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Radiographs in Pediatric Rheumatology: Where Do We Stand?

Deeksha Bhalla[1] Manisha Jana[2] Narendra Bagri[3]

[1] Department of Radiodiagnosis, Postgraduate Institute of Child Health, Noida, Uttar Pradesh, India
[2] Department of Radiodiagnosis and Interventional Radiology, All India Institute of Medical Sciences, New Delhi, India
[3] Division of Paediatric Rheumatology, Department of Paediatrics, All India Institute of Medical Sciences, New Delhi, India

Address for correspondence Manisha Jana, MD, Department of Radiodiagnosis and Interventional Radiology, All India Institute of Medical Sciences, New Delhi, India (e-mail: manishajana@gmail.com).

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Abstract

Rheumatic disorders in children include inflammatory arthritis, inflammatory bone disorders such as chronic nonbacterial osteomyelitis (CNO), connective tissue disorders, and vasculitides (juvenile dermatomyositis, scleroderma). The diagnosis in these children is based on a combination of history, clinical examination, and laboratory investigations. Radiographs play an important role in children with arthritis, who have atypical presentation or for assessment of disease-related damage and differentiation from mimics. Further, radiographs also have an ancillary role in the assessment of musculoskeletal disorders such as dermatomyositis and hemophilia. This review seeks to present a detailed analysis of the specific indications and advantages of radiographs in the situations. Further, a structured reporting format for assessment of radiographs in pediatric rheumatic disorders has also been presented for the reader's reference.

Keywords
- chronic nonbacterial osteomyelitis
- juvenile idiopathic arthritis
- pediatrics
- rheumatology
- X-rays

Introduction

While radiographs have gradually been replaced by cross-sectional imaging techniques, they still remain essential for musculoskeletal disorders/pathologies. For radiologists engaging in specialized care of rheumatic disorders, it is important to understand where radiographs are placed in the algorithm based on the clinical presentation, as well as to define how many body parts are to be imaged, since there is an inevitable radiation burden of this investigation. In addition, it is essential for residents and trainees to be able to determine when radiographs will suffice for management and when additional imaging must be ordered. This review seeks to familiarize the reader with these concepts. The entities discussed in this review are summarized in ►**Table 1**. Radiographs are used for imaging inflammatory musculoskeletal disorders which may manifest joint involvement (arthritis[1]; ►**Fig. 1**) in patients with immune-mediated inflammatory arthritis particularly juvenile idiopathic arthritis (JIA) or as bone marrow involvement (osteitis) in patients with chronic nonbacterial osteomyelitis (CNO). Additionally, they can also give cues toward sinister underlying diagnosis such as malignancies, infectious arthritis in children presenting with musculoskeletal manifestations (►**Fig. 2**).

Inflammatory Arthritis

Juvenile arthritides include JIA, inflammatory connective tissue disorders, and juvenile onset spondyloarthropathies (including ankylosing spondylitis and psoriatic arthritis). JIA is the most common rheumatologic condition of childhood. There are multiple forms of the disease, which have been classified by the International League of Associations for

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Table 1 Summary of entities discussed in the review

Inflammatory arthritis	Inflammatory bone disorder	Connective tissue disorders	Miscellaneous
Juvenile idiopathic arthritis (JIA)	Chronic nonbacterial osteomyelitis (CNO)	Juvenile dermatomyositis (JDM) Scleroderma	Hemophilic arthropathy

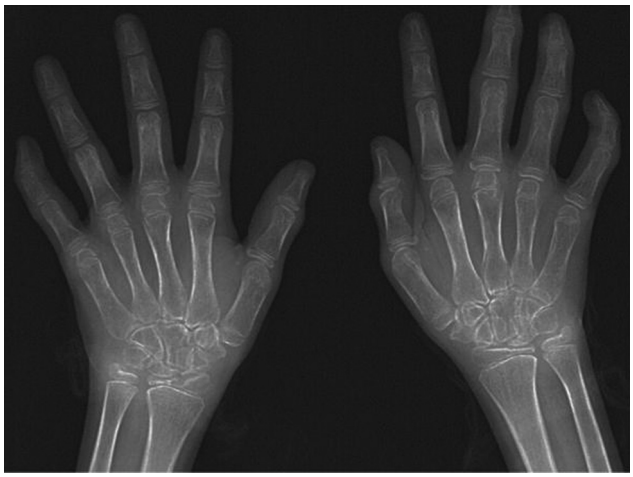

Fig. 1 List the radiographic findings noted in this posteroanterior (PA) radiograph of bilateral wrist and hands. Answer available under the "Reporting Checklist" section.

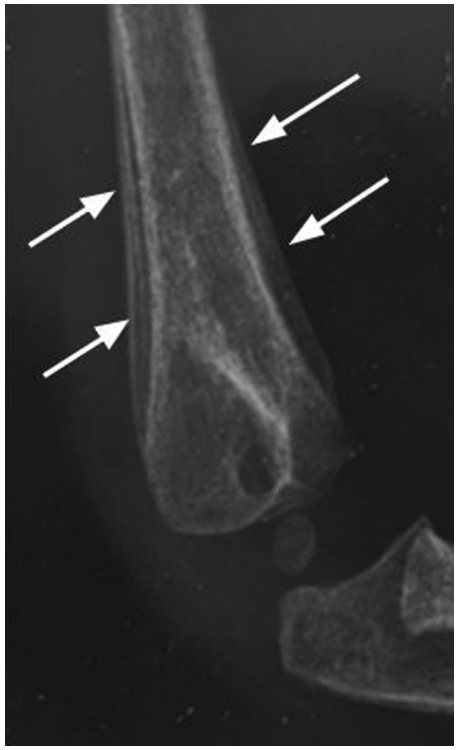

Fig. 2 Periosteal reaction in leukemia. Lateral radiograph of the elbow in a 2-year-old boy with pain around the joint shows a lamellated periosteal reaction (*white arrow*).

Rheumatology into seven forms.[2] These include systemic (sJIA), polyarticular rheumatoid factor negative (pJIA RF–), polyarticular rheumatoid factor positive (pJIA RF+), oligoarticular (oJIA), psoriatic, enthesitis-related arthritis (ERA), and undifferentiated arthritis. Among these, the polyarticular form is most common.

Table 2 Radiographic appearance in juvenile idiopathic arthritis (JIA)

Radiographic features of JIA (monoarticular, oligoarticular, and polyarticular forms):
• Periarticular soft-tissue swelling • Joint space reduction • Osteopenia: periarticular in early stages, diffuse in advanced disease • Erosions: most common at sites of ligament insertion or synovial reflection

When to Consider Radiographs in Children with JIA

Diagnostic Value

JIA is primarily a clinical diagnosis.[3] The role of radiographs is limited to certain indications where clinical examination may be limited, for assessment of joint damage, or for ruling out differential diagnoses. The typical findings in JIA on radiographs are periarticular osteopenia, joint space reduction, and erosions (►**Table 2**). A few specialized indications where radiographs may help in diagnosis are listed below.

- *Oligoarticular arthritis*: The diagnosis of a child presenting with the monoarticular form of oligoarticular arthritis is often challenging (►**Fig. 3**). In the Indian setting, a common infectious cause of monoarticular arthritis is tuberculosis. The other important causes that have been reported in the literature include brucellosis[4] or borreliosis; and poststreptococcal infection reactive arthritis. The oligoarticular or ERA subtypes of JIA may present as a monoarticular involvement at initial onset. In a study of 195 patients with antinuclear antibody (ANA) positive oligoarticular arthritis, Felici et al[5] found that the monoarticular form was the most common at initial presentation. Further, 26% of patients progressed to polyarticular involvement at 1 year, while at 5 years, the number rose to 51%. In this subset of patients, knee involvement was the most common form at initial presentation. In a study of patients with oligoarticular arthritis in India, Gupta et al[6] found that monoarticular involvement was far more common in infectious forms as compared to noninfectious causes of arthritis ($p = 0.001$). In addition, they found that axial involvement and erosive changes were more common in infectious causes, of which the difference was statistically significant for erosive disease ($p = 0.01$). As per the joint recommendations of the French rheumatology, pediatric rheumatology and radiology groups for

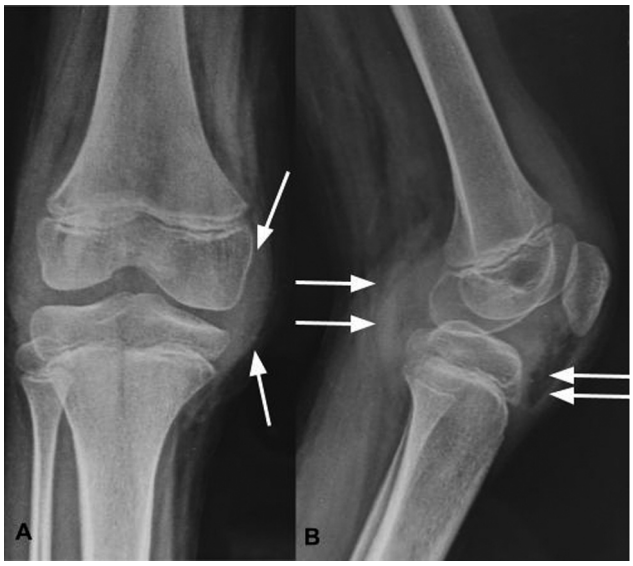

Fig. 3 Monoarticular arthritis in an 8-year-old girl. (**A**) On the frontal radiograph, there is symmetric soft-tissue swelling around the right knee joint (*arrow*) suggesting synovial proliferation. (**B**) The lateral view shows synovial proliferation in the infrapatellar bursa, partially effacing the infrapatellar fat pad as well as along the posterior joint recess (*arrows*). Monoarticular knee involvement is a common presentation of oligoarticular juvenile idiopathic arthritis (JIA).

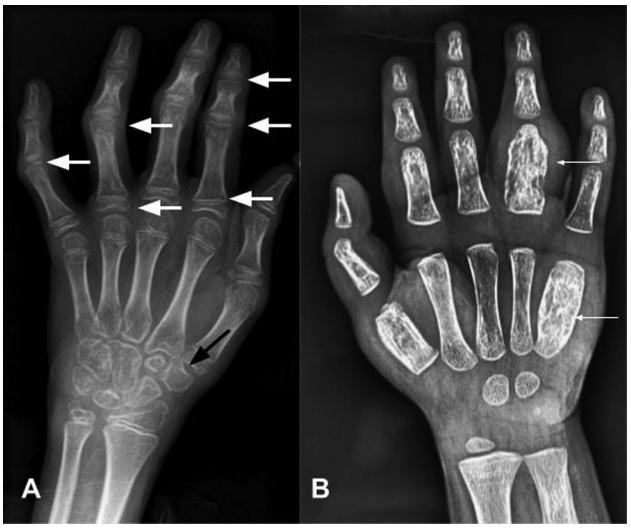

Fig. 4 Etiological differentiation of dactylitis based on radiographs. (**A**) In a 12-year-old male child patient with juvenile idiopathic arthritis, there is synovial proliferation around the metacarpophalangeal, proximal, and distal interphalangeal joints with periarticular osteopenia (*white arrow*). Note is also made of soft-tissue swelling around the wrist joint and carpal erosions (*black arrow*). (**B**) Bony expansion with lytic areas and periostitis seen in the phalanges and metacarpals in an 18-month-old girl with tubercular dactylitis (spina ventosa).

patients with monoarticular arthritis, radiographs of the affected joint in two perpendicular views should be performed, excluding the contralateral joint.[7]

- *Juvenile psoriatic arthritis*: A common presentation of juvenile psoriatic arthritis is dactylitis, which refers to "sausage"-shaped digits due to inflammation in the metacarpophalangeal, proximal, and distal interphalangeal joints of a single finger. This may be associated with nail changes and a typical rash along the extensor surfaces. Dactylitis is seen in 16 to 49% of patients with juvenile psoriatic arthritis; recurrent dactylitis in the same digits may be the only symptom in initial years of the disease.[8] The diagnosis is often complicated by the fact that dactylitis is rather a common presentation of multiple digit diseases. Thus, in patients presenting with an isolated swollen digit, radiographs are essential to reach the correct diagnosis. Tubercular dactylitis or "spina ventosa" presents with an expansile lytic lesion in the shaft with periostitis. Sarcoid dactylitis presents with a latticelike, reticular pattern due to trabecular changes. JIA associated dactylitis, on the other hand, shows synovitis and soft-tissue edema along the affected joints, with or without articular erosions (►**Fig. 4**). Periosteal proliferation may also be noted in affected digits[8] (►**Table 3**).
- *Axial spondyloarthropathy*: Juvenile spondyloarthropathy/ERA is the most common subtype of JIA in South East Asia and is characterized by entheseal and axial joint involvement in addition to arthritis. In children, due to skeletal immaturity, assessment of sacroiliitis by radiographs alone often proves challenging. A radiographic definition for sacroiliitis in juvenile spondyloarthropathies has recently been proposed by Weiss et al, which was shown to have 90% specificity compared to magnetic resonance imaging (MRI;[9] (►**Table 4**). As per this definition, unequivocal lesions including erosion, ankylosis, or sclerosis must be present in at least one iliac bone (►**Fig. 5**). The definition of sclerosis to be considered positive as per this study was greater than 5 mm involvement from the joint surface. However, as of now, radiographs for primary diagnosis of sacroiliitis are not encouraged. As per the French recommendations, in patients with spondyloarthropathy, radiographs of the hip and spine may be performed to differentiate juvenile spondyloarthropathy from other causes of back pain such as Scheuermann's disease, or hip pain such as CNO.[7]

Table 3 Radiographic appearance in juvenile idiopathic arthritis (JIA) associated dactylitis

Radiographic features of JIA associated dactylitis:
• Soft-tissue swelling
• Joint space reduction
• Periostitis: appearance of widened, "squared-off" metacarpals and phalanges
• Erosions: periarticular

Table 4 Radiographic definition of sacroiliitis in juvenile idiopathic arthritis (JIA)

Radiographic criteria for sacroiliitis in JIA[9]:
• Erosion
• Sclerosis: extends for >5 mm from joint surface
• Ankylosis
At least one of these must be present in one iliac bone to be labeled sacroiliitis

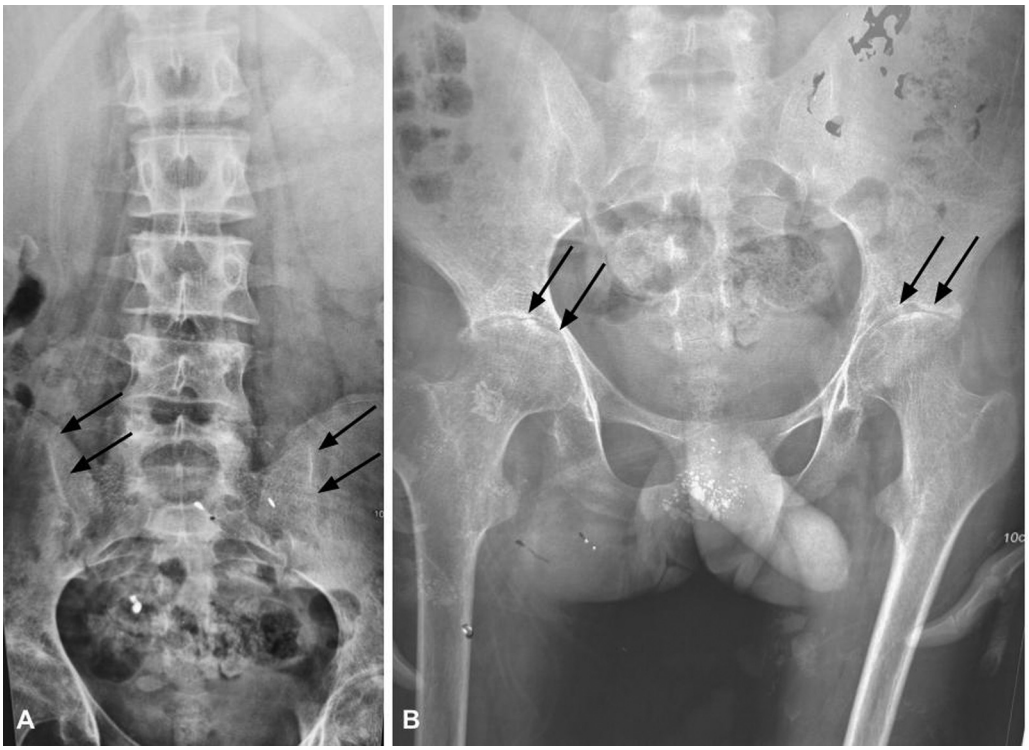

Fig. 5 Juvenile spondyloarthropathy in a 16-year-old adolescent male patient. (**A**) There is complete loss of joint space seen in both sacroiliac joints (left > right) along the superior aspect (*arrows*) suggesting bony ankylosis. (**B**) Anteroposterior (AP) radiograph of the pelvis with both hip joints also shows loss of joint space in both the hip joints (right > left) with sclerosis and flattening of the right femoral head (*arrows*).

Differentiation from Mimics

The differentiation of disorders presenting with similar clinical features, such as familial noninflammatory arthropathies including idiopathic multicentric osteolysis, camptodactyly-arthropathy-coxa vara-pericarditis syndrome, and progressive pseudorheumatoid dysplasia (PPRA) from inflammatory arthritis is critical.[10] It is important to elicit family history in such cases, as consanguinity may often be found, and there are more than one affected family members. These children often lack clinical findings suggestive of inflammation, such as joint tenderness and elevation of inflammatory markers such as raised erythrocyte sedimentation rate (ESR) or C-reactive protein level (CRP). Appropriate diagnosis is important to prevent unnecessary exposure of anti-inflammatory or disease modifying antirheumatic drugs in these children with inadequate response.[11]

Radiographs play a vital role in establishing the diagnosis in these children and directing them toward genome sequencing and genetic counseling. A full skeletal survey must be performed. In PPRA, there are gouge-shaped defects in the anterosuperior end plates of vertebrae associated with platyspondyly. There is also characteristic metaphyseal expansion in the phalanges, most marked in the proximal phalanges with epiphyseal irregularity (►**Fig. 6**). Epiphyseal enlargement is noted in the humeral and femoral heads.[12]

Assessment of Disease-Related Damage

- Appendicular skeleton: Multiple radiographic scoring systems have been devised to assess the degree of articular damage. These have either been adapted from adult arthritis scoring systems or developed as novel methods specific for juvenile arthritis.

The hip and wrist have been found most susceptible to early joint space narrowing in JIA[13] (►**Fig. 7**). The novel score developed by Bertamino et al[14] for disease-related damage at the hip is a 7-point score. The assessment criteria are described in ►**Table 5**. Similarly, another score was developed by Ravelli et al, which was adapted from the Sharp/van der Heijde scoring systems for adult rheumatoid arthritis. While the original score analyzed 15 areas in the wrist and hand for joint space narrowing and 16 areas for erosion, the modified score included an additional 5 areas of assessment for erosion, since that is considered a more reliable predictor of long-term outcome[15] (►**Fig. 8**; ►**Table 6**). The primary utility of these radiographic scores is in longitudinal assessment of disease-related articular damage and are important research tools.

As per joint recommendations by the French societies,[7] all patients with polyarticular RF positive arthritis must undergo radiographs of the hands, wrists, and forefeet at diagnosis, 1 year postdiagnosis and when transitioning to adult care, to document disease-related damage. In patients with polyarticular RF negative arthritis, routine follow-up radiographs are recommended only for those patients with adverse prognostic factors, due to low risk of articular damage. Further, in oligoarticular forms, radiographs are not recommended at diagnosis, but rather only those who remain symptomatic at 3 months.

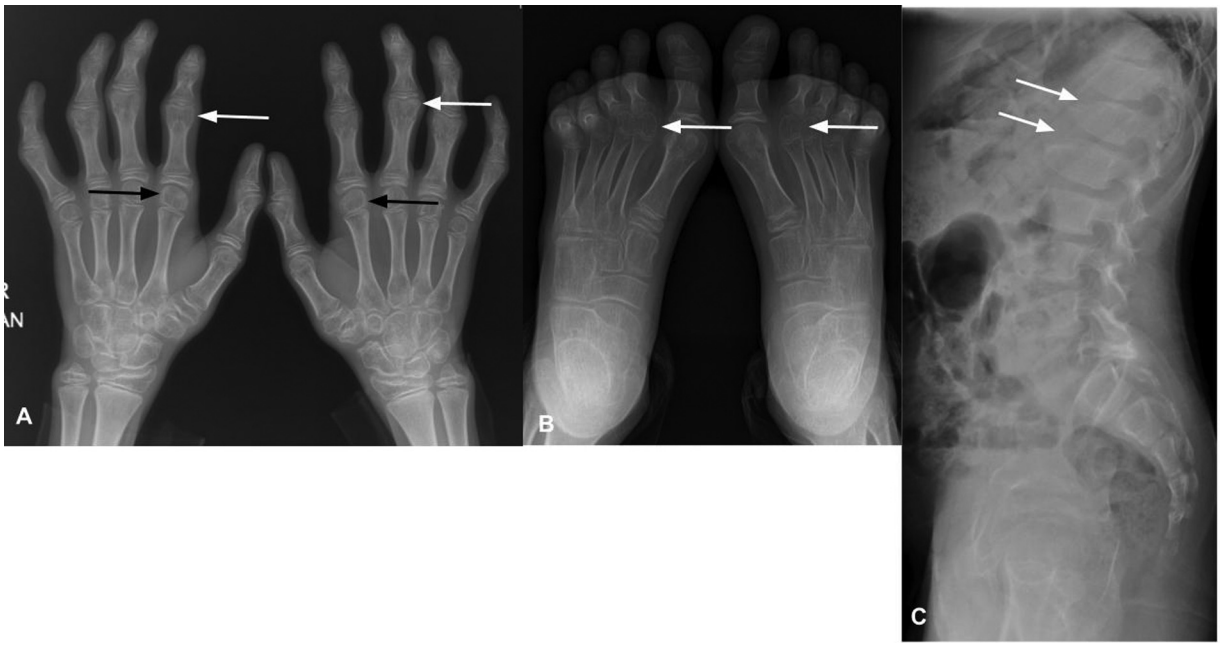

Fig. 6 Progressive pseudo-rheumatoid dysplasia in a 9-year-old male child patient with progressive hand deformity and short stature. (**A**) Posteroanterior (PA) radiograph of the hands reveals epiphyseal enlargement of the distal phalanges (*white arrow*) as well as the distal metacarpals (*black arrow*). (**B**) Similar enlargement of metatarsal epiphysis is also seen (*arrow*). (**C**) On lateral spine radiograph, the characteristic anterosuperior end plate defects are noted (*arrow*).

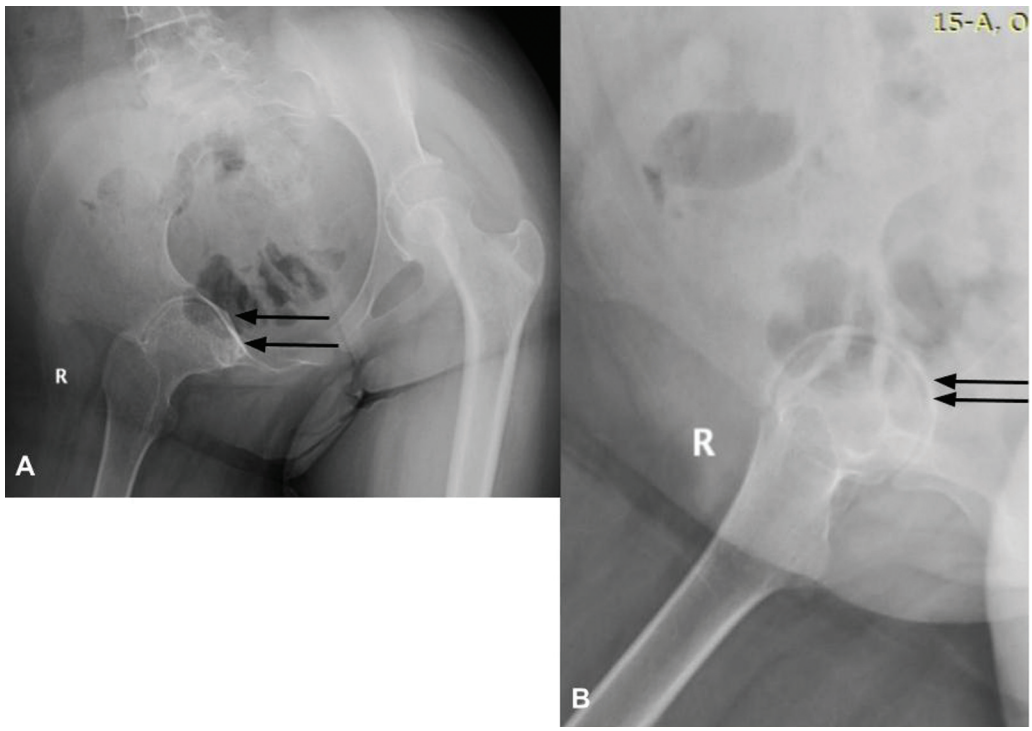

Fig. 7 Assessment of disease-related damage at the hip joint in a 15-year-old male child patient. (**A**) Frontal radiograph shows pelvic tilt toward the right side. There is loss of joint space with periarticular osteopenia in the right hip joint (*arrow*). (**B**) On the oblique view of the right hip, there is significant joint space narrowing (*arrow*) with flattened femoral head, though no erosion is seen.

- *Cervical spine*: Many JIA patients report symptoms attributable to cervical spine and craniovertebral junction involvement. This varies among subtypes, ranging from as high as 45% in the polyarticular form to 4% in the oligoarticular form. Radiographs are the mainstay of imaging in such patients. The abnormalities are varied and range from

Table 5 Score developed by Bertamino et al[14] for disease-related damage at the hip

Type of damage	Score criteria
Joint space narrowing	<50%, >50%, ankylosis
Erosion	Small, marked, severe, extensive destruction
Growth abnormality	Mild, severe
Subchondral cysts	Mild, severe
Malalignment	Subluxation, dislocation
Sclerosis of acetabulum	Present, absent
Avascular necrosis of femoral head	Present, absent

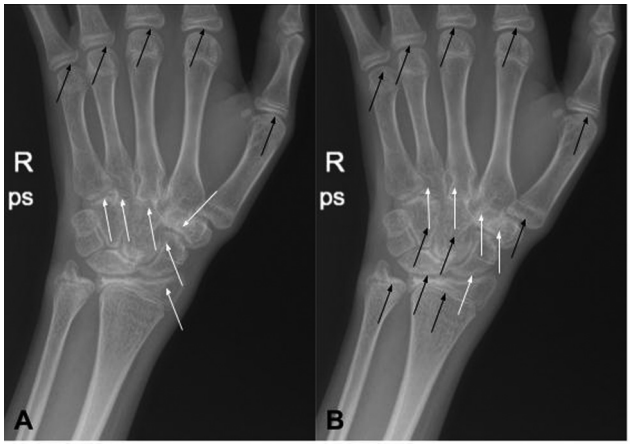

Fig. 8 Assessment of disease-related damage at the wrist joint in a 14-year-old girl. The anteroposterior (AP) radiograph of the right wrist, when scored according to the Ravelli modification of Sharp/van der Heijde method. (**A**) Joint space narrowing (JSN) was assessed at the radio-scaphoid, scapho-trapezoid, scapho-capitate joints, joints between the capitate, hamate and third, fourth, and fifth metacarpal bases, as well as all metacarpophalangeal joints. Additionally, the interphalangeal joints are also assessed (not shown). *Black arrows* show joints without JSN, while *white arrows* show joints with JSN. (**B**) Erosions were assessed at the metaphysis of the radius and ulna, scaphoid, lunate, trapezoid, capitate, hamate, bases of the first to fourth metacarpals and proximal phalanges. The bases of distal phalanges are also assessed (not shown). *Black arrows* depict sites without erosion, while *white arrows* depict sites with erosion.

atlantoaxial subluxation to apophyseal joint ankylosis. Wolfs et al[16] in their review reported apophyseal ankylosis prevalence of 4 to 67% at the C2–C3 level, resulting in growth disturbances in the upper cervical spine (►**Fig. 9**). Increased atlanto-dental interval (>5 mm in children) has been used as an indicator for atlantoaxial subluxation; however, an additional measure, the posterior atlanto-dental interval (PADI), which is the distance between the posterior border of dens and the anterior border of the posterior arch of atlas and indicates the space available for the spinal cord, has been suggested as a more useful indicator. PADI <13 mm is associated with neurological symptoms.[16] The current indications for surgery are greater than 8 mm cervical instability or less than 14 mm PADI in asymptomatic individuals; in symptomatic individuals, a lower threshold for intervention is kept.

In children with ankylosis and fixed deformities, particularly in weight-bearing joints, radiographs are essential if correction is planned, for preoperative measurements and procedure planning. The extent of cervical spine involvement must also be documented prior to general anesthesia, since intubation and head movement may be challenging in such patients.

Cutaneous Involvement in Inflammatory Connective Tissue Disorders

Deposition of calcium in the skin and subcutaneous tissue is known as calcinosis cutis. Dystrophic calcification typically occurs in association with autoimmune disorders and can present with plaques, nodules, or papules. In a study by Shahi et al,[17] the most common cause was dermatomyositis, followed by diffuse and limited systemic sclerosis. They reported that radiographs detected calcinosis in 100% patients, and were also able to identify patterns such as nodular, sheetlike, or linear (►**Fig. 10**). These may be incidentally detected in patients undergoing radiographs for other clinically evident findings. Radiographs are also indicated for noninvasive confirmation of diagnosis, to determine the depth of involvement and also to assess longitudinal changes with/without treatment.

Hemophilic Arthropathy

Radiographs are the most widely used investigation for joint involvement in patients with hemophilia. The most commonly affected joints are the knees, elbows, and ankles. Since the pathology in hemophilic arthropathy patients is recurrent hemarthrosis leading to chronic synovitis, radiographic evaluation is limited by its low sensitivity to early changes.[18] In patients with advanced joint involvement, however, the Pettersson score[19] performed on radiographs is recommended by the World Federation of Hemophilia for assessment of disease-related damage (►**Table 7**). This score is an 8-point score that grades bony changes such as osteoporosis and epiphyseal enlargement, joint changes including joint space narrowing, erosion, and irregularity of subchondral surface, and the outcome of these changes, which is the extent of joint deformity. Since patients have mostly reached adulthood by the time advanced changes develop, a detailed discussion of this score is beyond the scope of this review.

Chronic Multifocal Osteomyelitis/Chronic Nonbacterial Osteomyelitis

CNO is an autoinflammatory bone disorder that is increasingly being recognized in children as a cause of multifocal bone pains.[20] This commonly affects the flat bones, including the clavicle, vertebra, and jaw, in addition to lower limb long bones. Two patterns of

Table 6 Disease-related damage score as per the Ravelli modification of the Sharp/van der Heijde score[15]

Parameters of assessment	Joints	Sites	Number of sites
Joint space narrowing	Metacarpophalangeal joints	1–5	5
	Proximal interphalangeal joints	2–5	4
	Carpometacarpal joints	Capitate, hamate: 3/4/5 metacarpals	3
	Intercarpal joints	Scaphoid-trapezium/trapezoid/hamate	2
	Radio-scaphoid joint		1
Erosions	Proximal interphalangeal joints	1–5	5
	Metacarpophalangeal joints	1–5	5
	Metacarpal base	1–4	4
	Carpals	Scaphoid, lunate, trapezium/ trapezoid, capitate, hamate	5
	Distal radius and ulna		2

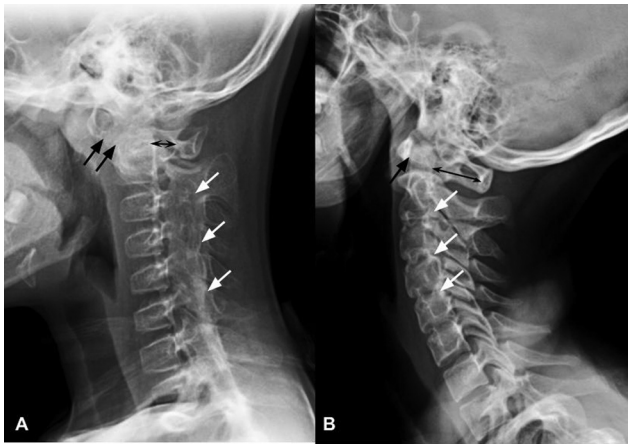

Fig. 9 Cervical spine involvement in juvenile idiopathic arthritis (JIA). (**A**) Lateral radiograph of the cervical spine in a 6-year-old male child patient shows increased atlanto-dental interval (*black arrow*) and reduced posterior atlanto-dental interval (PADI) (*double arrow*). There is apophyseal ankylosis seen in the upper cervical spine (*white arrows*). (**B**) In another patient, a 13-year-old male child patient, the atlanto-dental (*black arrow*) and PADI (*double arrow*) are normal. There is bony ankylosis seen in the vertebral bodies in the upper cervical spine (*white arrows*).

involvement have been reported by Andronikou et al. The more common among these is the tibio-appendicular pattern where children manifest tibial and multifocal appendicular lesions with absence of clavicular involvement. The other, less common form is the claviculo-spinal pauci-focal pattern, where children have clavicular involvement and overall fewer lesions, mostly in the spine.[21] A brief summary of the role of radiographs in CNO is given below.

Role of radiographs in children with CNO:

- **Diagnostic value:** Radiographs are the most commonly requested initial imaging modality. The findings represent a combination of acute and chronic infective OM, with both lytic lesions and sclerotic areas with bony expansion. In long bones, lesions are most commonly localized in the metaphysis (►**Fig. 11**).[22] The imaging findings are summarized in ►**Table 8**. However, a study by Fritz et al[23] highlighted the inadequacy of radiographs alone for this condition. The sensitivity of radiographs was 0.13, less than even physical examination (0.31). Whole-body MRI (WB MRI) is the mainstay of imaging, and in fact the investigation of choice in these children for early diagnosis. It is thus essential for radiologists to understand that if lesions are identified on radiographs in a child with multifocal symptoms at presentation, or associated signs suggestive of CNO such as psoriasis or palmoplantar pustulosis, a skeletal survey is *not* to be performed, but rather radiation-free imaging must be suggested. This assumes further importance due to the fact that most of these children will undergo repeat imaging at any time between 3- and 12-month intervals,[20] and thus we must avoid a mounting radiation burden.
- **Differentiation from mimics:** The foremost consideration remains differentiating CNO from infectious osteomyelitis (OM). Bacterial OM can be multifocal in approximately 7% patients, and in these patients the differentiation is of utmost importance. Lack of sclerosis as well as absence of soft-tissue features of inflammation are a pointer toward CNO versus bacterial OM; inflammatory markers are also often not raised in CNO. Similarly, in tubercular OM, soft-tissue inflammation and abscess formation are dominant features. Spinal tuberculosis is centered in the intervertebral disk, and therefore shows a "paradiskal" pattern, while CNO is centered in the bone marrow and joint involvement is rare.[24]
- **Assessment of disease-related damage:** As mentioned earlier, WB MRI using short tau inversion recovery (STIR) sequences is the mainstay of imaging for mapping of disease extent including occult disease sites, as well as assessing progression and response to therapy. However,

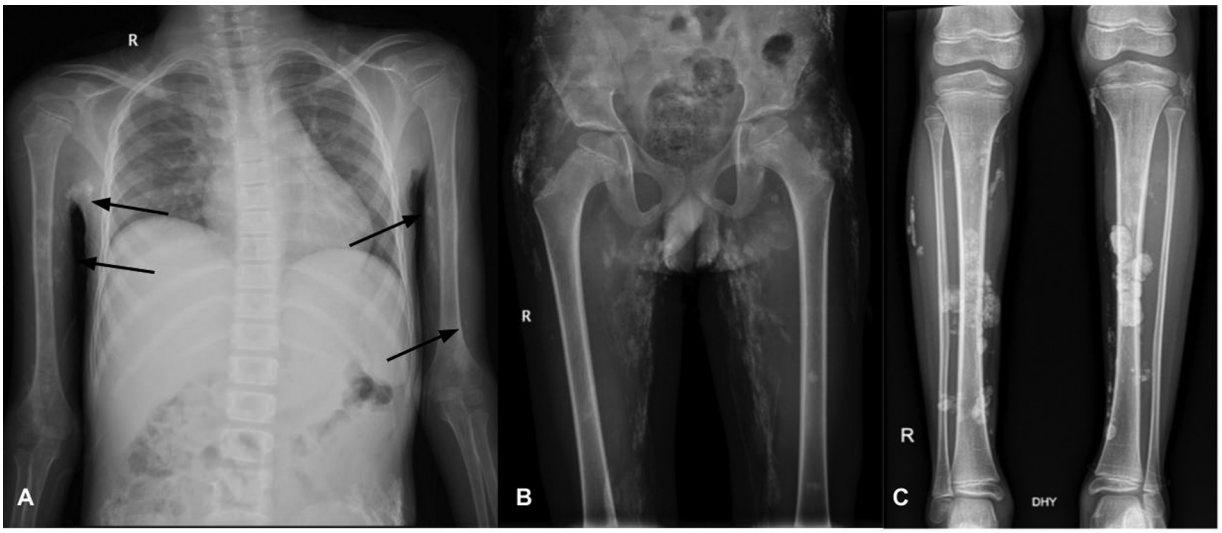

Fig. 10 Calcinosis cutis in dermatomyositis in a 10-year-old male child patient. (**A**) Linear soft-tissue calcification is seen in both the upper limbs (*arrow*). (**B**) There is more extensive calcification seen around the pelvic bones and in the soft tissue of the medial thigh, forming a sheetlike pattern. (**C**) Nodular deposits are also seen in the soft tissue of both calves.

Table 7 Pettersson score[19] for radiographic scoring of hemophilic arthropathy

Radiographic parameter	Criteria
Osteoporosis	Present, absent
Enlarged epiphyses	Present, absent
Irregular subchondral surface	Absent, slight, pronounced
Narrowing of joint space	Absent, <50%, >50%
Subchondral cyst formation	Absent, one cyst, more than one cyst
Erosion at joint margins	Present, absent
Gross incongruence of articulating bone ends (angulation/displacement)	Absent, slight, pronounced
Joint deformity	Absent, slight, pronounced

localized radiographs are essential to demonstrate complications such as growth plate damage.

Reporting Checklist

Systematic approach to reporting of radiographs must be followed in children with inflammatory arthropathy to adequately document the disease extent as well as rule out differential diagnosis. A sample case as well as use of reporting checklist is shown in ►**Figs. 12** and **13**.

Table 8 Radiographic features of chronic nonbacterial osteomyelitis (CNO)

Radiographic features of CNO:
• Multifocal involvement: in children, appendicular skeleton more than axial skeleton
• Metaphyseal predilection
• Mixed lytic and sclerotic areas, progressive sclerosis with healing
• Periosteal reaction

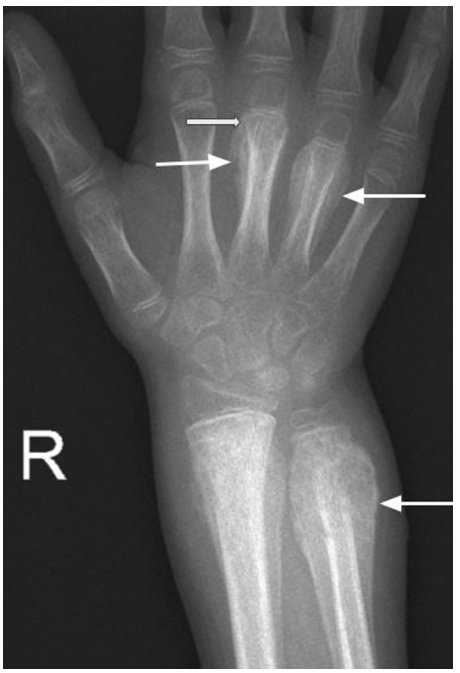

Fig. 11 Chronic nonbacterial osteomyelitis in a 9-year-old boy. The posteroanterior (PA) radiograph of the hand shows extensive periostitis (*arrows*) involving the third and fourth metacarpals as well as the distal radius and ulna. Healing lytic sclerotic lesion is seen in the third metacarpal head adjacent to the growth plate (*solid arrow*).

Key Messages

- Role of radiographs differs based on clinical presentation (►**Fig. 14**).

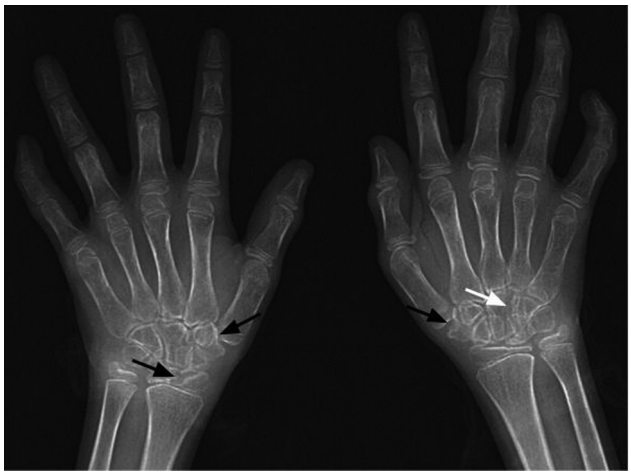

Fig. 12 Radiograph of bilateral hands and wrist in a 10-year-old boy with joint idiopathic arthritis (JIA). The structured reporting format is shown in ►**Fig. 13**.

Radiograph bilateral hand and wrist

A. Bone density : Normal/Reduced
B. Soft tissue swelling :
Present/Absent
Joints involved :-
C. Joint space narrowing :
Present/Absent
Joints involved : Radiocarpal, intercarpal, carpometacarpal
D. Bone erosion :
Present/Absent
Bones involved : Carpals (*black arrow* in Fig. 12)
E. Periostitis :
Present/Absent
Bones involved :-
F. Epiphyseal changes (if any) :-
G. Ankylosis :
Present/Absent
Joints involved : Intercarpal (*white arrow* in Fig. 12)

Impression: Extensive articular damage around wrist joint-advanced juvenile arthritis

Fig. 13 Structured reporting format for radiographs in juvenile arthritis.

- In children with arthritis, radiographs have diagnostic value in patients with dactylitis, monoarticular involvement, and spondyloarthropathy.
- For assessment of disease-related damage, including deformity, dislocations, and preoperative planning, radiographs are the most commonly used investigation.
- Radiographs are useful to differentiate mimics such as familial noninflammatory arthropathies from JIA.
- In children with multifocal bone pains, radiographs are useful to demonstrate lesions suggestive of CNO, and may be further augmented by WB MRI.

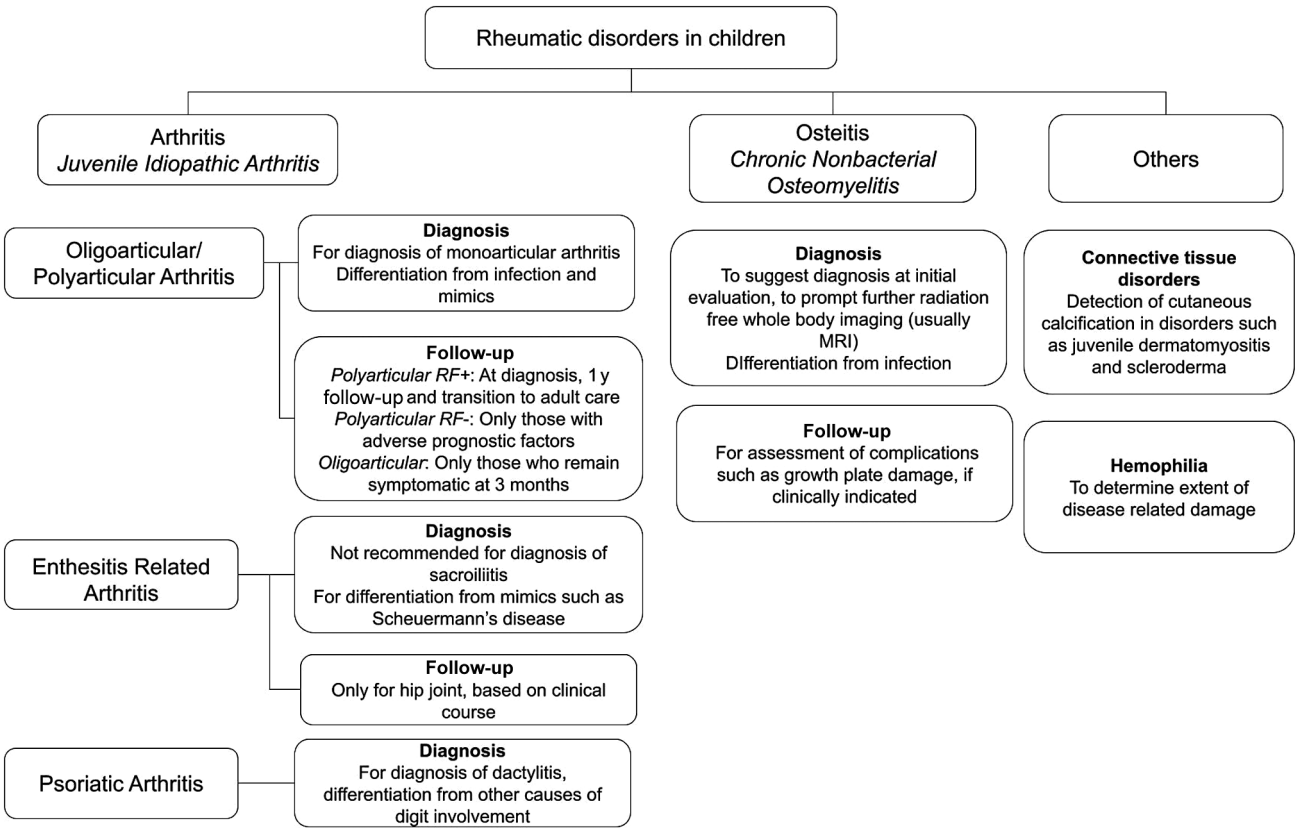

Fig. 14 Summary of the role of radiography in rheumatic disorders in children.

- For confirmation of soft-tissue involvement as in calcinosis cutis also radiographs may be used.

Conclusion

This review highlights the current day role of radiographs in children with rheumatological disorders. It is clear from the evidence presented that even in the era of advanced imaging, musculoskeletal radiographs have a unique and irreplaceable place in the diagnostic algorithm, which practicing radiologists must make an effort to understand so as to most effectively utilize the information gained from this examination.

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None declared.

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