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# An Alternative Method for Closure of Fasciotomy Wounds: Healing by Secondary Intention

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## Citation

L Boxer, S Buchman. *An Alternative Method for Closure of Fasciotomy Wounds: Healing by Secondary Intention*. The Internet Journal of Plastic Surgery. 2002 Volume 1 Number 2.

## Abstract

Although healing wounds by secondary intention is not a new method for wound closure, its application and superior outcome in certain clinical situations is often overlooked. We describe the management and care of large bulging wounds after lower limb fasciotomy in two patients. By allowing the wounds to heal by secondary intention, the patients are discharged from the hospital sooner resulting in a reduced length of stay; in addition they avoid repeated trips to the operating room, and circumvent unnecessary additional scarring that can result from skin grafting. This procedure offers many additional benefits to the patients including the benefit of a normal contour to the extremity and a more rapid return to daily activities following discharge from the hospital. Four-year postoperative follow up examination of the patients in this report revealed improved outcomes as exhibited by no additional need for operations, excellent healing, and minimal scarring.

## INTRODUCTION

The most common causes of acute compartment syndrome are fractures and vascular trauma<sup>1</sup>, and often result in increased tissue pressure within an enclosed compartment which can lead to ischemic damage of muscles and nerves. Once compartment syndrome has been discovered, fasciotomy is the treatment of choice to relieve tension and enhance tissue perfusion.<sup>2</sup> Fasciotomy often results in a large open wound secondary to retraction of skin edges. These open fasciotomy wounds are often a management dilemma faced once surgical release for a compartment syndrome has been performed. Many different methods and techniques have been proposed in the literature for wound healing after fasciotomy and yet no ideal solution has been found; options include skin grafting, delayed primary closure and slow dermal apposition. An ideal treatment regimen for these open wounds would allow the patient to be quickly discharged from the hospital, avoid unnecessary secondary operations and reduce visible scars, and diminish the possibility of developing another compartment syndrome.

Skin grafting of a large fasciotomy wound is the most common procedure following fasciotomy, yet it has many associated problems; it requires multiple operations that can lead to aesthetically undesirable scarring both at the site of fasciotomy and the donor site. After the skin graft is in place, subsequent operations and serial excisions are

required to remove the skin graft. In addition, while the graft is in place the scar is often insensate. Alternative options to skin grafting, such as delayed primary closure and slow dermal apposition, are often accompanied by lengthened hospital stays and multiple operative procedures. This paper suggests healing by secondary intention as an alternative method for fasciotomy closure that should also be kept in the armamentarium. This alternative allows the fasciotomy to heal based solely on skin contraction. Although healing by secondary intention is not a novel idea, it has never been documented or thoroughly presented in the literature as an alternative method for closure of fasciotomy wounds. This method of treatment can be conducted as an outpatient without concern about recurrent compartment syndrome. In addition, closure by secondary intention would eliminate additional scarring associated with skin grafting, normalize the contour of the extremity, decrease hospital stay, and reduce the need for secondary procedures, thereby reducing the overall costs for the patient. This option is especially practical for responsible patients and would immediately allow them to return to their daily activities while in the process of healing.

## MATERIALS AND METHODS

The two patients in this case study were discharged from the hospital after they were stable from an orthopedic point of view and after they and their families were comfortable with

the wound care and dressing change regimen. Dressing changes varied from once to three times a day depending on the state of the wound. Saline irrigation was used to clean and Chlorpactin™ (sodium oxychlorosene) soaked gauze was then packed into the wound. Montgomery straps were placed in order to keep the dressing intact and allow for ease in dressing changes. The use of an ace bandage or knee brace was also used intermittently as a means of support for the wound and to allow the patient some mobility. The patients were encouraged, to the extent of their orthopedic limitations, to return to a full range of activities. Daily showers were also encouraged as a means of personal hygiene as well as a means of cleansing their wounds. When possible, swimming in a chlorinated pool often hastened wound healing and wound closure.

### **CASE 1**

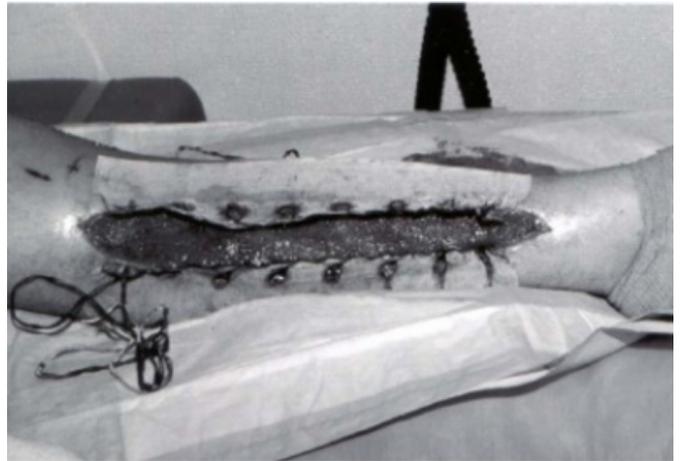
J.M., a 16-year-old, otherwise healthy, Caucasian male was involved in a motor vehicle accident and sustained a grade 1 open tibial fracture, a right distal radial, and right ulnar fractures. He underwent intramedullary nail placement into his left tibia and a four-compartment fasciotomy was performed as a prophylactic measure to guard against a potential compartment syndrome. He also underwent closed reduction of his right forearm fractures and placement in a forearm splint. The resulting wound on the lateral side of his leg was 14 cm x 6 cm in size. Upon examination, the patient was presented with the options of skin grafting, gradual dermal apposition, and healing by secondary intention for the treatment of his wounds. The patient's desire to get out of the hospital quickly and avoid further trips to the operating room were essential to his choice of healing by secondary intention. It was explained to the patient that he would have to carefully follow a daily care regimen, yet he felt that option was far superior to possible secondary operations. The patient's activity level returned to normal soon after his fasciotomy and the majority of his wound closed quickly. Complete healing and contraction of the scar was complete by three months. No revision or additional surgery has been performed nor desired.

### **CASE 2**

J.F., a 17-year-old Caucasian male, was a restrained driver involved in a motor vehicle accident and sustained a left tibia fracture and compartment syndrome. He underwent intramedullary nailing and a four-compartment fasciotomy. On the medial side of his leg the length of the wound was 27.5 cm with the widest area measuring 4 cm (figure 1a and 1b).

**Figure 1**

Figure 1a: Wound in the immediate post-operative period with Montgomery straps



**Figure 2**

Figure 1b: Closer view of wound in post-operative period



The lateral wound was 14 cm in length and 3.5 cm wide. Similar to the previous case, the patient chose healing by secondary intention. The patient did initially require pain medication for the dressing changes but was quickly able to undergo the wound care regimen with little discomfort. The patient returned to school immediately after his discharge from the hospital. He was followed intermittently as an outpatient to follow the progress of his wound (figure 2a).

**Figure 3**

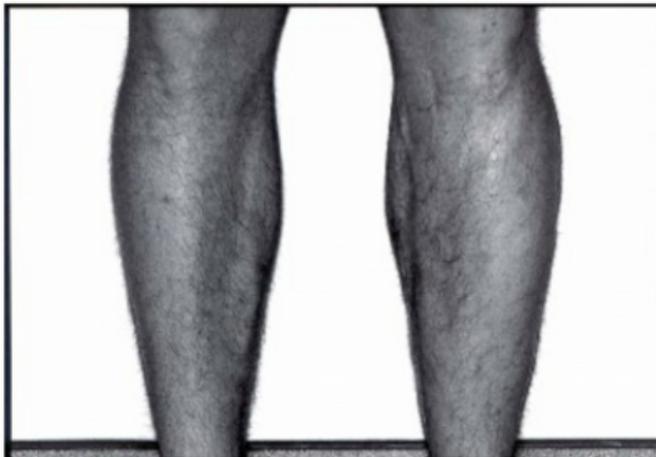
Figure 2: Wound two months after fasciotomy



Complete healing and contraction of the scar took four months; during that time, however, his activity level immediately returned to normal. Examination four years postoperatively revealed that the contour of his leg returned to normal and he was left with minimal scarring requiring no further operative intervention (figures 3a-3c). Photographs of fasciotomy after skin grafting have been included for comparison (figures 4a-c).

**Figure 4**

Figure 3a: Anterior view of leg after full recovery



**Figure 5**

Figure 3b: Lateral View of leg after full recovery



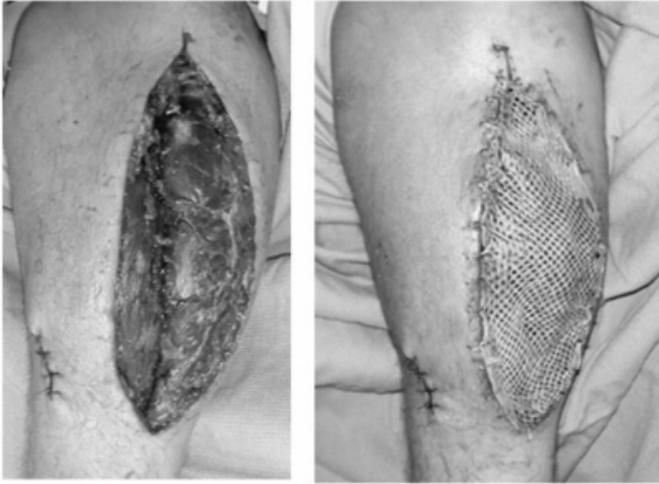
**Figure 6**

Figure 3c: Wound after completely healed



**Figure 7**

4a: Similar Wound immediately following fasciotomy –  
Comparative photo 4b: Fasciotomy wound after skin graft –  
Comparative photo



**Figure 8**

4c: Fasciotomy wound with skin graft after 2 months –  
Comparative photo



**DISCUSSION**

Compartment syndrome is a common adjunct to trauma and often the result of fracture or crush injuries.<sup>3</sup> In order to alleviate increased pressure and ischemia fasciotomy is performed in a timely manner. Although it is effective in relieving the underlying pressure by enhancing tissue perfusion, it often results in a large, open, bulging wound. This large wound requires thoughtful management that can have an important impact on the rehabilitation of the patient. Skin grafting is the most common method for closure and although effective it is wrought with many problems for the

patient. It requires a second operative procedure, an extended hospital stay (both of which add to the overall cost), and an acceptable donor site (which results in further scarring).<sup>2</sup> Furthermore, skin grafting can lock in deformities and often results in non-durable skin coverage with significantly diminished sensation.<sup>4</sup> In addition, most skin grafts require surgical revision by serial excision.

Other methods of closure that have been suggested in the past have been delayed primary closure and gradual dermal apposition. Delayed primary closure requires a second operation and an increased length of stay in the hospital. Gradual dermal apposition, using such methods as Cohn's vessel loop shoelacing technique,<sup>5</sup> and McKenney's suture tension adjustment reel (STAR)<sup>2</sup> have innate problems as well. These classic vessel loop methods requires daily trips to the operating room for tightening. Other methods such as Almekinders revised technique uses nylon sutures<sup>3</sup> yet this method requires daily bedside tightening and results in a lengthened hospital stay of between 7 and 10 days.<sup>2</sup> The STAR device, which uses horizontal mattress sutures to perform mechanical dermal apposition, is also tightened daily bedside or alternatively performed on an outpatient basis but requires daily visits to the physician's office. Even though this method does decrease hospital stay, it involves extra cost and significant inconvenience for the patient. Healing by secondary intention is an alternative method of fasciotomy closure; it is a practical and simple procedure for

responsible patients and can easily be integrated into any treatment plan.

### **CONCLUSION**

Although many methods may be ideal in certain clinical situations, healing by secondary intention should be kept in the armamentarium of surgeons. As an alternative method for fasciotomy closure, healing by secondary intention avoids a secondary operation and often will obviate the need for scar revision. In addition, this alternative method decreases hospital stay, minimizes visits to outpatient clinics, and lowers the overall cost of the patient's care. Using this method, patients are able to continue healing at home while returning to their daily routine as soon as they are able from an orthopedic stand point. Healing by secondary intention is meant to be an adjunct to the current repertoire of methods of fasciotomy closure. It is a practical and simple procedure for responsible patients and can easily be integrated into any treatment plan.

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