The Use of Liquid Amniotic Fluid Allograft in the Revision of 2 Subtalar Joint Fusion Non-unions in the Surgical Correction of Comminuted Calcaneal Fracture

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**Statement of Purpose**
Comminuted calcaneal fractures (including intra-articular fractures) usually require open reduction internal fixation, or delayed subtalar joint (STJ) fusion. In this case study, we analyzed the results of 2 subtalar joint fusions complicated by non-unions of the primary fusion and revisional fusion, use of 2 different bone stimulators and subsequent removal of hardware and application of amniotic suspension. This case study details the course of the treatment and achieving pain relief.

**Case Study**
50 year old female suffered a work injury resulting in left non-displaced intra-articular comminuted calcaneal fracture. Patient decided to undergo STJ fusion. Her past medical history significant for depression and hall a pack/day smoker. Bone stimulator used which caused CRPS-like pain out of proportion, after discontinuation, she had a 2nd STJ fusion which also was a non-union, exhausted another bone stimulator and physical therapy. Pain remained 9/10. X-rays noted loosening of the 2 screws of the STJ, removed the screws and an amniotic allograft was injected into the dorsal incision into the STJ.

**Methodology & Hypothesis**
A retrospective review of the patient was performed with a 34 months follow up. The patient was diagnosed with severe pain, non-union of the STJ fusion site based on the duration of symptomatic pain (> 6 months) and MRI. Objective and subjective assessment was obtained using the American Orthopedic Foot and Ankle Society (AOFAS) ankle and hindfoot scores. Radiographs were analyzed immediately post operatively, 1, 2 and 3 months post operatively for evidence of bony bridging across the sites the allograft was injected.

**Level of Evidence**
Level IV

**Literature Review**
The calcaneus is the most commonly fractured bone in the foot, comprising 65% of tarsal fractures, and up to 73% in Sanders Type IV calcaneal fractures (including intra-articular fractures). Patient non-unions occurred when there was more than 2mm of avascular callus formation noted at anterior and posterior facet. After the fusion was not completely achieved. However, AOFAS score did improve to a 90 after injection of amniotic allograft. Easely et al report that the most important parameter to consider with non-unions was pre-operative bone vascularity, and observed that all non-unions occurred when there was more than 2mm of avascular subchondral bone at the subtalar joint. Therefore, lower union rate with increased subchondral sclerosis (chronicity of trauma, previous nonunion). Given the patient's history of smoking we are not at all surprised at the complication of non-union and with Easely et al reporting the 1st attempt at fusion already had a lower success probability. With that said, it is of note that the patient's functionality increased despite failing the previously mentioned modalities. This is important because so many of our patients who come in use tobacco in one form or another and calcaneal fractures as we know can be a devastating injury therefore setting the patient up for an ill fate situation. With the success we have shown with a two year follow up, we have demonstrated one case which suggests that amniotic graft can possibly be used as a modality for a patient with a history of tobacco use and failed standard post-operative adjunctive healing options.

**Results**
Bony callous formation noted at anterior and posterior facet. After the last procedure, patient's pain improved significantly. The multiple attempts to fuse STJ yielded unsuccessfully, however using amniotic allograft resulted in the facet fusions as noted above. Patient had an AOFAS score of 90.

**Analysis & Discussion continued**
This case study follows a patient who had multiple failed attempts at a Subtalar Joint fusion with common adjunctive healing modalities namely physical therapy and two attempts with a bone stimulator. In the end the hard ware was required to be taken out and a fusion was not completely achieved. However, AOFAS score did improve to a 90 after injection of amniotic allograft. Easely et al report that the most important parameter to consider with non-unions was pre-operative bone vascularity, and observed that all non-unions occurred when there was more than 2mm of avascular subchondral bone at the subtalar joint. Therefore, lower union rate with increased subchondral sclerosis (chronicity of trauma, previous nonunion). Given the patient's history of smoking we are not at all surprised at the complication of non-union and with Easely et al reporting the 1st attempt at fusion already had a lower success probability. With that said, it is of note that the patient's functionality increased despite failing the previously mentioned modalities. This is important because so many of our patients who come in use tobacco in one form or another and calcaneal fractures as we know can be a devastating injury therefore setting the patient up for an ill fate situation. With the success we have shown with a two year follow up, we have demonstrated one case which suggests that amniotic graft can possibly be used as a modality for a patient with a history of tobacco use and failed standard post-operative adjunctive healing options.

**References**