

IMAGING EVALUATION OF SUSPECTED ANKLE FRACTURES

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Summary of Literature Review

The committee has reviewed pertinent articles dealing with more than 21,000 adult patients with ankle injuries. Some of the reviewed papers were written by authors from the United States and dealt with various issues, including the impact of the clinical history on performance (2,3), missed fractures (11), the role of the physical examination (1), and overutilization and cost containment (1,4,8,13). The driving force behind most of the studies from Great Britain and Canada relate to the establishment of clinical criteria that would decrease the number of ankle radiographs without missing significant injuries (5-7,9,10,12,14-18,20).

In one large series, radiographs were obtained in 89% of all patients who presented to the emergency room with a history of extremity trauma; only 17% of these cases had abnormalities that altered treatment (4). Ankle x-rays account for approximately 10% of all x-rays ordered in the emergency room (11); they are the third most common study ordered and are exceeded in frequency only by chest and cervical spine films (11). Stielt and colleagues reported that more than 92% of patients with ankle trauma in the ER setting had radiographs ordered (16). In a retrospective review of more than 600 patients, Vargish et al (20) found that less than 25% had adequate physical examinations and more than 99% had radiographs. In another study, all patients in whom radiographs were ordered were subjected to a physical examination by the radiology resident; there were no significant differences in the percentages of indicated studies ordered by triage personnel and residents in the emergency room (1). The percentage of significant injuries detected on the radiographs was equivalent for the two groups (1). It is therefore not surprising that nurse practitioners, nurses, and medical students had similar percentages of abnormal x-rays because radiographs were ordered by almost everyone seen with ankle trauma.

Gleadhill et al (10) concluded that it was possible to establish guidelines that would increase the quality and efficiency of service and influence the diagnostic skills and referral habits of physicians ordering ankle radiographs in the emergency room. De Lacey et al (7) have utilized a simple guideline “no swelling adjacent to a malleolus, no radiographs.” Dunlop et al (9) in a prospective study of 500 patients with inversion injuries of the ankle, concluded that radiographs should be performed only for patients with distal fibula tenderness, inability to bear weight, or aged over 60 years. In their case, material swelling was absent in 11% of malleolar fractures and in two of four calcaneal fractures (19). Sujitkumar et al (20) analyzed 2000 ankle injuries and concluded that swelling alone was an unreliable indicator of injury and that patients with minimal pain and swelling who were able to bear weight did not require radiographs. Stielt et al (14-18), in a number of well designed, elaborate papers, have concluded that focal tenderness over the malleolus and the inability to bear weight will detect virtually 100% of patients with significant ankle fractures. They evaluated 1,032 patients prospectively and validated their criteria on 453 new patients (17). They believed that if this rule were used, significant fractures could be detected with a sensitivity of 1 and a confidence level of 95% (17). A 30% reduction of foot and ankle radiographs could be obtained without missing any significant injuries (17). When these rules were implemented there was a decrease in the number of ankle films ordered which decreased patient waiting times and costs without patient dissatisfaction or missed fractures (18). This study was confirmed at an independent site by Pigman et al who reported a 19% reduction in ankle and midfoot radiographs (13).

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An 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 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.

In the clinical setting, x-rays of the foot and ankle are often obtained together even though the pain can almost always be localized to one area or another. Cockshot et al (6) stated that ordering both reflects an inadequate clinical examination; on the rare occasions when fifth-metatarsal fractures occur in association with inversion injuries of the ankle, they can be detected clinically. In the presence of an inversion injury of the ankle, foot radiographs have no role in management (9). It is widely accepted that an adequate radiograph of the ankle should include the base of the fifth metatarsal bone distal to the tuberosity.

The committee believed that the guidelines established by Stiehl et al (14-18) and confirmed by Pigman and colleagues should be adopted in the evaluation of patients with ankle trauma. Ankle films should be obtained in patients with the following clinical findings: (1) inability to bear weight immediately after the injury, (2) point tenderness over the medial malleolus, or the posterior edge or inferior tip of the lateral malleolus or talus or calcaneus, (3) inability to ambulate for four steps in the emergency room. It has been convincingly demonstrated that one can approach a sensitivity of 100% in excluding significant ankle fractures using these simple criteria (13-18). Limiting ankle radiographs to patients who meet these criteria can eliminate a considerable number of ankle and mid-foot radiographs (estimated range 19%-36%) without missing significant injuries (13). This would result in a considerable savings in patient cost and waiting time.

An evaluation of the traumatized ankle should consist of anteroposterior (AP), lateral, and mortise views of the ankle. Additional views can be added to the minimal series in questionable cases. The fifth metatarsal base distal to the tuberosity should be seen on at least one projection. The use of a pertinent clinical history for the site of point tenderness will decrease the misrate for subtle fractures by approximately 50% (3,12).

Anticipated Exceptions

None.

Review Information

This guideline was originally developed in 1995. A complete review and revision of this document was approved in 1999. All Appropriateness Criteria™ topics are reviewed annually and updated as appropriate.

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Clinical Condition: Suspected Ankle Injury in Patient Meeting Ottawa Rules

Radiologic Exam Procedure	Appropriateness Rating	Comments
AP x-ray	9	
Lateral x-ray	9	
Mortise view-x-ray	9	
Appropriateness Criteria Scale		
1 2 3 4 5 6 7 8 9		
1=Least appropriate		9=Most appropriate

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