Complete Summary

GUIDELINE TITLE

Chronic foot pain.

BIBLIOGRAPHIC SOURCE(S)

El-Khoury GY, Bennett DL, Dalinka MK, Daffner RH, DeSmet AA, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Chronic foot pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 7 p. [58 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: American College of Radiology (ACR), Expert Panel on Musculoskeletal Imaging. Chronic foot pain. Reston (VA): American College of Radiology (ACR); 2002. 7 p. (ACR appropriateness criteria).

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- May 23, 2007, Gadolinium-based Contrast Agents: The addition of a boxed warning and new warnings about the risk of nephrogenic systemic fibrosis (NSF) to the full prescribing information for all gadolinium-based contrast agents (GBCAs).

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Chronic foot pain

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Orthopedic Surgery
Podiatry
Radiology
Sports Medicine

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for chronic foot pain

TARGET POPULATION

Patients with chronic foot pain

INTERVENTIONS AND PRACTICES CONSIDERED

1. X-ray
    - Anteroposterior (AP), lateral with or without oblique
    - AP, lateral and oblique and Harris-Beath view
2. Computed tomography (CT)
3. Magnetic resonance imaging (MRI)

4. Nuclear medicine (NUC), bone scan
5. Ultrasound (US)

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of peer-reviewed medical journals, and the major applicable articles were identified and collected.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by this Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Chronic Foot Pain

Variant 1: 20-year-old male suspected to have Reiter's disease. Now complains of heel pain and swollen toes.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP, lateral, and oblique	9	
X-ray, foot, AP and lateral	2	
CT, foot	2	
MRI, foot	2	
NUC, bone scan	2	
US, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Pain and tenderness over navicular tuberosity unresponsive to conservative therapy. Plain radiographs showed accessory navicular.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, foot	9	
NUC, bone scan	3	
CT, foot	2	
US, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Pain and tenderness over head of second metatarsal. Rule out Freiberg's disease.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP, lateral with or without oblique	9	
CT, foot	2	
MRI, foot	2	
NUC, bone scan	2	
US, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Athlete with pain and tenderness over tarsal navicular; plain radiographs are unremarkable.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, foot	9	
CT, foot	6	Especially for follow-up of healing fractures.
NUC, bone scan	2	If MRI cannot be performed.
US, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: To rule out reflex sympathetic dystrophy.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP, lateral and oblique	9	
NUC, bone scan	8	If plain films are not diagnostic.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP and lateral	2	
CT, foot	2	
MRI, foot	2	
US, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Child or adolescent with painful rigid flat foot. Rule out tarsal coalition.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP, lateral and oblique and Harris-Beath view	9	
CT, foot	9	
X-ray, foot, AP and lateral	2	
MRI, foot	2	
NUC, bone scan	2	
US, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Middle aged woman with burning pain and paresthesias along the plantar surface of the foot and toes. Clinically, the patient is suspected of having tarsal tunnel syndrome.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP, lateral, and oblique	9	
MRI, foot	9	
US, foot	8	Can be used in place of MRI, with the proper expertise.
NUC, bone scan	2	
CT, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 8: Patient is complaining of pain in the 3-4 web space with radiation to the toes. Morton's neuroma is clinically suspected.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP and lateral	9	
MRI, foot	9	
US, foot	8	Can be used in place of MRI, with the proper expertise.
CT, foot	2	
NUC, bone scan	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 9: Young athlete presenting with localized pain at the plantar aspect of the heel. Plantar fasciitis is suspected clinically.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, foot, AP and lateral	9	
MRI, foot	9	
US, foot	8	Can be used in place of MRI, with the proper expertise.
NUC, bone scan	2	
CT, foot	2	
Appropriateness Criteria Scale **1 2 3 4 5 6 7 8 9** **1 = Least appropriate 9 = Most appropriate**		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Many conditions can affect the foot and cause chronic foot pain. Some of these conditions and techniques to image them are:

Tarsal Coalition

Tarsal coalition is a congenital abnormality resulting from fibrous, cartilaginous, or osseous union of two or more tarsal bones. Calcaneonavicular and middle-facet talocalcaneal coalitions are the most common. In about half the patients the coalition is bilateral. Calcaneonavicular coalition is easily detected on oblique radiographs of the foot and confirmed by computed tomography (CT). Talocalcaneal (subtalar) coalition is often associated with severe valgus deformity of the hind foot, rigid painful flat foot, and restricted subtalar motion. It is frequently overlooked on standard foot radiographs because of overlapping structures; however, secondary signs on the lateral view could be suggestive of a subtalar coalition. These signs include talar beaking, flattening and broadening of the lateral talar process, positive C-sign, and narrowing of the posterior talocalcaneal joint. A well-penetrated axial view (Harris-Beath view) can demonstrate the posterior and middle subtalar joints.

Computed tomography of the subtalar joint is usually diagnostic. Magnetic resonance imaging (MRI) has been shown to be effective in depicting all types of coalition. Inversion-recovery magnetic resonance (MR) images may reveal bone marrow edema along the margins of the abnormal articulation, which is an important clue to the diagnosis.

Reflex Sympathetic Dystrophy (RSD) Syndrome

Reflex sympathetic dystrophy (RSD) also called complex regional pain syndrome type I (CRPS I), is characterized clinically by pain, tenderness, swelling, diminished motor function, and vasomotor instability. Conditions associated with

RSD of the foot include fractures and other trauma, central nervous system (CNS) and spinal disorders, and peripheral nerve injury. RSD has also been described in children; the patients are predominantly girls. Early diagnosis favorably affects outcome. Diffuse osteopenia of the involved part is seen in 69% of patients with RSD. The osteopenia patterns are not pathognomonic and can be seen as a result of disuse. Three-phase radionuclide scans have been used to diagnose RSD. One study reported characteristic delayed bone scan pattern consisting of diffuse increased tracer throughout the foot, with juxta-articular accentuation of tracer uptake. Overall sensitivity in this study was 100%, specificity 80%, positive predictive value 54%, and negative predictive value 100%. There are no specific findings on MRI in patients with RSD. Using power Doppler sonography, patients with RSD of the lower extremity have increased power Doppler flow compared with asymptomatic control subjects.

Stress Fractures

(See also ACR's "Stress/Insufficiency Fractures [Excluding Vertebral"]). Stress injuries can be categorized into three types: stress reactions, fatigue fractures, and insufficiency fractures. A stress reaction occurs when microfractures are healing and a complete fracture has not yet developed. Activities producing fatigue fractures in the feet include running, marching, and dancing. The second and third metatarsals as well as the calcaneus are the most common sites for stress fractures and stress reactions. Stress fractures have also been described, less frequently, in the tarsal navicular, first metatarsal, and medial sesamoid bones of the great toe. In the early phase, plain radiography may be entirely normal, but with time a fracture line can be identified and only one cortex may be involved; a hint of periosteal reaction with some endosteal new bone may develop. It may take 3 to 4 weeks for changes to occur in the metaphyseal area of bone and 4 to 6 weeks for them to occur in the diaphysis. During the healing phase, both periosteal and endosteal new bone are incorporated in the cortex, resulting in a fusiform expansion of the cortex. Occasionally more than one stress fracture is present in the same foot. Most of the navicular fractures are oriented in the sagittal plane and occur in the central third of the bone. Some are partial fractures involving only the dorsal portion of the navicular. Participation in strenuous exercise is not essential for such fractures to develop.

Initially plain radiographs can be negative, and the panel believes that the best next test is MRI.

Avascular Necrosis of the Metatarsal Head (Freiberg's Disease)

This disease is characterized by pain, tenderness, swelling, and limitation of motion in the affected metatarsophalangeal (MP) joint. The disease is usually detected in adolescents, and adolescent girls predominate about three or four to one. Radiographic changes are characteristic, and they show increased density of the metatarsal head, and flattening, collapse, cystic changes, and widening of the MP joint. The second metatarsal is most commonly affected, although the third and fourth can also be occasionally involved.

Painful Accessory Bones

Potentially painful normal variants such as accessory navicular and os trigonum have been described.

The mechanism of pain in the presence of an accessory navicular has been attributed to traumatic or degenerative changes at the synchondrosis or to soft-tissue inflammation. Symptomatic accessory navicular bones have been studied with radionuclide bone scans and MRI. Symptomatic lesions are reported to show increased radiotracer uptake or marrow edema across the synchondrosis.

For a painful os trigonum, selective arthrography of the synchondrosis followed by local anesthetic injection localizes the source of pain.

Neoplasm

Neoplasm is another cause of chronic foot pain, and (diagnostically) these lesions in the foot can be approached like other neoplasms in the musculoskeletal system (see ACR's "Soft Tissue Masses and Bone Tumors").

Arthritis

All the common forms of arthritis affect the feet and can cause chronic foot pain. Most of the arthritides are best evaluated with plain radiography. Charcot changes are still best detected and followed by plain radiography also. There is now evidence that gadolinium-enhanced MRI can be helpful in detecting early rheumatoid arthritis.

Chronic heel pain can be caused by calcaneal stress fractures, tarsal tunnel syndrome, and plantar fasciitis. When the heel pain is bilateral, the seronegative arthritides warrant consideration.

Plantar Fasciitis

Plantar fasciitis is the most common cause of plantar heel pain. It may occur in isolation or as a manifestation of a systemic disease such as the seronegative spondyloarthropathies, rheumatoid arthritis, gout, or systemic lupus erythematosus (SLE). In athletes, plantar fasciitis is a common cause of foot pain and it is attributed to mechanical stresses, presumably due to repetitive trauma causing microtearing of the plantar fascia at its origin as well as fascial and perifascial inflammation. Plantar fasciitis is also common in obese patients and in patients with flat feet. Typically plain radiography is not productive, but bone scintigraphy and MRI have been shown to be helpful in arriving at a diagnosis. Ultrasonography has been shown by one study to be effective in differentiating normal plantar fascia from those involved with plantar fasciitis.

Tarsal Tunnel Syndrome

This syndrome is a compressive neuropathy of the posterior tibial nerve or one of its branches. Patients typically complain of poorly localized burning pain and paresthesias along the plantar surface of the foot and toes. Inflammatory processes or mass lesions in the tarsal tunnel are described as the cause for this

syndrome in most of patients with this syndrome. Such lesions are best imaged by MRI.

Interdigital (Morton's) Neuroma

This is a nonneoplastic perineural fibrous proliferation involving a plantar digital nerve. Clinical symptoms include pain in the involved web space that often radiates to the toes. Morton's neuroma is frequently asymptomatic. These neuromas are seen more often in women and typically involve the three-four or less commonly the two-three intermetatarsal space. They are best detected on MRI using T1-weighted or T1-weighted, fat-suppressed images with gadolinium enhancement and T2-weighted images. The diagnosis of Morton's neuroma at MRI becomes relevant only when transverse diameter of the lesion is 5 mm or more and can be correlated with the clinical findings. High-resolution ultrasound has been used successfully to diagnose Morton's neuromas.

Tendinopathies

Tendinopathies, ranging from tendinosis to complete tear, in and around the foot can result in significant foot pain and disabilities. The most commonly affected tendons are the Achilles tendon, posterior tibial tendon, and peroneal tendons. Tendon dysfunction is best imaged with MRI and ultrasound.

Hallux Valgus

Hallux valgus is a common foot disorder resulting in significant morbidity. Preoperative radiographic evaluation and measurements as well as postoperative follow-up are best evaluated on the weight-bearing posteroanterior (PA) and lateral radiographs of the feet.

Abbreviations

- AP, anteroposterior
- CT, computed tomography
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- US, ultrasound

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Selection of appropriate radiologic imaging procedures for evaluation of patients with chronic foot pain

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

El-Khoury GY, Bennett DL, Dalinka MK, Daffner RH, DeSmet AA, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Chronic foot pain. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 7 p. [58 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1998 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Musculoskeletal Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: George Y. El-Khoury, MD (*Principal Author*); D. Lee Bennett, MD (*Research Author*); Murray K. Dalinka, MD (*Panel Chair*); Richard H. Daffner, MD; Arthur A. De Smet, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; William B. Morrison, MD; Helene Pavlov, MD; David A. Rubin, MD; Robert Schneider, MD; Lynne S. Steinbach, MD; Barbara N. Weissman, MD; Robert H. Haralson III, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

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GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® *Anytime*, *Anywhere*™ (PDA application). Available from the ACR Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This summary was updated by ECRI on May 22, 2003. The information was verified by the guideline developer on June 23, 2003. This NGC summary was updated by ECRI on January 5, 2006. The updated information was verified by the guideline developer on January 19, 2006. This summary was updated by ECRI Institute on May 17, 2007 following the U.S. Food and Drug Administration (FDA) advisory on Gadolinium-based contrast agents. This summary was updated by ECRI Institute on June 20, 2007 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents.

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