

American College of Radiology ACR Appropriateness Criteria®

Clinical Condition: Suspected Ankle Fracture

Variant 1: Patient Meeting Ottawa Rules.

1. Inability to bear weight immediately after the injury OR
2. Point tenderness over the medial malleolus, or the posterior edge or inferior tip of the lateral malleolus or talus or calcaneus OR
3. Inability to ambulate for four steps in the emergency room.

Radiologic Procedure	Rating	Comments	RRL*
X-ray ankle AP lateral and mortise views	9		Min
<u>Rating Scale:</u> 1=Least appropriate, 9=Most appropriate			*Relative Radiation Level

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SUSPECTED ANKLE FRACTURE

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Summary of Literature Review

The musculoskeletal expert panel 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 deal with various issues, including the impact of the clinical history on performance [1,2], missed fractures [3], the role of the physical examination [4], and overutilization and cost containment [4-7]. 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 [8-18].

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 [5]. Ankle radiographs account for approximately 10% of all radiographs ordered in the emergency room [3]; they are the third most common study ordered and are exceeded in frequency only by chest and cervical spine films [3]. Stiell and colleagues reported that more than 92% of patients with ankle trauma in the ER setting had radiographs ordered [15]. In a retrospective review of more than 600 patients, Vargish et al [19] found that less than 25% had adequate physical examinations, and more than 99% had radiographs. In another study, all patients for 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 [4]. The percentage of significant injuries detected on the radiographs was equivalent for the

two groups [4]. 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 [7] concluded that it is 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 [11] have utilized a simple guideline “no swelling adjacent to a malleolus, no radiographs.” Dunlop et al [3] 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 or inability to bear weight, or who are older than age 60. In their case, material swelling was absent in 11% of malleolar fractures and in two of four calcaneal fractures [19]. Sujitkumar et al [18] analyzed 2,000 ankle injuries and concluded that swelling alone is an unreliable indicator of injury and that patients with minimal pain and swelling who are able to bear weight do not require radiographs.

Stiell et al [13-17], 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 [16]. They believed that if this rule were used, significant fractures could be detected with a sensitivity of 1 (100%) and a confidence level of 95% [16]. Foot and ankle radiographs could be reduced 30% without missing any significant injuries [16]. 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 [17]. This study was confirmed at an independent site by Pigman and colleagues, who reported a 19% reduction in ankle and midfoot radiographs [9].

In the clinical setting, radiographs of the foot and ankle are often obtained together even though the pain can almost always be localized to one area or another. Cockshott et al [10] 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 [10,20]. It is widely accepted that an adequate radiograph of the ankle should include the base of the fifth metatarsal bone distal to the tuberosity.

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The committee believed that the guidelines established by Stiell et al [13-17] and confirmed by Pigman and colleagues should be adopted in the evaluation of patients with ankle trauma. These guidelines for obtaining ankle radiographs in patients with the following clinical findings: 1) inability to bear weight immediately after the injury, or 2) point tenderness over the medial malleolus, or the posterior edge or inferior tip of the lateral malleolus or talus or calcaneus, or 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 [7,13-17]. Limiting ankle radiographs to patients who meet these criteria can eliminate a considerable number of ankle and midfoot radiographs (estimated range 19%-36%) without missing significant injuries [7]. This would result in a considerable savings in patient cost and waiting time.

The validation and cost effectiveness of these rules has since been confirmed in multiple subsequent series [21-24].

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 miss rate for subtle fractures by approximately 50% [2,12].

Geusens et al [25] utilized a reverse oblique view of the ankle in addition to the three standard views and found that 10 of 29 fractures were seen only on the reverse oblique view; seven of the ten were avulsion fractures of the anterolateral aspect of the calcaneus. These figures should be confirmed by others, as this is a high percentage of missed fractures and a very high percentage of avulsion fractures of the calcaneus.

Clark et al [26,27] have shown that occult fractures of the ankle may present with an ankle effusion in the absence of a visible fracture. They found that approximately one third of patients with effusions in the absence of a visible fracture will have a fracture on computed tomography (CT) of the ankle. Haapamaki et al [28] used multidetector CT (MDCT) of the ankle in multitrauma patients and compared the MDCT findings with the radiographs. When compared to MDCT, radiographs were 87% sensitive in the detection of calcaneal fractures, 78% sensitive in talar fractures and 25%-33% sensitive in midfoot fractures. Only 5 of 21 Lisfranc fracture dislocations were detected on radiographs. They recommended MDCT for patients with high energy

polytrauma and in those with complex foot and ankle fractures.

Remplik et al [29] compared low field (0.2 Tesla) magnetic resonance imaging and conventional radiography and found no statistical difference in the detection of acute fractures of the distal extremities.

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