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Diagnosis and Treatment Of Ankle Fractures

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Diagnosis and Treatment Of Ankle Fractures

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Ankle fractures are common among all populations, although incidence increases in the elderly. They are most often the result of simple falls and athletic injuries but also may be caused by underlying pathology. A thorough patient evaluation with description of the mechanism of injury is key to proper diagnosis.

This article examines the use of radiography and other imaging modalities in diagnosing ankle injuries, as well as several classification systems to describe the pattern of injury and aid in treatment planning. Treatment, rehabilitation techniques and possible complications of ankle fractures also are discussed.

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After reading this article, readers should be able to:

- Review ankle joint anatomy and the role of ligament structures in providing stability.
- Describe the role of imaging in patient diagnosis, treatment planning and follow-up.
- Discuss classification systems for ankle injury patterns.
- Determine when surgical reduction and internal fixation of ankle fractures is required and complications that may result from surgery.
- Describe rehabilitation techniques and functional recovery prognosis.

Injuries to the ankle are common in the general population and in athletes.[1,2] It is estimated that 260 000 Americans sustain an ankle fracture each year and that ankle fractures occur in about 100 per 100 000 people in major cities.[3,4] They constitute 21% of all sports-related injuries.[1] One study reported that the incidence of ankle fractures has increased in recent decades, especially among the elderly.[5]

Ankle fractures often are complicated by associated ligamentous injuries that must be repaired to ensure joint stability.[6] The most common cause of ankle injury is excessive inversion stress.[7] Fractures also may result from abnormal stress applied to the joint or when the strength of the bones is insufficient to support normal stress.[8] Two classification systems, the Lauge-Hansen and the Danis-Weber, or Weber, are used widely to aid in the diagnosis and treatment of ankle fractures resulting from an acute injury. Several other fracture types do not fit into these classification schemes, including stress fractures and pathologic fractures. Diagnostic imaging techniques used to evaluate these injuries may include conventional radiography, magnetic resonance (MR) imaging, computed tomography (CT), radionuclide bone scanning and ultrasonography.

Stable fractures are effectively treated with casts and removable braces.[9] Unstable fractures must be reduced promptly and accurately to optimize healing and minimize the length of hospital stay.[4] When surgery is required, a wide variety of fixation devices and surgical techniques are used for open reduction and internal fixation of the ankle.[6] Following surgery, these fractures also are treated with a period of immobilization, then rehabilitation to attempt functional recovery of the joint.[2,10] Patient age, severity of injury, quality of treatment and use of rehabilitation interventions are parameters used to predict the outcome of ankle fractures.[2,5]

Epidemiology

Ankle fractures are common to all groups of the population. Most ankle fractures are inversion injuries caused by sports activities or simple falls.[11] Several studies have shown that the incidence of ankle fractures has continued to rise, especially in postmenopausal women. The peak age range for men to suffer ankle fractures is 15 to 24 years, whereas the peak age range for women is 65 to 75 years.[11] The injuries also occur frequently in the pediatric population. According to Davis, fractures of the ankle make up 5% of all pediatric fractures and 15% of physeal injuries with a peak incidence between 8 and 15 years.[12] Sports that reportedly lead to unstable ankle fractures include football, baseball, cheerleading, softball, wrestling, basketball, gymnastics, motocross, rock climbing, rodeo, rugby, soccer and volleyball.[1,13]

Risk factors for ankle fracture include obesity, diabetes, osteoporosis, prior injury and the level and type of physical activity.[14-16] Falls are more common in the elderly, but one study reported that a higher rate of falls did not correlate with an increased rate of ankle fractures.[17] Obesity is a risk factor for ankle fractures in children and adults and also is a predictor of poorer outcome following ankle fractures in adults.[15] Type 2 diabetes has been associated with increased rates of foot and ankle fractures and corresponds to a higher fracture severity.[3,14] Osteoporosis also is a risk factor for ankle fracture and subsequent refracture. Known risk factors for osteoporosis include female sex, older age, lower body mass index and a family history of the disease.[14]

The risk of refracture also is significant for elderly patients. Center et al found that refracture risk of low-trauma ankle fracture in men and women was equal to the initial fracture risk of a man 20 years older or a woman 10 years older. For example, a woman who is aged 60 to 69 years has the same refracture risk as a woman aged 70 to 79 years has of initial fracture.[16] Refractures reported in this study were most likely to occur in the first 2 years following the first fracture. The authors reported that incidental low-trauma fractures are a sign that subsequent osteoporotic fractures are likely and that these patients should receive preventive therapy.[16]

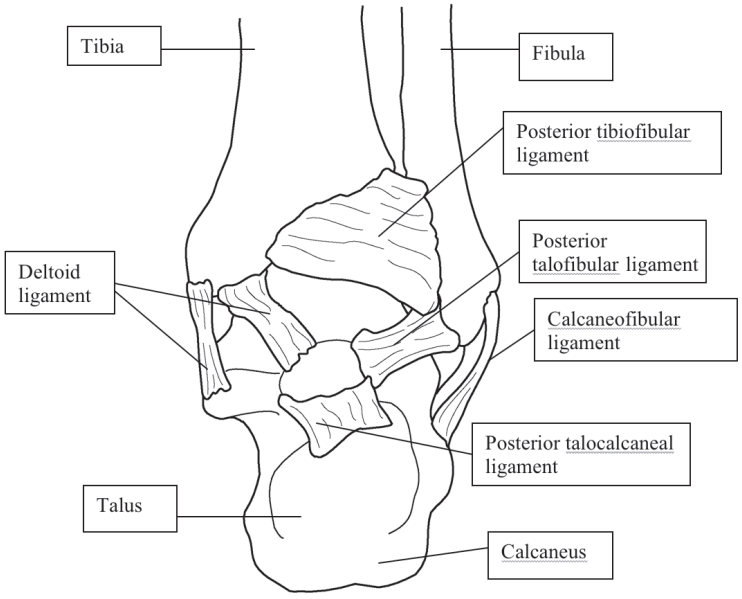

Figure 1. *Posterior aspect of right ankle joint depicting bony and ligamentous anatomy.*

Ankle Anatomy and Biomechanics

The ankle comprises 3 bones: the distal tibia, distal fibula and talus. It also includes the joint capsule and supporting ligaments (see **Figure 1**).[1,18,19] The tibia and fibula are long bones, whereas the talus is short and squarish in shape. Long bones have a shaft called the diaphysis, which is located between 2 larger ends called the epiphyses. The metaphysis connects the diaphysis and epiphyses. The diaphysis is made up of compact bone that surrounds a medullary cavity containing marrow. The epiphysis consists of spongy bone covered by compact bone. Hyaline cartilage covers the end of each epiphysis.[20]

Longitudinal growth occurs between the epiphysis and the metaphysis at the epiphyseal cartilage (growth plate). The growth is stimulated by growth and sex hormones. The plate ossifies and becomes the epiphyseal line when longitudinal growth ceases. The density and thickness of bone may change at any time because of hormonal influence, such as growth hormone, parathyroid hormone or cortisol. Changes in osteoblastic (bone producing) and osteoclastic (bone resorbing) activity also affect bone density (the amount of calcium and other minerals present in the bone).[20] Accessory ossification centers may be mistaken for