The Effect and Characteristics of Avulsed Fragment Compression during Fixation of Supination External Rotation-Type Ankle Fractures

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Statement of Purpose and Literature Review

A common surgical approach for open reduction internal fixation (ORIF) of supination external rotation-type (SER) ankle fractures is by means of an interfragmentary compression screw with a lateral neutralizing plate [1-7]. However, the intra-operative placement of an interfragmentary screw is sometimes difficult to achieve necessitating other fixation constructs such as the use of buttress plating, posterior anti-glide plating, locked anatomic plates, etc. In our clinical practice we have observed this to be particularly true in situations of fibular fracture comminution where an interfragmentary screw does not achieve the desired level of stability and/or compression. If foot and ankle surgeons were able to pre-operatively predict which fractures were not amenable to the placement of an interfragmentary screw, it could decrease operative times, hardware costs, unnecessary dissection/drilling, etc.

The hypothesis of this investigation was that the presence of a Wagstaffe-type avulsion fracture from the distal fibula in rotational ankle fractures would be associated with fibular comminution and affect the ability to achieve the desired level of stability and/or compression. If foot and ankle surgeons were able to pre-operatively predict which fractures were not amenable to the placement of an interfragmentary screw, it could decrease operative times, hardware costs, unnecessary dissection/drilling, etc.

Methodology

Following IBF approval, we identified a consecutive retrospective series of 47 SER-type rotational ankle fractures presenting to our health system which 1) underwent a pre-operative computerized tomography (CT) scan and 2) had subsequent ORIF including at least the lateral malleolus. The pre-operative plain film radiographs and CT scans were reviewed to determine the presence of a Wagstaffe-type avulsion fracture from the distal fibula. Post-operative radiographs were then assessed for the presence or absence of an interfragmentary compression screw across the primary fracture line of the fibula with additional descriptive analysis of the utilized plate fixation construct. Frequencies were compared by means of a two-tailed Fisher’s exact test. We then reviewed the CT scans in an attempt to identify any common fracture characteristics and/or involvement of the Wagstaffe avulsion within the primary fracture line of the fibula. We hypothesized that the Wagstaffe fracture could be associated with excessive comminution of the distal fragment, particularly in the area where an interfragmentary screw would be expected to exit the posterior-distal cortex. The presence of comminution or another consistent fracture line in this location might be suspected to cause an interfragmentary compression screw to not “bite” as expected.

Results

- The objective results of this investigation indicate that the presence of a Wagstaffe fracture might influence the ability to achieve interfragmentary compression of SER ankle fractures. Those SER fractures we identified as having a Wagstaffe fracture were less likely to have placement of an interfragmentary compression screw during ORIF (23.5% vs. 76.5%), but this difference did not demonstrate statistical significance (p = 0.1350). The presence of a Wagstaffe ankle fracture did not appear to substantially influence the utilized plate construct. The groups with and without a Wagstaffe fracture utilized a lateral plate construct at a similar rate (52.9% vs. 60.0%; p = 0.7614). Of the 47 SER mechanism fractures, 17 (36.2%) demonstrated radiographic evidence of having a Wagstaffe-type avulsion fracture. Thirteen (76.5%) of these did not receive an interfragmentary compression screw during ORIF, while 4 (23.5%) did receive an interfragmentary compression screw. Nine (52.9%) of these 17 had a lateral plate construct applied (neutralization or buttress), while 8 (47.1%) utilized another plate construct. The subjective results of this investigation did not provide substantial visual evidence of involvement of Wagstaffe fractures in the compression of the primary spiral fracture line of the fibula or where one might expect to place an interfragmentary compression screw. -It is our hope that this study increases the body of knowledge with respect to the diagnosis and treatment of rotational ankle fractures, and leads to future investigations about the effect of Wagstaffe fractures on the intervention of rotational ankle fractures.

Discussion

- The subjective results of this investigation did not provide substantial visual evidence of involvement of Wagstaffe fractures in the compression of the primary spiral fracture line of the fibula or where one might expect to place an interfragmentary compression screw. Of the 47 SER mechanism fractures, 17 (36.2%) demonstrated radiographic evidence of having a Wagstaffe-type avulsion fracture. Thirteen (76.5%) of these did not receive an interfragmentary compression screw during ORIF, while 4 (23.5%) did receive an interfragmentary compression screw. Nine (52.9%) of these 17 had a lateral plate construct applied (neutralization or buttress), while 8 (47.1%) utilized another plate construct. The subjective results of this investigation did not provide substantial visual evidence of involvement of Wagstaffe fractures in the compression of the primary spiral fracture line of the fibula or where one might expect to place an interfragmentary compression screw. Of the 47 SER mechanism fractures, 17 (36.2%) demonstrated radiographic evidence of having a Wagstaffe-type avulsion fracture. Thirteen (76.5%) of these did not receive an interfragmentary compression screw during ORIF, while 4 (23.5%) did receive an interfragmentary compression screw. Nine (52.9%) of these 17 had a lateral plate construct applied (neutralization or buttress), while 8 (47.1%) utilized another plate construct.

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References


Figures

Figure 1A

Figure 1B

Figure 2A

Figure 2B

Figure 2C

Figure 3A

Figure 3B

Figure 3C