

# SURGICAL OPTIONS FOR REDUCING PRESSURE ON CHRONIC WOUNDS

*David C. Alder, DPM*

## INTRODUCTION

One of the greatest challenges encountered in the treatment of chronic wounds is that of pressure reduction in the wound. This is especially important in the neuropathic patient due to the lack of natural feedback that the body provides to warn that thresholds have been exceeded. Often a simple plantar wound under too much pressure can evolve into a limb-threatening infection. The key is to minimize the pressure while getting the wound to heal and altering the biomechanics of the limb to prevent future wound breakdown.

Most of the time modifications in shoe wear will accomplish these goals, however some times the situation will arise that will necessitate a permanent alteration of the anatomy for continued success. Surgical decompression of the wound involves procedures designed to both reduce the pressure on the wound site while also allowing adequate function to maintain the viability and usefulness of the limb.

## EFFECT OF PRESSURE ON WOUNDS

When treating chronic wounds of the lower extremity, it is important to determine the cause of the delay in the healing process. The delay is usually caused by diminished circulation, excessive pressure, infection, and/or uncontrolled edema. Vascular studies and a consult to the vascular surgeon is a good way to address the vascular problems. The edema can be controlled by a variety of compression dressings when adequate vascular supply is present. Infection is more of a challenge especially when the infection is in the bone. If surgical options are being considered to reduce pressure, it is important to be sure that osteomyelitis has been or is currently being addressed. Modalities such as MRI and bone biopsy can determine if osteomyelitis is present and when needed intravenous antibiotics with appropriate bone resection are used for treatment.

When excessive pressure is present on a wound it can make it difficult to determine exactly which problem is the true delay in the healing process of the chronic wound. Perfect resolution of the other problems can be achieved,

but pressure can destroy any new tissue the body will be able to produce. This is also the case when indirect pressure is present.

One of the ways indirect pressure is caused is by the patient trying to walk on only a portion of the foot. This usually results in direct pressure in the neuropathic patient because they can not tell they are walking on the wound, but in the patient that does avoid the wound the tension of the skin that does have pressure pulls on the wound creating similar wound destruction as direct pressure. Conservative methods of offloading of a wound such as shoe padding, total contact casting, and use of crutches will only work if the patient is strictly compliant. This delay in healing can often lead to infection or destruction of tissue that can make the wound not only larger but more complex.

## ALTERING THE BIOMECHANICS FOR PRESSURE REDUCTION

The concept of altering the biomechanics to reduce pressure is intended to prevent possible wound formation or in the case of a previous wound allow the site to heal or prevent a return of the wound. The site of the ulcer is changed surgically to allow function of the foot without excessive shoe alteration, which will possibly create other wounds or not work when the shoe is not worn for short periods of time.

The areas where the procedures are most effective are the forefoot, the midfoot, and specifically the plantar aspect of the hallux interphalangeal joint and distal aspect of the digits. These procedures should only be tried when conservative treatments have proven ineffective in maintaining an ulcer-free site. It is also important to consider possible effects on other parts of the foot to include stress fractures, new wounds in other areas, and Charcot arthropathy of surgical sites.

The surgical procedures are intended to alter the biomechanics of the ulcer site and allow the area to bear weight without causing ulcers. These procedures are not quick fixes, they should be used to eliminate the wound stress.

## TIMING OF SURGICAL INTERVENTION

The best time to perform surgical alteration is when pathology exists, but a wound has not yet fully developed. A good example of this is the patient with hallux valgus that has some soft tissue concerns at the prominence. When conservative treatment does not eliminate the pressure and the patient continues to have chronic erythema or skin breakdown, a surgical repair of the joint will eliminate the pressure and prevent wound formation.

In the situation when an ulcer is present, it is important to make an attempt to first heal the wound before surgical alteration is performed because of the risk of infection. This also helps to minimize the risk of complication from chronic osteomyelitis.

The principles of wound care should be applied, and when pressure to the wound is the main issue preventing completion of the healing process, offloading techniques such as padding of a postoperative shoe or boot should be applied, use of crutches, wheel chair, or walker should be done to achieve initial healing of the wound. Once the wound has healed and enough time has elapsed to be sure that chronic osteomyelitis is present, then it is time to perform surgery.

In situations where pressure is not the primary issue in wound healing, biomechanic-altering surgery is not always the best form of treatment. An example of this would be a heel ulcer that finally heals but was due to a prolonged bed rest. This patient would not benefit from biomechanic-altering surgery.

## FOREFOOT AND MIDFOOT ULCERATIONS

Forefoot and midfoot ulcerations often result from ankle equinus with or without alterations in the architecture of the bones and joints of the foot. The ulcer will often start out as a callus and this will break down to form the primary wound. In time if the wound does not heal, infection will set in and often lead to osteomyelitis. The wound is often treated by a primary wound care provider who does not understand the biomechanics of the wound. In this case, all the technologies of wound care in the world will not allow the wound to heal and to maintain an ulcer free site.

When ankle equinus is present (and if possible the wound has healed) the best surgical intervention is to perform an Achilles tendon release. The Achilles tendon release can be performed in a variety of ways from a traditional lengthening to a simple transverse transaction

with some variations in between. The goal of the procedure is to decrease the pressure on the forefoot. Sometimes this can be done with ankle joint stretching exercises such as a calf stretch. However, generally this will not be sufficient to eliminate the pressure needed for success.

When the Achilles tendon is lengthened too much, the patient will often develop heel ulcers. This can be an enormous problem because these ulcers are often very difficult to heal and the over lengthening of the tendon will have to be addressed at a later date. Under-lengthening of the tendon will not eliminate enough pressure and the original ulcer will return. The key to this procedure is to lengthen the tendon and allow it to heal in a position where the tendon will still provide some function in gait.

The author's method for accomplishing this is to perform a sagittal plane lengthening with the arms of the tendon overlapping each other. The tendon is not sutured. The patient is nonweight-bearing for 2 weeks. The patient then ambulates in a cam walker for 2 to 4 weeks, then progresses to a stable shoe. This procedure works well to accomplish the goal of offloading pressure with out creating a calcaneal gait.

When an ulcer site is located beneath a plantar flexed metatarsal head, some times an Achilles tendon lengthening is not going to reduce the pressure enough. In this instance a dorsiflexory wedge osteotomy may be needed. This combination of procedures will help to alleviate the pressure while maintaining the function of the foot.

## HALLUX ULCERATIONS

Ulcerations on the plantar aspect of the hallux interphalangeal joints are very common and often fail to remain healed even with custom accommodative orthotics. Usually the ulceration forms due to excessive pressure from an underlying hallux limitus. When motion limitation is the problem, a surgical procedure to increase the motion will work much better than simply removing bone. An osteotomy for hallux limitus correction such as a modified Youngswick will work well to preserve function of the joint while reducing the wound causing pressure. When a hallux interphalangeal joint arthroplasty is performed, the usual outcome is to simply move the ulcer site more proximal (Figure 1).

## DISTAL DIGITAL ULCERATIONS

Distal digital ulcerations often occur in conjunction with hammer toe contractures and are frequently worsened by shoes that apply additional pressure to the dorsum of the



Figure 1A. Hallux interphalangeal joint ulcer secondary to hallux limitus.

digits. Wearing extra-depth shoes will sometimes relieve the pressure and allow the toes to function without ulcer formation. When the ulcers persist either in the plantar distal aspect or on the side of the toe, a hammer toe correction will work well.

Arthrodesis procedures will usually have a longer lasting effect when the ulcer is due to a transverse plane deformity. Distal ulcers occurring from a sagittal plane deformity at the DIPJ will respond well to an arthroplasty if the soft tissues are tightened up sufficiently to limit future deformity.

Regardless of the type of procedure performed if the wound is still present at the time of surgery a Kirschner-wire should not be placed through the open ulcer site. If



Figure 1B. Plantar ulcer remains healed after hallux limitus repair.

there is a question of osteomyelitis, it is better to allow the wound to heal before performing an osseous hammer toe correction on the digit.

## CONCLUSION

When treating chronic wounds of the foot, it is important to eliminate all of the variables preventing the wound from healing. One of the major problems to deal with is the ongoing pressure that will persist even after the wound has healed. Surgical procedures that reduce pressure to an acceptable level and allow the foot to function work well in the treatment of chronic wounds.