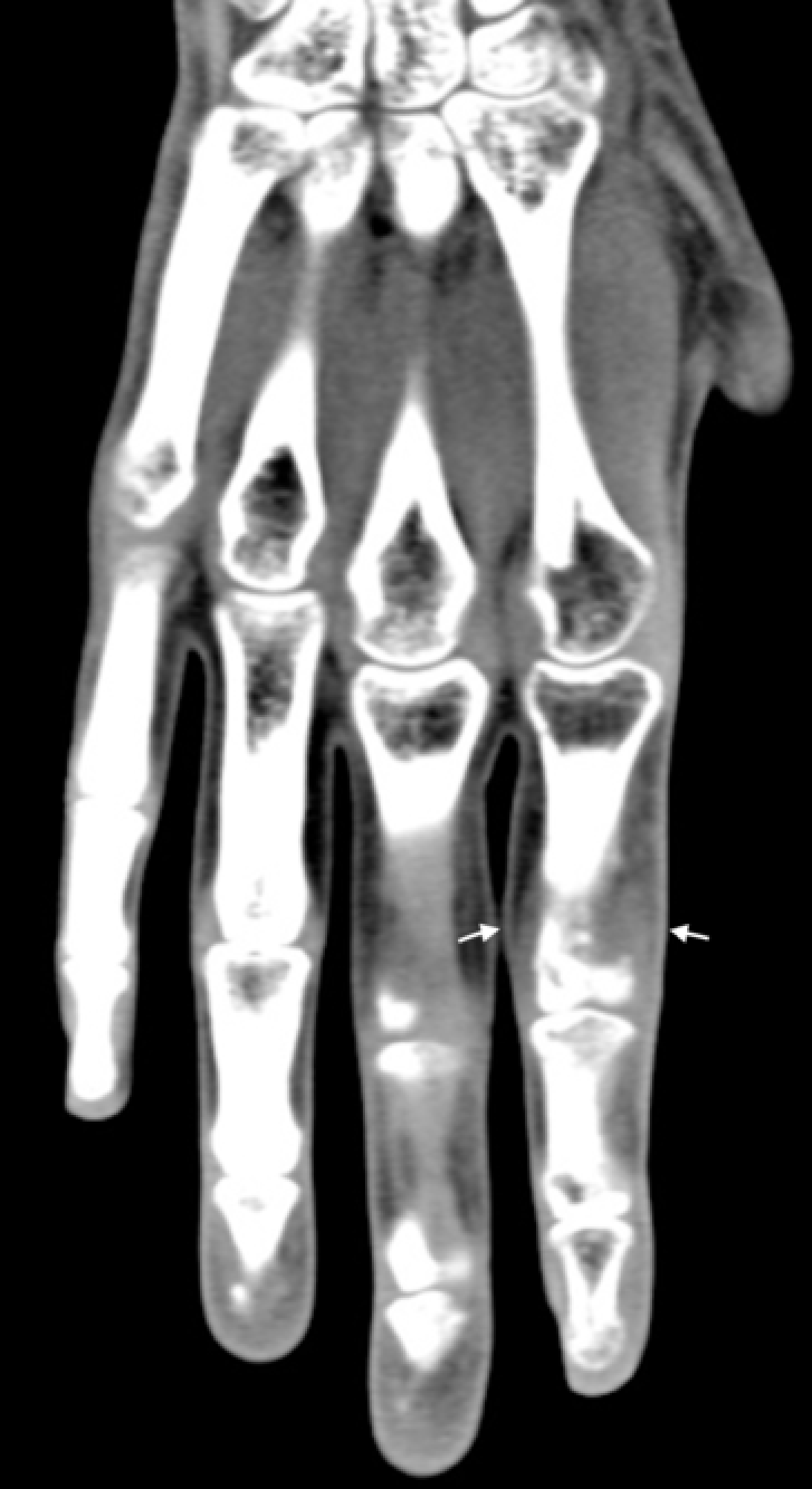


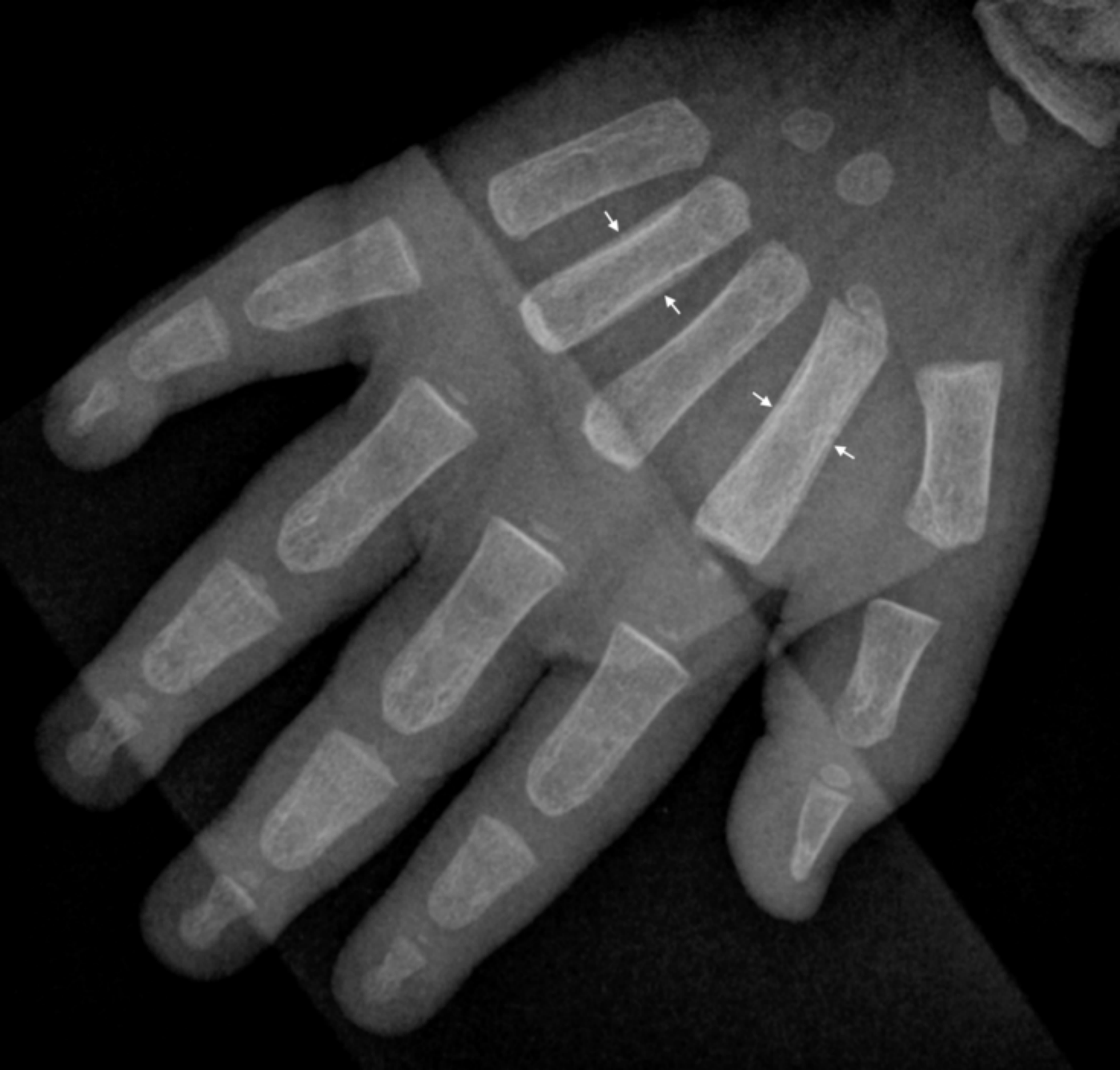


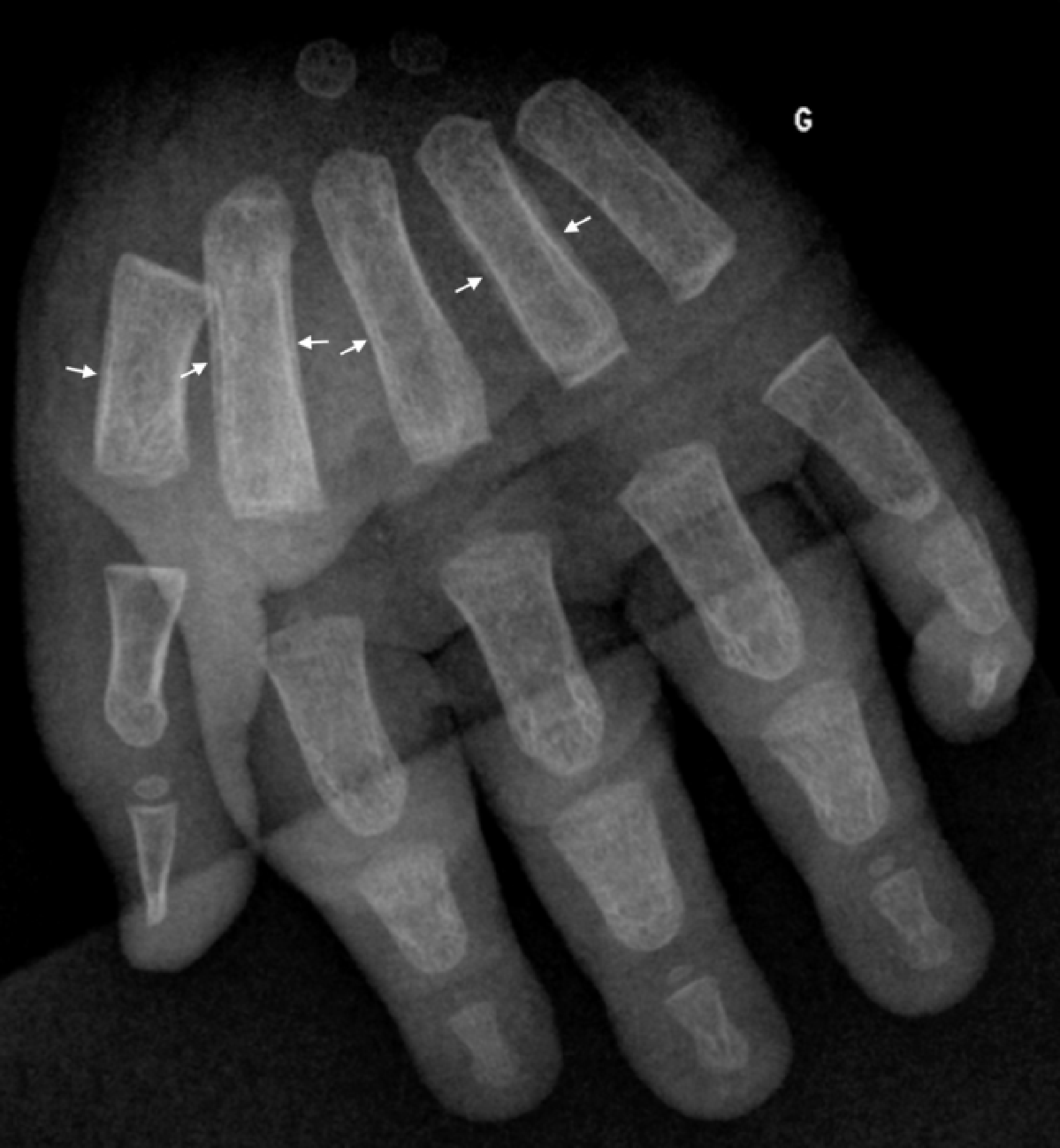











G

	Population	Pathophysiology	Clinical findings	Biological findings	Imaging findings
Tuberculous	Children and adolescents more often than adults	Hematogenous spread of *Mycobacterium tuberculosis* during primary infection -> osteomyelitis	Hands >> feet Finger swelling Painless of mildly painful Other organ involvements: - Other sites of osteomyelitis: ribs, skull - Thoracic	PCR or culture detection of *Mycobacterium tuberculosis* (bone biopsy)	Bone destruction: - typically expansive cystic-like cavity 'spina ventosa' - possibly non-expansive destruction - sequestration, sinus tract Periosteal reaction Possible adjacent joint involvement and soft tissue swelling
Syphilis	Children	Congenital syphilis: untreated maternal infection by *Treponema pallidum*	Hands >> feet Hands and feet swelling	VDRL and TPHA serology	Close to findings observed in tuberculous dactylitis: - more exuberant periostitis - bilateral and symmetrical involvement
Peripheral spondyloarthritis	Adults with spondyloarthritis	Inflammation at entheses, including 'functional entheses' subject to biophysical stress (pulleys constraining flexor tendons)	Feet >> hands Tender and painful forms Non-tender forms: lack of pain and tenderness Look for peripheral and axial skeletal involvement	Inflammatory syndrome HLA-B27	Flexor >> extensor tenosynovitis 'Pseudotenosynovitis': extra-tendinous soft tissue inflammation ('functionnal entheses') Other possible features: nail anchorage network enthesitis, collateral ligament enthesitis, joint synovitis, bone marrow edema Look for finger and toe features of psoriatic arthritis: - asymmetrical distribution - predominant distal interphalangeal joint involvement - whole digit involvement - erosive and constructive joint changes, articular destruction - psoriatic onycho-pachydermo-periostitis
Sarcoidosis	Adults under 40 years old Black skin subjects: more severe forms	Unknown Susceptibility to infectious and non-infectious environmental agents Epithelioid and giant cells granulomatosis Involvement of the small bones of the hands and feet in 90% of cases	Finger/toe involvement: - Variable pain - Focal or diffuse soft tissue swelling Rarely sole clinical expression -> other organs are almost always involved: - Skin = lupus pernio ++ - Thoracic ++ - Muscular, ocular, parotid, central nervous system	Angiotensin converting enzyme elevation Calcitriol hyperproduction -> hypercalcemia and hypercalciuria	Bone marrow replacement Osseous invasion lytic lesions: - large geodes (type I) - rounded pseudocystic lesions and acro-osteolysis (type II) - thin cortex and thickened trabecular structures = 'grid' appearance Periosteal and soft tissue invasion Bone scintigraphy - whole body investigation - specific if facial, metacarpal and metatarsal bones are involved

	Population	Pathophysiology	Clinical findings	Biological findings	Imaging findings
Gout	Adults with gout	Deposition of monosodium urate crystals in joints and soft tissues	Acute arthritis: - intense pain and local inflammatory signs - sudden onset - metatarsophalangeal joint of the first toe = inaugural feature of the disease Tophaceous (chronic) gout	Chronic hyperuricemia	Tendon sheath effusion Joint synovitis Tophaceous gout: soft tissue tophi
Calcium hydroxyapatite	Adults Children are rarely affected Possible recent trauma	Deposition of calcium hydroxyapatite crystals in tendons	Fingers Acute manifestation = self-resolving resorption episode: - intense pain and local inflammatory signs - sudden onset, and reduction in symptoms within 4-7 days		Periarticular mineralization (digital flexor tendon ++) Tenosynovitis Surrounding bone and soft tissue edema Markedly decreased within 2-3 weeks
Osteoid osteoma	Children and young adults	Inflammatory benign bone tumor	Fingers/toes Intense and inflammatory pain - nocturnal predominance - reduced by acetylsalicylic acid		Nidus: lucent area with central focus of mineralization Surrounding reactive bone formation Surrounding bone and soft tissue edema Possible reactive arthritis or tenosynovitis
Sickle cell disease	Inherited sickle cell disease Children before 4 years old	Abnormal haemoglobin S -> erythrocyte sickling -> acute vaso-occlusive crisis -> bone infarction	Vaso-occlusive crisis: - ‘hand-foot syndrome’: several fingers/toes involved - erythema, pain of variable intensity, and edema - fever - episodes lasting 1 to 3 weeks - frequent recurrences Splenic abnormalities are usually associated	Leukocytosis	Initially: soft-tissue swelling After 1 week: - Periosteal reaction - Metacarpal/metatarsal and phalangeal osteolysis