



Vacuum-assisted wound closure (VAC) with simultaneous bone transport in the leg : A technical note

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Successful treatment of infected non union in long bone fractures has always been a challenge. Segmental excision followed by bone transport is one of the common modalities of treatment in such difficult cases. The soft tissue coverage of the resulting wounds was however not well described in the literature. The authors would like to report a simple technique that was used. After segmental bone excision and application of a ring fixator, a vacuum assisted closure (VAC) dressing was applied to the wound, which resulted in not only a remarkable growth of granulation tissue that filled the soft tissue defect, but also satisfactory signs of bony union across the docking site.

The authors would like to emphasise the benefits of a simple method such as VAC therapy in enhancing cover of the large soft tissue defects during simultaneous bone transportation, and thus avoiding complex plastic surgical procedures.

Keywords : long bone fracture ; non-union ; bone transport ; vacuum assisted wound closure.

quate coverage of the bone. Plastic surgical procedures are often unsuccessful to cover the resultant bone and soft tissue defects in such infected cases.

We would like to report a simple technique that we used in treating a 53-year-old patient with infected non-union of the distal shaft of the tibia with an osteomyelitic segment of eight centimetres.

Illustrative case

A 53-year-old male patient presented to our limb reconstruction unit with infected non union of the distal shaft of the tibia with an osteomyelitic segment of eight centimeters, as confirmed on MR scan. A segmental tibial excision and soft tissue debridement was contemplated, which left a 12-centimeter length wound on the anterior aspect of leg with a bone gap of eight centimeters. A ring external fixator (Taylor Spatial Frame) was applied to the tibia (fig 1).

INTRODUCTION

Successful treatment of infected non union in long bone fractures has always been a challenge. Segmental excision of the infected bone followed by bone transport is one of the common modalities of treatment.. Apart from the challenge due to the resultant large bone defect, often the surrounding unhealthy skin and soft tissues further hinder ade-

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Fig. 1. — AP radiograph illustrating the segmental bone defect in the distal tibia.

Appropriate intravenous antibiotics were commenced postoperatively and two further wound debridements were performed. Considering the fact that the wound was infected, soft tissue reconstructive procedures such as flap were deferred. We were faced with a complex problem of addressing the soft tissue and bony defects with no possibility of contemplating any plastic surgical procedures to cover the wound.

Technique

We decided to undertake distraction osteogenesis with simultaneous vacuum assisted wound closure (VAC) to address both the bone and soft tissue defects. A continuous vacuum therapy was applied to the wound on day 6 postoperatively. On day 14 postoperatively, a piggy back circular frame was applied to the tibia, and a proximal tibial corticotomy was performed. Acute shortening was attempted by performing fibular osteotomy which reduced the bone defect to six centimeters (fig 2).

Segmental bone transport was commenced one week later, while the vacuum therapy was

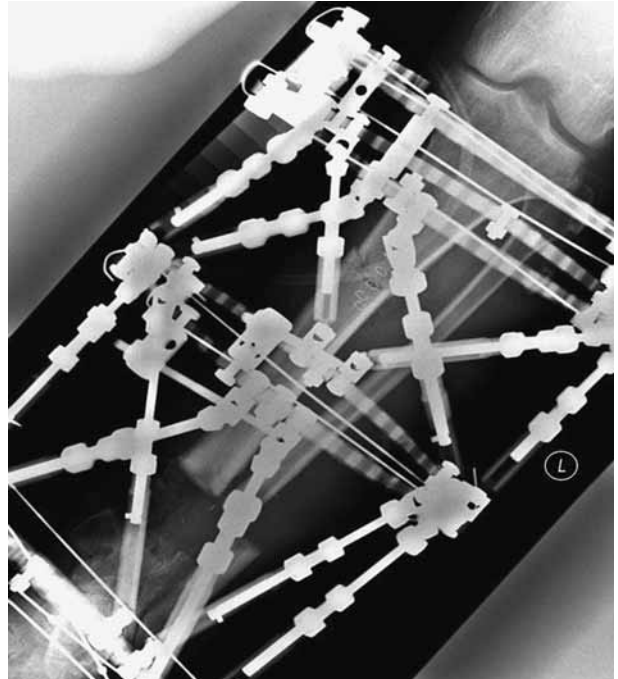


Fig. 2. — AP radiograph of the leg illustrating the proximal corticotomy and fibular osteotomy.

continued at home simultaneously. After six weeks of bone transport and vacuum therapy, we noted that there was not only a remarkable growth of granulation tissue that filled the soft tissue defect and covered the bone (fig 3), but also satisfactory early signs of bone union across the docking site (fig 4). VAC therapy was discontinued at this stage and skin grafting was performed.

DISCUSSION

Vacuum-assisted wound closure was originally developed as an alternative treatment for debilitated patients with chronic wounds. It has rapidly evolved into a widely accepted treatment in the management of traumatic wounds after débridement, infection after débridement, and fasciotomy wounds for compartment syndrome (1,19). Venturi *et al* (16) suggested its use in wounds with exposed bone and hardware, diabetic foot ulcers, and venous stasis ulcers. VAC was also used as a dressing for anchoring an applied split-thickness skin graft (17).

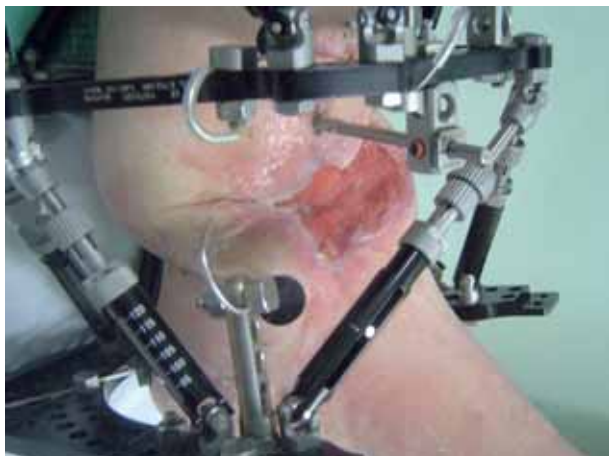


Fig. 3. — Photograph of the wound taken 6 weeks following VAC therapy.

Use of VAC therapy has been found to enhance debridement of wound debris, mechanical reduction in the size of the wound and stimulation of granulation tissue formation (11). Stannard *et al* (14) suggested that angiogenesis, increased blood flow, and decreased interstitial fluid could be the mechanisms enhancing wound healing. Wongworawat *et al* observed an average of 43% reduction in the original size of the wound (18).

VAC has been used successfully in the treatment of open tibial fractures (4,8,9). Parrett *et al* (13) noted a significant change in practice, with a trend down the reconstructive ladder, currently using fewer free flaps and more delayed closures and skin grafts with frequent use of VAC therapy. Similar findings were noted by Hardwicke and Paterson and Bollero *et al* (3,7).

Orthopaedic wounds especially when they are infected, with or without exposed metal work, are difficult to close and can be problematic. Good results were noted with VAC in sternal, spinal and calcaneal osteomyelitis cases (2,5,6,20). A severe combined bone and soft tissue loss in the extremities is the most challenging situation for a limb reconstructing surgeon. Acute shortening of bone to facilitate wound closure, followed by lengthening using a circular frame has been described in the literature (10,12). There is only one paper which reported a technique similar to the one described

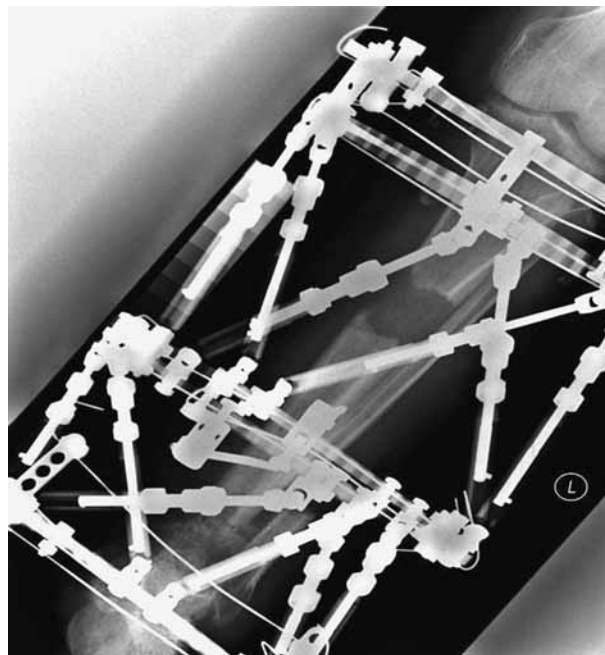


Fig. 4. — AP radiograph of the leg taken at 6 weeks, illustrating the early signs of bony union at the docking site.

here (15), but the study group involved patients who sustained high-energy fractures, not patients who suffered bone and soft tissue loss due to osteomyelitis.

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