Are Isolated, Non-Displaced Medial Malleolus Fractures Always Benign in Patients with Diabetes?

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Abstract: Isolated, non-displaced fractures of the medial malleolus in diabetic patients are generally treated non-operatively. The authors present a case report involving an isolated non-displaced medial malleolus fracture in a diabetic patient, the sequelae into acute Charcot arthropathy, and treatment recommendations.

Key words: Diabetes, medial malleolus fracture, acute Charcot arthropathy, deltoid ligament complex.

Case report

A 57 year old female presented to the emergency department in November 2005 complaining of pain to the left ankle. She had sustained an isolated, non-displaced medial malleolus fracture after twisting her ankle while walking down a flight of three stairs. She was examined and treated by an orthopaedic resident and splinted. (Fig. 1) Post-splinting radiographs revealed excellent anatomic alignment. (Fig. 2) She was dispensed a walker, instructed to be non-weight bearing, and to follow up in our office the following week.

When she first presented to our office, the splint was removed and the ankle was grossly unstable. She also presented with a medial malleolar ulceration with surrounding erythema. Radiographs demonstrated an unstable fracture dislocation of the ankle with significant displacement of the medial malleolus fracture fragment (Fig. 3). Her skin temperature was elevated about her ankle, and she had severe non-pitting edema. Her dorsalis pedis pulse was palpable, but the posterior tibial pulse was not, secondary to edema. Subjectively, she had no complaints of pain or tenderness about her ankle or foot. She was tested via Semmes-Weinstein monofilament, revealing a complete absence of protective sensation and fine point discrimination. Based on her history and presentation, she was diagnosed with acute Charcot arthropathy (ACA) and acute cellulitis.

Introduction

Isolated non-displaced medial malleolus ankle fractures are routinely treated non-operatively. Patients with diabetic neuropathy are at risk for the development of, non-union, mal-union, infection, and Charcot arthropathy. 1,14

The purpose of this case report is to present an isolated non-displaced medial malleolus fracture that progressed to significantly dislocated, unstable, trimalleolar ankle fracture with acute Charcot arthropathy (ACA) over short period of time.

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Figure 1 Patient with diabetes presents to the emergency department with isolated, non-displaced medial malleolus fracture.

Figure 2 Post-splinting radiographs reveal the ankle mortise is reduced anatomically.

Figure 3 Radiographs on first visit to our office, approximately one week after discharge from emergency department, demonstrating an unstable ankle.

Her past medical history included: insulin dependent diabetes mellitus with severe neuropathy, hyperlipidemia, coronary artery disease with bypass grafting, cerebral vascular accidents, metastatic melanoma, and osteoporosis. Her medications included: Humulin™, Tramadol™, Clonazepam™, Lipitor™, Neurontin™, Plavix™, and Citaloprolam™. She denied tobacco use or alcohol consumption. She had a fairly active lifestyle prior to her injury, and lived at home with family members.

She was admitted to the hospital and intravenous antibiotic treatment was initiated. The next day, we performed irrigation and debridement of the medial ulcer, a percutaneous Achilles tendon lengthening, closed reduction of the displaced medial fracture fragment, and applied a multiplane external fixator. To increase stability, a Steinmann pin was placed across the ankle joint. (Fig. 4) During the post-operative course, an external bone stimulator was used to promote osseous healing. The patient was instructed to remain non-weight bearing on the affected lower extremity for the next three months. During that time she was followed closely and radiographs were obtained. Her cellulitis and ankle ulceration resolved without incidence.

Her external fixator was removed after twelve weeks and a total contact cast was applied. At that time, radiographs revealed disuse osteopenia, fracture healing and good alignment. At two years follow up, she had a clinically stable ankle joint and a propulsive, plantigrade foot. (Figs. 5 and 6)
Discussion

Isolated non-displaced fractures of the medial malleolus are generally considered stable with an anatomic mortise on radiographs.\textsuperscript{10} Although there have been studies suggesting successful outcomes with non-operative treatment\textsuperscript{1,10}, there remains an uncertainty associated with the soft-tissue injury that may lead to a late-subluxation of the ankle.\textsuperscript{6} A recent study found that isolated non-displaced medial malleolus fractures when treated non-operatively had high rates of union and functionality at three years of follow-up.\textsuperscript{10} However, the study did not specifically discuss its patient population’s medical history, and whether this may play a role in outcomes. We believe in our case that the patient’s history of diabetes with neuropathy led to her complicated treatment course.

According to Wukich and Kline\textsuperscript{14}, isolated stable non-displaced fractures of the medial malleolus are generally treated successfully with non-operative treatment, however frequent follow-up and examination are mandatory for a successful outcome in diabetic patients. It has been often reported in the literature of the higher rates of complications for ankle fractures for patients with diabetes.\textsuperscript{4,11,12} These complication rates are even more impressive in patients who also have peripheral vascular disease, neuropathy, and poor compliance with their diabetes treatment regimen.\textsuperscript{8,14}

The medial malleolus and deltoid ligament complex have been shown to be important in maintaining stability in the ankle.\textsuperscript{5,10} Significant changes in ankle contact characteristics due to soft-tissue injury may occur prior to radiographic evidence for significant damage.\textsuperscript{5} Injury to the deltoid ligament complex can lead to ankle instability, resulting in complications such as non-union, mal-union, arthritis, and ankle dislocation.\textsuperscript{5} However, a key criterion to direct appropriate treatment to the area is the physical finding of pain. In patients with diabetic sensory neuropathy, the absence of pain may allow subtle ankle instability to go undetected.

Figure 4 Post-operative radiograph reveals her ankle is reduced into anatomic position.

Figure 5A and B Patient at two-year follow-up reveals a stable and anatomic ankle joint.
The Journal of Diabetic Foot Complications

In our case, the patient’s treatment course was compromised by the development of acute Charcot arthropathy, ulceration, and cellulitis. Although immobilized and instructed to remain non-weight bearing during her initial visit, the patient had rapidly developed acute Charcot arthropathy within three weeks of her reported injury. The rapid progression of the joint destruction, even with immediate immobilization and non-weight bearing status, is not uncommon for diabetic patients with neuropathy.\(^\text{15}\)

The initial presentation of Charcot arthropathy of the foot and ankle is commonly described as painless, warm, edematous and erythematous.\(^\text{15}\)

Shibata, et al.,\(^\text{13}\) described a prodromal, inflammatory stage (“Stage 0 Charcot”) where distinct radiographic changes are absent, but the patient presents with localized increased skin temperature and erythema as the primary symptoms. If left unrecognized and untreated, Charcot arthropathy can progress to a destructive stage (“Stage 1 Charcot”) as evidenced by radiographic changes of bone and joint architecture\(^\text{7}\). The resolution of the Charcot process eventually leads to decreasing warmth, redness, and swelling, and radiographic coalescence of fracture fragments (“Stage 2 Charcot”). The last phase (“Stage 3 Charcot”) is characterized as the remodeling and consolidation of fracture fragments leading to osseous deformity. This chronic phase of Charcot arthropathy is without the warmth, redness, and edema as in previously stages, but the final consolidation can result in either a stable or unstable deformity.\(^\text{15}\) Ideally, Charcot arthropathy should be diagnosed and treated as early as possible to avoid these devastating consequences.

Our patient with diabetic sensory neuropathy presented with an acute non-displaced fracture initially to the emergency department. According to recent literature\(^\text{15}\), this can be characterized as Stage 0 Charcot, the prodromal presentation of Charcot arthropathy. Although she was treated appropriately, the significance of her diagnosis may have not been fully understood by the patient. The lack of sensory awareness and pain feedback removes a vital barrier of protection, and may have even masked the severity of her injury as evidenced by radiograph. It is well supported in the literature that neuropathy in patients with diabetes is the primary risk factor for developing ulcerations.\(^\text{2, 9}\)

Patients with diabetes have an increased rate of complications associated with ankle fractures whether treated non-operatively or operatively.\(^\text{14}\) Although an isolated non-displaced medial malleolus fracture is typically benign in clinical behavior, clinicians treating diabetic patients with neuropathy may need to take extra precaution in these seemingly minor injuries.
As outlined by Wukich and Kline\textsuperscript{14}, clinicians dealing with patients with diabetes should adjust their standard protocol for treatment of ankle fractures. This includes prolonging their period of non-weight bearing, followed by a prolonged period of protected weight bearing. The amount of follow-up should also be “doubled” for all diabetic ankle fractures because vigilance is needed in preventing complications.

References