



Factors affecting pain in acute ankle fractures: A prospective evaluation



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ARTICLE INFO

Article history:
Accepted 2 May 2015

Keywords:
Ankle fracture
Lower extremity
Pain
Ethnicity

ABSTRACT

Pain has been identified as the dominant factor in patient outcomes. The purpose of this study was to evaluate the degree of pain reported in a large series of acute ankle fractures and to determine what factors are associated with higher pain scores.

We prospectively evaluated 457 consecutive patients with acute Weber B supination external rotation ankle fractures upon presentation for pain in 9 areas of the ankle. There were 231 females and 226 males, average age 46.2 (18–96) with 133 bi/tri-malleolar and 324 lateral malleolar fractures. There were 101 SE2, 73 stress (+) SE4, and 150 ligamentous SE4 injuries. The highest pain score (VAS 0–10) for the medial and lateral regions was chosen for analysis. Other factors included in the multivariate analysis were: age, ethnicity, DM, alcohol presence, and days from injury to presentation on the level of pain reported using a linear regression model and set statistical significance at 0.05.

In univariate analysis, the type of injury (medial malleolus or deltoid ligament) nor instability differed with respect to medial pain. However, patients presenting with instability had more lateral pain (5.6 ± 3) than those with stable injuries (2.6 ± 3) ($p < 0.001$). Additionally, those with bony medial injury had more lateral pain (7 ± 2.7) than those with isolated lateral malleolar fractures (4.0 ± 3.4) ($p < 0.001$).

Most importantly, in the multivariate analysis, the only factor that was significant for both medial and lateral pain (separate regressions) was ethnicity, with blacks having more pain given the same injury than whites ($p < 0.001$). Latinos trended towards having more lateral pain than whites ($p = 0.15$), but not more medial pain ($p = 0.3$). For lateral pain, in addition to ethnicity, presence of a displaced mortise ($p < 0.0001$), having a medial bony injury ($p < 0.0001$), and the days from injury ($p = 0.008$) were significant. Pain decreased with time from injury.

In this evaluation of over 450 patients with Weber B, SE pattern ankle fractures we confirmed previous work in the upper extremity indicating an important difference in the reported pain by ethnicity. In particular, black patients have more pain than white or latino patients given the same injury.

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Introduction

Ankle fractures are common injuries and many authors have attempted to identify factors that may be prognostic of clinical outcomes [1–11]. Fracture pattern has been shown to influence long-term functional outcomes, with bimalleolar ankle fractures having worse outcomes than lateral malleolar fractures with ligamentous injuries [6,7,12].

The perception of pain is a dominant factor in patient based outcomes, and the presence of increased pain early in the clinical course may be predictive of long-term pain [13,14]. The factors influencing pain at the time of presentation of acute ankle fractures has not been well investigated. Previously, McConnell et al. demonstrated that tenderness to palpation could not be used in isolation to differentiate stable and unstable SE ankle fractures [15]. However, the effect of ankle fracture pattern on differences in pain the acute setting is still not well understood. Identifying specific risk factors for pain at the time of presentation of acute ankle fractures may enable the orthopaedic provider to deliver enhanced analgesia for patients.

This study evaluated the degree of pain reported in a prospectively collected large series of ankle fractures at the time

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of presentation in the emergency department to determine which factors are associated with higher VAS pain scores. Patient and fracture specific factors were evaluated and univariate and multivariate analyses were performed to identify the variables that correlated with pain. Only Weber B SE pattern fractures were evaluated in order to create a more standard data set.

Materials and methods

From 2005 to 2012, we evaluated 457 consecutive adult patients with Weber B supination external rotation ankle fractures who presented to a single level one trauma center. Standard AP, mortise, and lateral radiographs were obtained in all cases. If the mortise was intact, an external rotation stress test was performed to delineate SE2 from stress positive ligamentous SE4 fracture patterns [15]. A positive result was defined by an opening of the medial clear space opened to at least 4 mm and at least 1 mm greater than the superior joint space [16].

The senior author (PT3) and another attending orthopaedic surgeon prospectively reviewed all radiographs and categorised all fractures into supination-external rotation type 2 (SE2) or supination external rotation type 4 (SE4) per the Lauge-Hansen classification system. SE4 injuries were further categorised as being ligamentous, stress (+) if the mortise was intact at presentation and opened with stress, or bony if the medial malleolus was fractured. For the purpose of analysis, SE2 fractures were considered “stable” and stress (+) SE4 and SE4 fractures were considered “unstable.”

Patient age, associated injuries, fracture pattern, presence of diabetes and the use of insulin, ethnicity, alcohol use at presentation, and days between initial injury and presentation to the ED were collected.

Ethnicity is a standard data point obtained on the patient intake forms. Patients are asked to identify themselves as “white, black, or latino.” During the study period only 10 patients identified themselves as Asian, 1 Native American, 6 as “other”, and one “undetermined.” Based on the small numbers, these patients were excluded from the analysis. Exclusion criteria included skeletally immature patients and those who were intubated or too obtunded to participate.

On physical examination in the emergency department, pain was recorded by direct palpation over nine anatomic sites around the ankle as previously described [15]. Firm pressure was applied to the anatomic sites with the intension of reproducing maximal point tenderness (Fig. 1). These nine sites were divided into three areas including the medial, anterior and lateral joint line. The patient was asked to rank pain on a visual analogue scale (VAS) with 0 being no pain and 10 being maximal pain. The highest pain score (VAS 0–10) for the three medial and the three lateral regions were used for analysis.

Our institution’s review and ethics board approved this study. No funds were received or utilised in this investigation.

Results

There were 231 female and 226 male patients with an average age 46.2 (18–96). 133 fractures were classified as bi/tri-malleolar and 324 lateral malleolar fractures. There were 101 SE2, 73 stress (+) SE4, and 150 ligamentous SE4 injuries. 215 patients identified themselves as black, 160 white, and 82 as latino.

Univariate analysis

Univariate analysis of medial sided pain demonstrated no difference between patients with fractures of the medial malleolus and those with a ligamentous injury (Tables 1 and 2). The presence

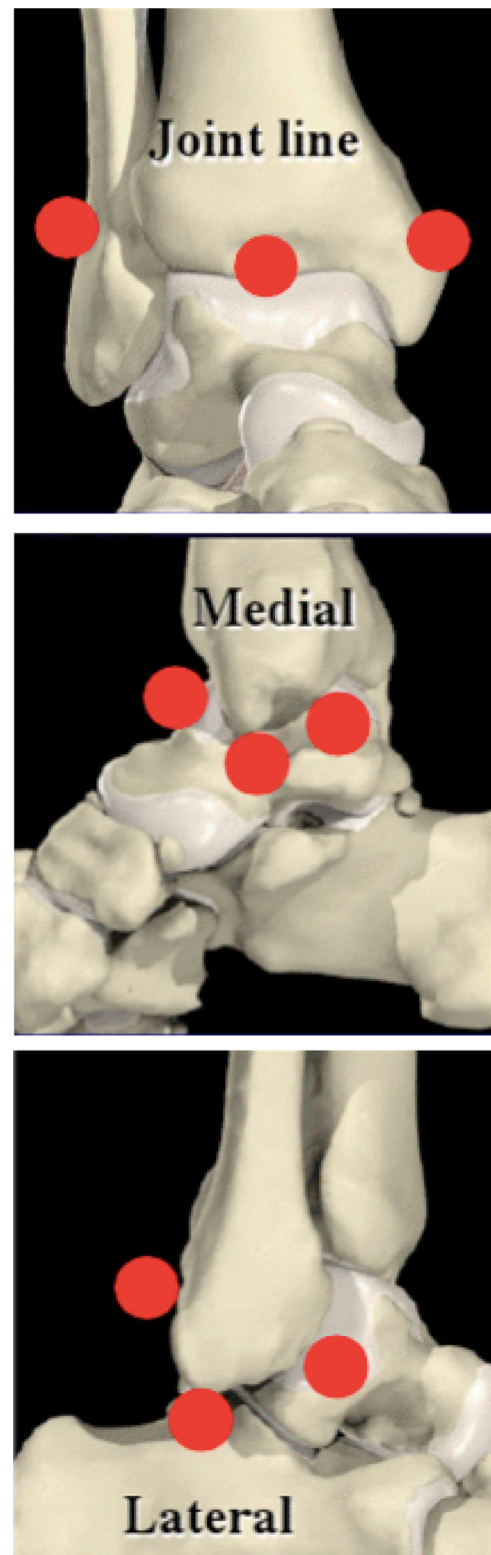


Fig. 1. Joint line, medial, and lateral anatomic landmarks for palpation.

Table 1
Medial pain: medial sided ligamentous vs bony SE4.

SE4	Mean	Std Dev	p-Value
Ligamentous	7.15	2.88	0.24
Bony	6.8	2.75	

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