Follow-Up Evaluation of Medial Clear Space Following Open Reduction Internal Fixation Without Primary Deltoid Repair in Bimalleolar Equivalent Ankle Fractures

Travis Motley, DPM, ACFAS1; Jordan Ernst, DPM2; Dalton Ryba, DPM2
1Attending Foot and Ankle Surgeon, John Peter Smith Hospital, Fort Worth, TX
2Resident Foot and Ankle Surgeon, John Peter Smith Hospital, Fort Worth, TX

METHODOLOGY AND HYPOTHESIS

Study Population:
- 100 adult patients (age 18-80) who sustained a bimalleolar equivalent fracture and underwent ORIF without deltoid repair
- Follow up requirement: > 1 year
- Patients were selected at random from a database of equivalent surgical procedures performed at JPS Hospital from 2013-2017
- Parameters were controlled for by standard reference values
- Inclusion: (1) all bimalleolar equivalent fractures with medial clear space >5mm on stress radiography, that (2) underwent fibula fracture ORIF (+/- syndesmosis repair) without primary deltoid repair, and (3) had follow up weight bearing radiographies > 1 year post-operatively

Study Design:
- Pre, Initial and >1 year post op AMM and malleolus view ankle films were used to evaluate MCS and Talar Valgus Angle
- Statistical analysis via paired dependent T-Test to contrast same variable sample means at variable sampling times
- Pathological markers: MCS >5mm (mortise), valgus tilt in talus in comparison to contralateral limb (AP)
- AOFAS scores obtained via phone/clinical encounter

Hypothesis:
- We submit that anatomic fibular fixation (+/- syndesmosis repair) in bimalleolar equivalent fractures is alone sufficient, and primary deltoid repair is not necessary in maintaining MCS or rectus talus long term
- We also contend that successful long term outcomes can be achieved without primary deltoid repair (AOFAS)

PROCEDURES

Operative Protocol:
- Surgical technique for bimalleolar equivalent fractures consists of a supine position, lateral incisional approach, careful dissection down to peristeme which is elevated to expose the fracture. Prior to fracture reduction, the syndesmosis is tested utilizing the hook test under fluoroscopy. Fibula fixation is then imparted with either neutralization or buttress plating depending on the mechanism of injury. Fibula length is often ensured with comparative contralateral intra-operative images. Fixation of the syndesmosis is performed with direct evaluation of reduction utilizing a tri- or quadri cortical positional screw (or combination) if required.
- Routine post-operative protocol includes 2 weeks neutral dorrsion in a splint, followed by 4 weeks NWB in CAM boot while allowing for sagittal plane ROM at therapy, followed by 4 weeks progressive walking in CAM boot to supportive tennis shoe. Syndromic injuries typically require an additional 2 weeks of NWB in the CAM boot.

LITERATURE REVIEW

Bimalleolar equivalent ankle fractures, specifically fibular fractures with concurrent deep deltoid rupture, are injuries necessitating surgical intervention. The need for surgical repair is attributable to the loss of tibio-talar joint stability following such an injury, where instability predisposes arthritis due to non-uniform joint contact stress and subsequent cartilage degeneration (1-3).

There are contrasting theories in regards to operative treatment in these injuries, specifically whether direct repair of the deltoid ligament is warranted. Some contend that fibula with or without syndesmosis fixation provides restoration of osteoarticular ligament anatomy, which is sufficient for long term taloruncal stability, while others assert that re-approximation without primary deltoid repair does not allow for direct end to end healing, thus leading to instability medially (4). Alternatively, some advocate for intra-operative scrutiny of the medial structures, basing primary repair of the deltoid ligament on either soft tissue impingement within the medial gutter or continued valgus angulation after fibular fixation (5,6).

Baird et al found a 90% good to excellent result in 24 patients who underwent fibula repair only fixation in bimalleolar equivalent fractures over a period of 2 years post-operatively (7).

Hsu, Lareau and Anderson advocate for primary repair of the deltoid in their 12 patient population of NFL athletes explaining return to high level function in 83% of the population (8).

Stromme and colleagues randomized 50 patients with functional bimalleolar fractures into a primary repair group and a fibula fracture only group and found no significant difference in outcomes long term (9).

No current study to our knowledge assesses pre and long term post op medical clear space and tibial valgus in these injuries, though these radiographic markers are indicators for deltoid competency.

RESULTS

Our study illuminated no significant difference in MCS or tibial valgus when contrasting initial post-operative radiographs and those taken at greater than 1 year follow up, in patients who underwent fibula fracture fixation (+/- syndesmosis repair) without primary deltoid repair in bimalleolar equivalent ankle fractures.

Furthermore, long term functional outcomes were found to be good to excellent in 91% of patients in our study

Regarding surgical decision making, the study results concur with the findings suggesting against primary deltoid repair. In accordance with Baird and Stromme, not only are long term functional outcomes without significant difference, radiographic parameters such as MCS and tibial valgus, which when pathologic predispose the ankle to complications, are anatomically maintained in lateral fixation alone.

ANALYSIS AND DISCUSSION

In total, 100 patients were involved in the study, 58% female, for a mean follow up of 2.37 years.

Paired T-Test was used to determine significant differences in same variable means at pre, initial, and current post-op

There was a statistically significant improvement in MCS (p=0.0002) and Valgus (p=0.012) from pre- to initial postoperative measurements.

There was not a statistically significant change between MCS (p=0.076) and Valgus (p=0.076) from initial to final follow up.

AOFAS score average was 88, with 91/100 (91%) of patients reporting good to excellent outcomes.