A Comprehensive Rheumatological and Immunological Approach to Diagnosis of Psoriatic Arthritis

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Edited by

Syuichi Koarada

Cambridge
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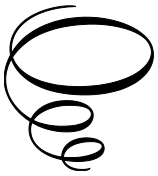

A Comprehensive Rheumatological and Immunological Approach to Diagnosis of Psoriatic Arthritis

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This book first published 2020

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN (10): 1-5275-4927-5
ISBN (13): 978-1-5275-4927-2

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PREFACE

When the cherry blossoms bloomed at the banks of Tafuse River, this book, "psoriatic arthritis – comprehensive rheumatological and immunological approach to diagnosis of psoriatic arthritis with one thousand illustrations" was drafted in Saga, Japan. Psoriatic arthritis is a chronic rheumatic disease that involves the inflammation of joints, entheses and skins. Although psoriatic arthritis has been considered as a milder arthritis, in the past decade psoriatic arthritis has been proven to be potentially a serious disease like rheumatoid arthritis. The radiographic findings, clinical presentation and laboratory tests reveal that psoriatic arthritis is a distinct joint disorder. However, early diagnosis of psoriatic arthritis is not always easy. There are numerous excellent textbooks and monographs of psoriatic arthritis. However, there are few books that illustrate the imaging, diagnosis and immunity of psoriatic arthritis for beginners, step by step from the basics. This book uses more than one thousand radiographs, photographs, and diagrams to help readers understand.

Of course, in this edition, there are parts that I have not written in, and I wish that beautiful flowers will be brought in the next edition when the cherry blossoms bloom based on readers' opinions.

Syuichi Koarada

ACKNOWLEDGMENTS

The authors thank the reviewers and editors of Cambridge Scholars Publishing for their excellent work and giving us the opportunity to publish this valuable book. We would like to express our deep appreciation to our patients who provided valuable data and images.

I would like to show my greatest appreciation to colleagues whose enormous support and insightful comments were invaluable during my study. I also owe a very important debt to assistants who provided technical help and sincere encouragement. I would also like to express my gratitude to my family, my parents, my wife, and my daughter, for their warm support and encouragements.

CHAPTER 1

INTRODUCTION AND CLASSIFICATION OF PSORIATIC ARTHRITIS

SYUICHI KOARADA, NOBUYUKI ONO, YOSHIFUMI TADA

Abstract

Psoriatic arthritis is an inflammatory disease of the bones and the joints related to psoriasis. In this book, characteristic findings of psoriatic arthritis in conventional radiography, ultrasound, MRI, CT, PET-CT, and bone scintigraphy are discussed. As a methodology, systematic interpretation based on ABCDEFGHI method is required to understand joint diseases. The purpose of this book is to present theoretical commentary as detailed as possible to allow a comprehensive interpretation of psoriatic arthritis.

Introduction

Psoriatic arthritis (PsA) is a common inflammatory disease that can lead to a wide range of pathological changes in the peripheral and the axial joints and the entheses associated with psoriasis [Brockbank J. 2002]. Therefore, psoriatic arthritis has diverse clinical and radiographic signs and changes [Firestein G.S. 2017]. Also, psoriatic arthritis is a member of the spondyloarthropathy family due to various clinical features of axis skeletal lesions [Moll J.M. 1973]. Although the exact cause of psoriasis and psoriatic arthritis is still unknown, it seems that a chronic multifactorial disease is contributed by complex interactions between genetic, the environment and immunologic factors [Barnas J.L. 2015].

Psoriatic arthritis was once thought to be a rheumatic disease with a good prognosis, but nowadays the disease is progressive and in the absence of appropriate treatment, joint destruction occurs, resulting in impaired function [Torre Alonso J.C. 1991] [S. R. Gladman D.D. 1987] [Ory P.A. 2005] [Siannis F. 2006].

For this reason, early intervention, diagnosis and treatment of psoriatic arthritis, is becoming more important. Patients with psoriatic arthritis can benefit from the initiation of appropriate treatment and maintenance of continuous immunotherapy [T. A. Gladman D.D. 2011] [Queiro-Silva R. 2003] [Theander E. 2014]. For this purpose, accurate diagnosis is necessary, and then differentiation of similar rheumatic diseases is indispensable. Psoriatic arthritis is in general difficult to define because of clinically heterogeneous findings. Psoriatic arthritis affects only the peripheral joints, the spine or the entheseal lesions. Psoriasis can occur after arthritis, and psoriatic arthritis without psoriasis (PsA sine psoriasis, sine syndrome) also exists.

Psoriatic arthritis has historically been defined as negative for rheumatoid factors (RFs), but anti-citrullinated peptide antibodies (ACPA) may be positive in some cases [S. R. Gladman D.D. 1987]. Another reason for requiring an accurate diagnosis is that the treatment is different based on the pathophysiological state, which has a great influence on the prognosis of the disease. Since differential diagnosis of psoriatic arthritis is usually performed based on clinical, immunological and radiological findings, the knowledge of these aspects is indispensable for accurate diagnosis.

Psoriatic arthritis has aspects of both osteoclastic changes and osteo-proliferations. Various lesions are generated due to the difference in degree of these bilateral natures, and as a result, various radiographic findings are formed. Literately, it is described that radiographic bone proliferative lesions are characteristic and are included in the classification criteria for psoriatic arthritis (CASPAR criteria) [Taylor W. 2006]. And psoriatic arthritis can also be diagnosed after clinical and radiographic features such as dactylitis, enthesitis, sacroiliitis, and spondylitis are taken into consideration [Coates L.C. 2012]. However, it seems to be easy to write like this, but it is impossible without comprehensive interpretation to lead to accurate diagnosis. Comprehensive interpretation is difficult without knowing the characteristics and changes depending on the organs and the sites, and typical and atypical cases.

In this book, as a methodology, we recommend systematic interpretation based on ABCDEFGHI to understand joint diseases.

The following describes the elements of psoriatic arthritis we are practicing.

ABCDEFGHI method

A: Alignment.

In psoriatic arthritis, pencil-in-cup deformity is characterized as an abnormality of alignment, but psoriatic arthritis can also cause various deformities.

B: Bones.

Bone and joint lesions are the most varied and important findings of psoriatic arthritis. In psoriatic arthritis, there are severe marginal and central erosions as erosive changes and, as bone proliferative lesions, they cause fraying or irregularity of the bone surfaces around the joints.

C: Capsula articularis.

Joint space widening or narrowing, joint fluid, and synovitis are observed in psoriatic arthritis.

D: Distribution of abnormalities.

Distribution of abnormalities in the bodies is generally different between psoriatic arthritis and other rheumatic diseases and is a very important finding.

E: Extracapsular manifestations.

Extra-articular or extracapsular findings include bursitis, tenosynovitis, and enthesitis, soft tissue, muscular, and vascular involvements. Psoriatic arthritis has the various articular and the extraosseous lesions, and changes in the entheseal sites, the tendon and the ligament attachments, are typical.

F: Further information and examination.

Furthermore, the accuracy of diagnosis can be dramatically increased by accumulating various information and examination, including clinical history, epidemiologic factor, family history, clinical findings, examination data, and imaging.

G: Goals of diagnosis.

Based on the above information of A to F, we conduct differential diagnosis, and according to classification criteria of psoriatic arthritis, we make a comprehensive judgement of diagnosis.

H: Healing and healthy condition.

Based on the diagnosis, we select and start the treatment, according to the degree of lesions, features, presence or absence of complications. After the starting of treatment, assessment of the reactivity for the treatment should be performed.

I: Immunological aspects.

An understanding of the immunopathology of psoriatic arthritis is important to improve diagnosis and treatment of patients with psoriatic arthritis.

In this book, the radiological features of psoriatic arthritis and immune-mediated mechanism are discussed. Here, we describe the radiographic features of each target and joint. We discuss the characteristic findings of ultrasound, MRI, CT, PET-CT, and bone scintigraphy, and present the images of these modalities. Of course, it is impossible to describe everything in this small book, but the images are important for the diagnosis of this disease, and more detailed research of psoriatic arthritis is required.

Classification of joint symptoms

Psoriatic arthritis involves various subgroups, and the patterns of joint lesions are of several types.

Moll and Wright Classification

The classic disease of psoriatic arthritis is a polyarticular disorder with a predilection for the DIP (distal interphalangeal) joints of the digits, but various other clinical types are observed and historically, five clinical subgroups have been described (Table 1). The clinical patterns of subgroups described by Moll and Wright are as follows [Moll J.M. 1973]: symmetric polyarticular arthritis, asymmetric oligoarthritis, distal interphalangeal arthritis, spondylitis, and arthritis mutilans.

Table 1: Moll and Wright criteria for psoriatic arthritis

• Polyarticular, symmetric arthritis (Rheumatoid arthritis-like)	15%
• Oligoarticular (< 5 joints), asymmetric arthritis	70%
• Distal interphalangeal joint predominant	5%
• Spondylitis predominant	5%
• Arthritis mutilans	5%

The frequency of each of these subgroups is given as a percentage.

Four of them involve the small joints of the hands and the feet, and two of the four subgroups are the DIP joint lesions and arthritis mutilans. Arthritis mutilans is usually the same as the DIP lesions, but patients with the DIP lesions do not always show arthritis mutilans. The remaining three subtypes are symmetric polyarthritis, asymmetric oligoarthritis, and spondyloarthritis. Furthermore, because patients with psoriatic arthritis may simultaneously have

rheumatoid arthritis, osteoarthritis, and/or gout, in clinical practice, the pathophysiology of psoriatic arthritis is more complicated. The various types are listed below.

Varied Patterns of Psoriatic Arthritis

1. Asymmetric oligoarthritis type

Asymmetric oligoarthritis type has less than five large and/or small joint lesions in an asymmetric distribution. This type includes monoarthritis and asymmetric oligoarthritis.

2. Symmetric polyarthritis type

Symmetric polyarthritis type is like rheumatoid arthritis and sometimes indistinguishable from it. This type is symmetric polyarthritis without laboratory findings specific for rheumatoid arthritis.

3. Distal arthritis type

Distal arthritis type is characterized by polyarthritis of the DIP joint lesions.

4. Spondyloarthritis type

Spondyloarthritis (SpA) type includes sacroiliac arthritis (sacroiliitis) and spondylitis resembling ankylosing spondylitis (AS).

5. Arthritis mutilans type

Mutilans arthritis is a deforming type characterized by deformity and destructive arthritis.

6. Rheumatoid arthritis type

Some patients with psoriatic arthritis have typical clinical features, positive serological tests, and specific findings of radiography of rheumatoid arthritis. The coincidence of psoriasis and rheumatoid arthritis is possible. It is controversial whether this condition should be a combination of rheumatoid arthritis by chance or psoriatic arthritis itself should be considered identical to rheumatoid arthritis in the patient.

7. Other types

Some patients with psoriatic arthritis may have different patterns from typical ones. The patients have clinical findings of dactylitis, enthesitis mainly [C. F. Salvarani C. 1997], and diffuse pitting edema of the extremities [C. F. Salvarani C. 1999].

8. Complex type

Because some patients present more than one pattern, they belong to a complex type.

Alternation of the pattern of psoriatic arthritis

The pattern of arthritis is not fixed, and so even with the same patient, the subtypes of arthritis may alter over time [Jones S.M. 1994] [Khan M. 2003]. Moreover, the condition of the patient will change, and treatment may also affect the pattern of arthritis. Using ultrasound, many patients classified as having oligoarthritis have been shown to be reclassified as polyarthritis [Freeston J.E. 2014]. This reclassification can lead to significant changes in prognosis and treatment of psoriatic arthritis.

Chronological classification

Psoriatic arthritis is also classified based on the chronological relationship between skin symptoms and arthritis.

Skin lesions preceding arthritis

In most adult patients, psoriatic arthritis usually appears after the onset of psoriasis. Skin involvement precedes the onset of arthritis in approximately 80-85% of cases, and arthritis typically develops about 10 years after the onset of psoriasis [Ritchlin C.T. 2017] [Boyle D.L. 2008]. Some patients may not know that they have psoriasis.

Simultaneous onset of skin lesions and arthritis

Arthritis may coincide with the appearance of skin lesions. The patients may also develop arthritis simultaneously with dactylitis and nail changes.

Arthritis preceding skin lesions

Arthropathy may precede classic cutaneous symptoms or nail lesions in a small percentage of patients. In some reports, about 15-20% of patients with psoriatic arthritis have arthritis prior to skin abnormalities [Scarpa R. 1984] [Pavlica L. 2005] [Boyle D.L. 2008]. Arthritis precedes skin lesions by more than 10 years in 1.6% of patients with psoriatic arthritis [Scarpa R. 1984]. Especially, in children, arthritis often precedes skin lesions. This may have led to difficulties and delayed diagnosis of psoriatic arthritis. Arthritis can persist for several years, with an unclear diagnosis until the appearance of skin or nail lesions of psoriasis [Taniguchi A. 2007].

Sine syndrome, Psoriatic arthritis sine (without) psoriasis

Psoriatic arthritis without psoriasis is also rare. Sine syndrome is reported to appear in 1.8% of 162 PsA patients in a retrospective study [Pavlica L. 2005]. Clinically, a sine syndrome is characterized by arthritis of the DIP joints and dactylitis without skin lesions. In patients with arthritis preceding skin lesions, a diagnosis of psoriatic arthritis sine psoriasis is made until the skin lesions appear. The patients with the sine syndrome share features with arthritis patients with late-onset skin lesions [Taniguchi A. 2007]. In sine syndrome, there are three subgroups: the patients without psoriasis, but having first- and second-degree relatives with psoriasis, the patients with arthritis preceding skin lesions, and with persistent arthritis sine psoriasis.

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Torre Alonso J.C., Rodriguez Perez A., Arribas Castrillo J.M., Ballina Garcia J., Riestra Noriega J.L., Lopez Larrea C. *Psoriatic arthritis (PA): a clinical, immunological and radiological study of 180 patients.* Br J Rheumatol, 1991, 30:245–50.

CHAPTER 2

A: ALIGNMENT IN PSORIATIC ARTHRITIS

SYUICHI KOARADA, MARIKO SAKAI

Abstract

Alignment is the placement of the bones. One bone is to be properly matched with the facing bone. In psoriatic arthritis, flexion contractures of the fingers and deformities occur mainly in the DIP joints. Destruction of the joints is particularly extensive in the late stage of the disease. Some patients have mutilans type arthropathy. Flexion contractures and deformities can also be seen in the PIP joints. By comparison with the digits, the carpal bones are relatively retained. The pencil-in-cup deformity is a characteristic change in psoriatic arthritis. There are ankyloses of the joints of the digits and few subluxations.

Introduction

Conventional radiography can show bone structure and is suitable for comprehensive evaluation of alignment. In psoriatic arthritis, malalignment, deformities and subluxation of the hands and the feet may occur. Severe joint destruction and deformity are features of psoriatic arthritis. Therefore, complete dissolution of bones, fragmentation and destruction of the joint structure occur, sometimes resembling neuropathic osteoarthropathy.

Deviation and deformity of the hands and the feet are relatively common complications of psoriatic arthritis [Belsky M.R. 1982]. The deformation of psoriatic arthritis varies from mild deviations to severe destructive diseases (arthritis mutilans). Some patients may present deformity without severe joint pain. Sometimes erosions and ankyloses coexist in the same hands or the same digits that is a unique finding in psoriatic arthritis [Anandarajah A. 2013]. The patients with psoriatic arthritis have few boutonniere and swan-neck deformity compared with rheumatoid arthritis.

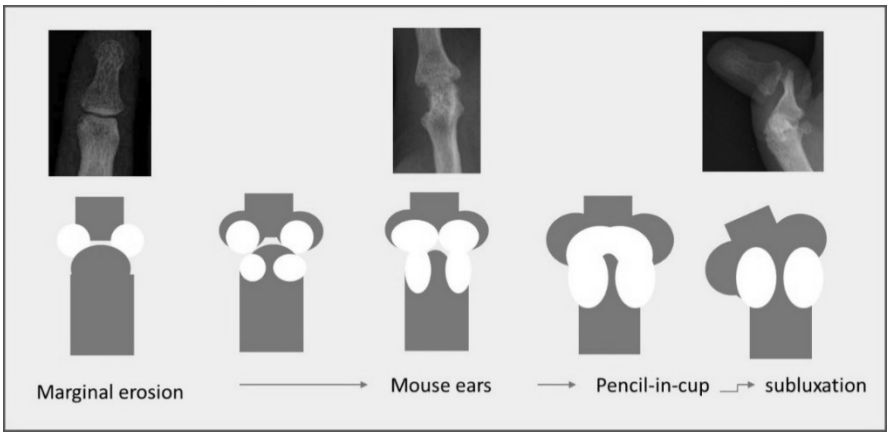

Figure 1. Deformities in psoriatic arthritis. The pencil-in-cup deformity and subluxation.

Deviation

Ulnar deviation of the metacarpophalangeal (MCP) joints and fibular deviation of the metatarsophalangeal (MTP) joints are not as common in psoriatic arthritis as in the cases of rheumatoid arthritis. However, ulnar and/or radial deviation of the distal interphalangeal (DIP) and/or the proximal interphalangeal (PIP) joints may be seen in psoriatic arthritis.

DIP joints

Figure 2. A patient with psoriatic arthritis. Ulnar deviation of the right fifth DIP joint is observed.

Figure 3. A patient with psoriatic arthritis. Radial deviation of the left second DIP joint is observed.

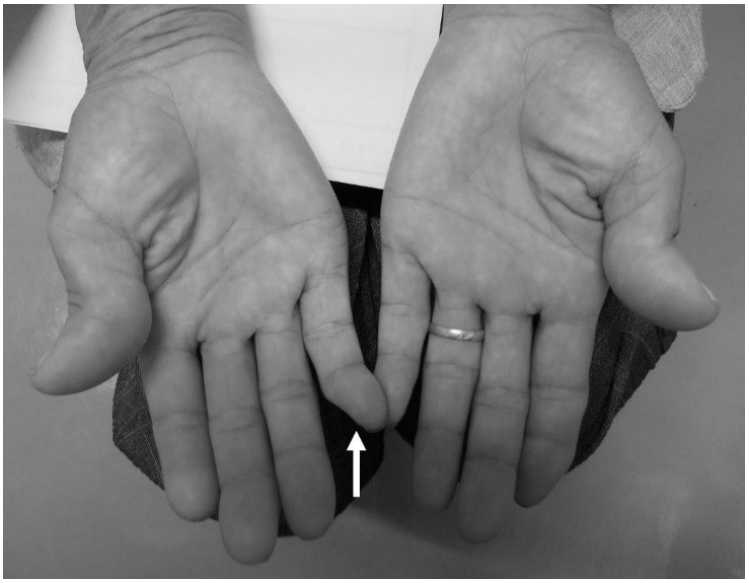

Figure 4. A patient with psoriatic arthritis shows the ulnar deviation of the right fifth DIP joint and radial subluxation of the distal phalanges of the thumbs.

Figure 5. A plain radiograph of the hands of a patient with psoriatic arthritis shows radial deviation of the distal phalange at the DIP joint of the right fifth digit.

Figure 6. A patient with psoriatic arthritis. Radial deviation of the distal phalange at the DIP joint of the right third digit.

Figure 7. A plain radiograph of the left third digit of a patient with psoriatic arthritis shows radial deviation of the distal phalange of the DIP joint.

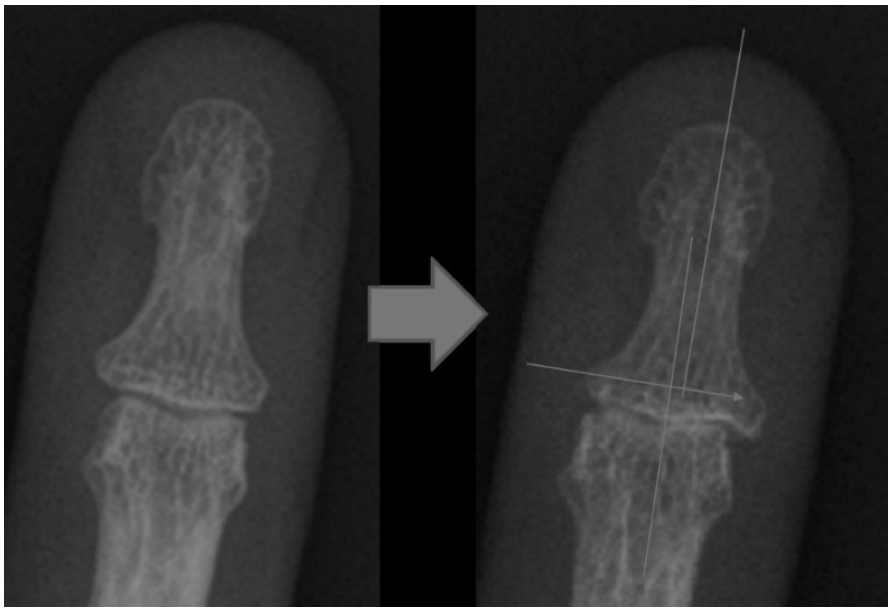

Figure 8. A patient with psoriatic arthritis. Over time, mild ulnar deviation of the DIP joint is seen.

PIP joints

Figure 9. A patient with psoriatic arthritis. Ulnar deviation of both the third PIP joints is seen.

DIP and PIP joints

Figure 10. A radiograph of the left hand of a patient with psoriatic arthritis. Deviation and subluxation of the DIP and the PIP joints are observed. However, the MCP joints and the wrist are relatively preserved.

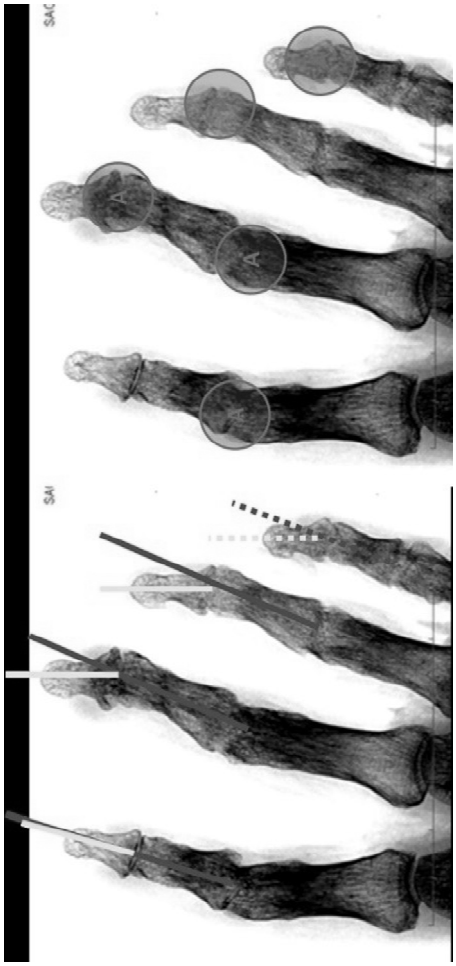

Figure 11. A radiograph of the right fingers of a patient with psoriatic arthritis. Deviation of the DIP and the PIP joints is observed.

Figure 12. A radiograph of the hands of a patient with psoriatic arthritis. Deviation of the DIP, the PIP and the MCP joints is observed. However, both the wrist joints are relatively preserved.

MCP joints

Figure 13. Radiograph of a patient with psoriatic arthritis. The deviation of the MCP joint of the left thumb is observed. The joint structure is partially destroyed and the bone surfaces on both sides of the joint overlap. Subluxation is a displacement of the joint beyond the midline, and this case still holds the midline.

Figure 14. Radiograph of a patient with psoriatic arthritis. Ulnar deviation of the right third MCP joint is observed.

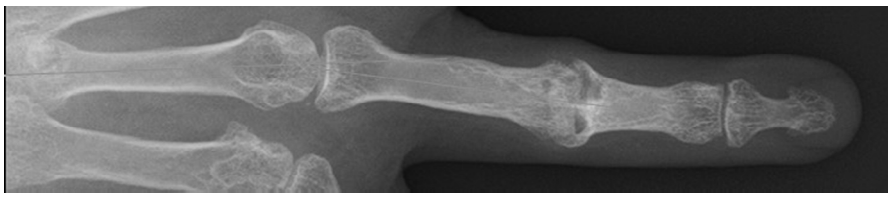

Figure 15. A patient with psoriatic arthritis. The mild ulnar deviation of the right fourth MCP joint is seen.

Figure 16. A patient with psoriatic arthritis. Ulnar deviation of the right fifth MCP joint is observed.

Shoulders

The shoulder joint is composed of the glenohumeral, the acromial humeral, and the acromioclavicular (AC) joint.

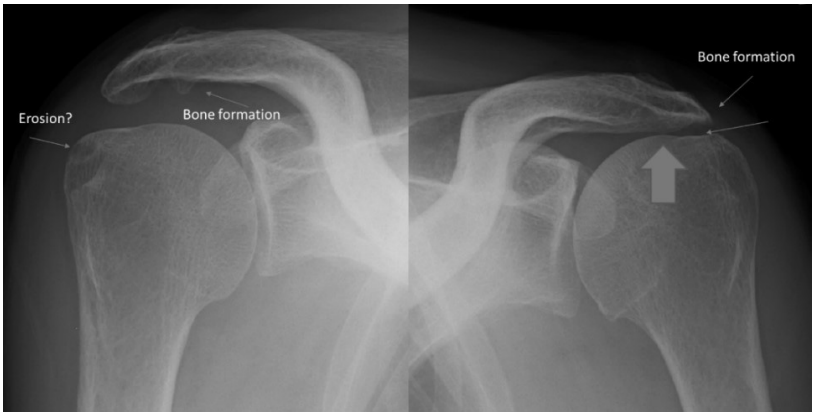

Figure 17. A patient with psoriatic arthritis. AP view of the shoulder. The left humeral head elevates and the narrowing between the humerus and acromion occurs due to the rotator cuff tear of the acromial humeral joint.

Cup-and-pencil deformities, Pencil-in-cup deformities

Classical deformity, which is called the cup-and-pencil or the pencil-in-cup deformity, produces the characteristic finding in psoriatic arthritis. Typically the finding is composed of the protrusion of a blunted osseous surface into a neighboring expanded base of the bone. In the small joints of the hands and the feet, including the DIP, the PIP, the IP, the MCP and the MTP joints, erosions begin on the lateral aspects of the joint and progress to more central areas over time and taper the end of the bone of involved phalanges. Because the heads or distal ends of the phalanges and the metacarpal bones are more resistant than the bases of the bone of corresponding joint, central pointed ends of proximal bones remain. Therefore, the pointed heads of the metacarpals and the phalanges by the destruction with severe bone erosions and resorption may result in protrusion into deep central erosions of the neighboring phalangeal expanded bases [Wassenberg S. 2015] [Zaias N. 1969].

The pencil-in-cup deformity may be bilateral or unilateral and symmetric or asymmetric.

Figure 18. Image of the pencil in a cup, and the "Pencil-in-cup" deformity.

Although this deformity is not specific for psoriatic arthritis and is also seen in other rheumatic diseases including rheumatoid arthritis and scleroderma, it is most commonly observed in psoriatic arthritis.

Hands

DIP joints

Figure 19. A patient with psoriatic arthritis. In the left second DIP joint, the cup-and-pencil (the pencil-in-cup) deformity is seen. The blunted and distorted bone surface of the head of the second middle phalange protrudes into the base of the adjacent enlarged base of the second distal phalange.

Figure 20. A patient with psoriatic arthritis. The pencil-in-cup deformity of the left fourth DIP joint.

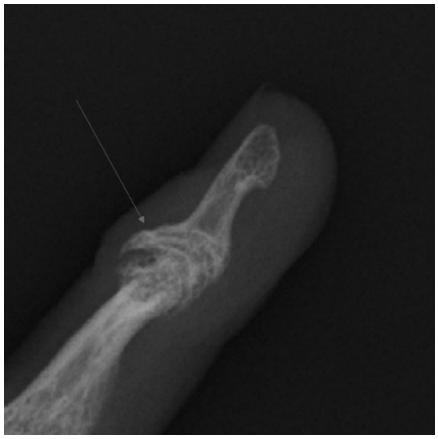

Figure 21. The pencil-in-cup deformity of the left third DIP joint of a patient with psoriatic arthritis.

Figure 22. A conventional radiograph of a patient with psoriatic arthritis shows the pencil-in-cup deformity of the right second DIP joint.

IP joints

Severe erosive deformity and bone proliferation of the thumbs result in the severe pencil-in-cup deformity of the interphalangeal joints.

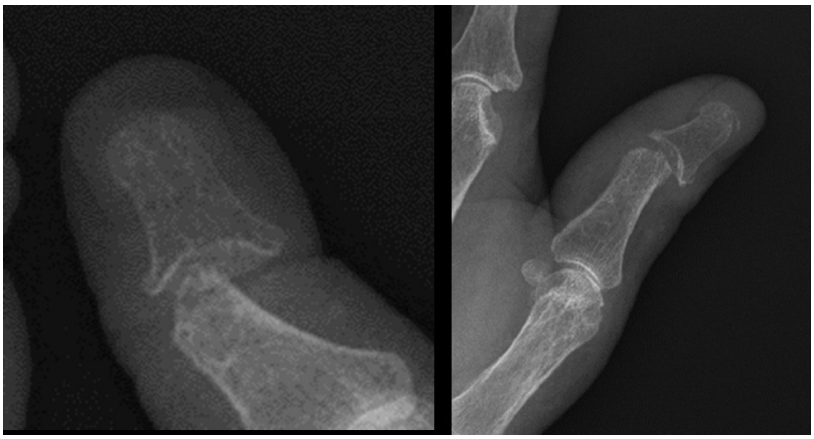

Figure 23. Conventional radiographs of the left thumb of a patient with psoriatic arthritis show the pencil-in-cup deformity of the IP joint.

Figure 24. A conventional radiograph of the right thumb of a patient with psoriatic arthritis shows the pencil-in-cup deformity of the IP joint.

Figure 25. A patient with Psoriatic arthritis. Plain radiograph shows the pencil-in-cup deformity of the IP joint with dislocation.

PIP joints

Figure 26. The pencil-in-cup deformity of the PIP joint of the right fourth digit.

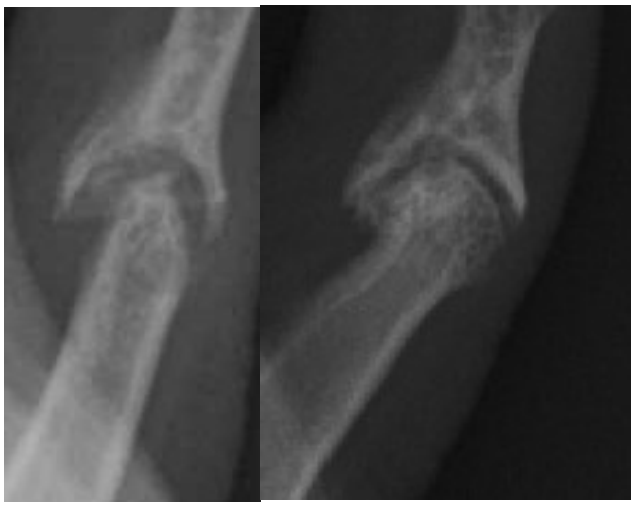

Figure 27. There is the pencil-in-cup deformity of the PIP joint of the right fifth digit.

Figure 28. The pencil-in-cup deformity of the right fifth PIP joint of a patient with psoriatic arthritis.

MCP joints

Figure 29. A conventional radiograph of a patient with psoriatic arthritis shows the pencil-in-cup deformity of the MCP joints of the left second digit.

Figure 30. A patient with psoriatic arthritis. Plain radiograph shows the pencil-in-cup deformity of the right second MCP joint.

Figure 31. A patient with psoriatic arthritis. Plain radiograph shows the pencil-in-cup deformity of the right third MCP joint.

Feet

Figure 32. A patient with psoriatic arthritis. Plain radiograph shows the pencil-in-cup deformity of the MTP joint of the right fifth toe.

Cup-and-saucer deformities

The bones of phalanges create rounded surfaces and may form deformity that resembles the cup-and-saucer appearance.

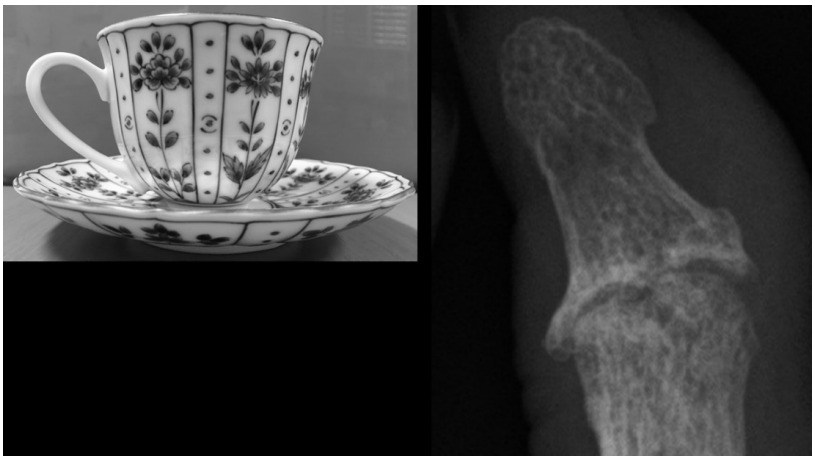

Figure 33. The cup-and-saucer deformity of the IP joint of a patient with psoriatic arthritis.