

SOFT TISSUE CONSIDERATIONS IN THE SURGICAL REPAIR OF CLOSED ANKLE FRACTURES

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INTRODUCTION

The condition of the soft tissue in fracture management is of extreme importance. Every effort should be made to protect it to avoid complications during the healing process. Careful management of the soft tissue will allow for early surgical intervention, which makes the reduction and fixation easier to perform and reduces the chances of postoperative complications.

INITIAL EXAMINATION

When the patient with a displaced fracture first presents, several decisions must be made. One of these is to determine if and when the patient should have a surgical reduction. Part of this decision is determined by the type of ankle fracture, the stability and the level of displacement. Another part is determined by the condition of the soft tissue. In cases of an open fracture the repair should be done right away to prevent possible bone infection. The neurovascular status should also be checked and the appropriate action taken if they are impeded in any way. When the soft tissue and vascular supply are intact there seems to be a large variety of opinions regarding the optimal time for surgery.¹⁻⁴

The first step in evaluating the soft tissue is to take a close look. Determine how much swelling is already present. This can easily be done by examination and comparison of the contralateral limb. If the injury is recent, the amount of edema may be minimal. It is also important to look for evidence of venous stasis or lymph edema. These diseases may give a false representation of the level of edema present. Fractures that are several hours old and have not been compressed or had ice put on them may be very edematous.

The injured area should also be checked for ecchymosis and trauma blisters. The areas of ecchymosis may be future sites of trauma blisters that have not yet developed. The location of the trauma blisters need to be carefully examined to see if they can be avoided during surgery. Once the

examination is completed, steps can be taken to prevent or reduce the edema while awaiting the operating room if appropriate.

INITIAL TREATMENT

Once the initial examination is completed and the decision is made to perform surgery, the ankle should be elevated, wrapped in a compression dressing and ice applied to slow or reduce the swelling. The compression dressing that is applied should be multilayer, such as alternating rolls of cast padding and elastic bandages, and if needed a rigid splint or shell is applied on top of the dressing. The dressing will provide compression to reduce swelling, it is comfortable for the patient, and it is safe because the multilayer design with stretchable materials is very unlikely to restrict blood flow or assist in creating a compartment syndrome. The rigid splint or shell applied help to prevent motion so that no further damage is done to the joint and any reduction that was performed will not be lost.

TRAUMA BLISTERS

Trauma blisters are a result of separation of the skin layers with the build up of fluid between them as a result of the trauma causing the fracture. The blisters can occur shortly after the fracture has occurred or may take days to appear. Trauma blisters can be filled with either blood or clear fluid. The difference in the fluid types comes from the level of trauma. Blood filled blisters have a separation between the dermis and epidermis. Clear fluid blisters are separated with some of the epidermis still attached to the dermis.⁵

The treatment for trauma blisters is to either wait for them to resolve before surgery or to debride them at the time of surgery and treat them with local wound care afterwards.⁵ With both forms of treatment the skin can heal with out complication following surgery or it can heal with prolonged complications and need for extensive wound care.

Other factors may come into play regarding the potential complications from trauma blisters. These include the overall health of the patient, history of tobacco use, poor nutritional status, diabetes, or extreme trauma to the skin such as high energy fractures or crush injuries. In the experience of the author the sooner the ankle is treated with surgery or compression and ice, the less likely it is that trauma blisters will occur.

When to Perform Surgery

The most important factor when deciding to perform an open reduction and internal fixation of an ankle fracture is the patient. The timing of the repair should take into account the soft tissue considerations, the health of the patient and when the best possible alignment of the fractured ankle can be made.

After a fracture has occurred the cellular response to repair the fracture begins. The fibroblasts and osteogenic cells begin to proliferate and migrate to the site of the fracture. The cells begin to lay down the collagen that in a few days begins to form into the bone callus. The osteogenic cells migrate and then turn into chondroblasts and the fibrocartilaginous callus bridges the fracture ends. In the process of callus formation and the phagocytic removal of dead bone the edges of the fractured bones change and it is more difficult to get anatomic alignment. It has been the experience of the author that when a fracture is reduced and fixated within 24 hours it is easier to align the bones than after even a delay of only 2 or 3 days. As the time of surgery is delayed to 1 to 2 weeks it becomes even harder to get a perfect fit because the bone edges become softer and change shape due to the bone healing process and the additional trauma to the bones because of the motion that occurs across the fracture sites even if cast immobilized. After only a few days the padding in a cast gets matted and this will allow motion at the fracture site unless it has been fixated or is a very stable fracture. This motion can cause a change in position of the fracture and may cause additional trauma to the fracture surfaces making accurate reduction later on more difficult.

Several studies have been done to determine the outcomes and possible complications of ankle fracture repair based on the timing of surgery and condition of the soft tissue.¹⁴

A retrospective study of 202 patients with unstable Weber B fractures that were surgically repaired found that excessive preoperative swelling, trauma blisters or abrasions were more frequent in the delayed cases than were in the ones treated early. They found that the reasons for delay included severe swelling, operating room unavailability, or issues with medical clearance. Although the delayed cases took longer to perform on average they found no significant difference in accuracy of reduction or complication rates. In this study they considered a 5 day wait for surgery to be early treatment.¹

Bhandari et al, performed a retrospective study of 54 patients with closed tibial shaft fractures. The results were that the patients that had surgery in less than 12 hours had shorter hospital stays, averaging 4.6 days less, and fewer complications compared with the patients that had to wait greater than 12 hours. In the delayed group 36.8% had post-operative infections compared with 7% of the early treated patients. Long term quality of life was not effected by the delay to surgical repair.²

Carragee et al reviewed the complications of 121 surgically repaired ankle fractures and found similarly that delay in surgery increased the complication rates. The surgeries done in less than 24 hours had 5.3% major complications compared with 44% in the delayed group.³

Fogel and Morrey reviewed the outcomes of 26 surgically repaired ankle fractures that were delayed 14-31 (mean 19.2 days) days after surgery compared with 25 that were operated on within 48 hours. The major problem found with delay was that the likelihood of getting an anatomic reduction was adversely affected. In the early group 88% had an anatomic reduction compared with 68% in the delayed group.⁴

CONCLUSION

When treating a patient with an ankle fracture the care of the patient should be the first priority. One of the major factors in the treatment process should be the care of the soft tissue. Clearly the literature supports either preventing or taking steps to reduce the post injury edema so that early open reduction and internal fixation can be performed. In general early surgical intervention for treatment of ankle fractures reduces the chances for complications and makes the procedure easier to perform.

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