

Case Report

Case Presentation of Soft Tissue Defect after Bimalleolar Fracture Osteosynthesis

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ABSTRACT: A 59-year-old patient presented in the ER with wound dehiscence and skin necrosis on the right ankle, with osteosynthesis implant visible, after open reduction and fixation with plate and screws, performed abroad, 16 days prior to the presentation, for a bimalleolar fracture. The patient was admitted to the plastic surgery department, where surgical debridement of the necrotic tissue was initially performed. Postoperatively, the patient was treated with Negative-pressure wound therapy (VAC dressing) and Platelet rich plasma (PRP) therapy. Upon obtaining granulation tissue without signs of infection, a sural fasciocutaneous flap was performed to cover the skin defect. Proper graft integration and healing was observed.

KEYWORDS: infection, negative-pressure wound therapy, tissue grafts, osteosynthesis, platelet-rich plasma

Introduction

VAC therapy (also referred to as Negative-Pressure Wound Therapy-NPWT). Is a wound handling system that uses negative, sub-atmospheric pressure applied to the wound bed, in order to extract any pathological secretions from the interstitial space, as well as promote blood flow, which in turn stimulates granulation tissue development at the wound site [1,2,3]

Orthopaedic implants used for fracture treatment are especially prone to infections [4,5] these infections associated with plate osteosynthesis of a bimalleolar fracture are known to be difficult to treat [6], due in part to the lack of muscle coverage in the distal part of the peroneus and the tibia [7,8]. Wound infection following an open reduction of a fracture and plate osteosynthesis can and usually leads to implant and fracture site infection which in turn can develop into septic pseudarthrosis [9,10].

The aim of this study is to present the introduction of a new management system (VAC therapy) in the treatment algorithm for an infected post plate osteosynthesis wound in the hopes of avoiding possible long-term complications

Discussion

A 59-year-old male presented to the Emergency Department with a surgical scar on his right tibial malleolus with extensive skin necrosis of the wound and surrounding tissue, pathological secretions and osteosynthesis material protruding through the wound (Fig.1).



Fig.1. Clinical presentation

Through careful anamnesis we could find that he had a bimalleolar fracture of his right ankle while working in Belgium 17 days prior to presentation. The physicians there debrided his wound, performed osteosynthesis with plate and screws, and closed the wounds by using surgical staples on the peroneal malleolar wound and surgical thread knot by knot technique on the tibial malleolar wound. After the surgery, he requested to leave the hospital contrary to medical indication and assumed responsibility for this by signing in the Belgian Orthopaedic Department observation chart.

He returned to his home in Romania and completely neglected his surgical wounds, not applying sterile bandage and leaving his wounds bare and exposed. The surgical scar located on his tibial malleolus started to exhibit signs of unfavourable wound evolution 13 days prior to presentation, but the patient did not seek medical attention at this time. The unfavourable wound evolution continued until his presentation in the Emergency department with above mentioned visible traits.

He was first seen by the Orthopaedic department and it was established that his fractures have been surgically resolved and he should be referred to the Plastic Surgery and Reconstructive Microsurgery (Plastic Surgery) physician on call. He was admitted to the Plastic Surgery Department. At the time of admission his laboratory results were in normal parameters. A written informed consent for the publication of data in scientific journals was obtained from the patient.

He was given a primary debridement and bandage in the Emergency Department prior to his admittance to the Plastic Surgery ward.

The same day he was admitted, under spinal anaesthesia, an extensive debridement of the necrotic tissue around the surgical scar was performed while obtaining a swab of the secretions for microbial culture and antibiogram, followed by deep lavage of any remnant pathological secretions with antiseptic solutions. At the end of the procedure his wound presented with a significant skin defect, visible bone and osteosynthesis material that were impossible to cover and close by surgical suture of the tissues. A VAC therapy bandage was applied according to specific protocols and guidelines [11,12,13]. The VAC therapy was set to a continuous negative pressure of 140mmHg. The patient was put on a broad-spectrum antibiotic (III generation Cephalosporine), Ceftriaxone 2g/day. The VAC dressing was changed once every

48 hours, by using local anaesthesia and thoroughly removing any developing necrotic tissue followed by local antiseptic solutions. Continuous negative pressure was applied for the first 48 hours. After this it was switched to intermittent negative pressure (5 minutes ON, 2 minutes OFF) according to protocol [12]. The antibiotic was discontinued after the first 10 days of VAC therapy treatment, when the patient's wound stopped exhibiting any clinical signs of a possible infection [14]. At this moment the decision was made to use Platelet Rich Plasma (PRP) [15] in order to enhance the healing process. The PRP solution was prepared by drawing 80 ml of blood from the antecubital vein, by using a 18G needle (pink) in order to not cause mechanical injury to the thrombocytes in the drawing process. The blood was collected in a sterile sodium citrate coated tube and was subjected to two centrifuge processes. The first was at 1800rpm for 15 minutes in order to properly separate erythrocytes and the second at 3500rpm for 5 minutes in order to separate the platelets. This resulted in 9 ml of PRP solution which was mixed with 0.0425mL of 10% calcium chloride per 1 mL of PRP in order to activate the thrombocytes [16,17,18]. The PRP was injected in the newly developed granulation bed and in the wound circumference. After the PRP injection the patient was left for 24 hours without a VAC bandage in order to properly allow the concentrated thrombocytes to disseminate in the tissue. VAC therapy was continued for 3 days. After a total of 14 days from the first surgery and the appliance of the VAC system, a well vascularized granulation tissue had formed (Fig.2).



Fig.2. Wound after VAC Therapy

The VAC system was carefully observed throughout for any failures, such as the coloring of the VAC tubing system in red, which would be indicative of a blood vessel rupture or the development of necrosis outside of the wound area possibly due to high negative pressure [19].

After the 14 days of VAC therapy, surgery was again performed-a two-step surgical sural fasciocutaneous flap. An elliptic-teardrop shaped flap was fashioned. Dissection was begun proximally and carried on distally, to the deep fascia; the sural nerve and artery were identified. The pedicle was dissected and the flap was elevated and pivoted in place. After short inspection, faint signs of ischemia of the flap were observed, as prolonged capillary refill. It

was decided to leave the flap in place in order to observe the evolution of the flap.

After a period of 7 days the flap was lifted from its place and placed over the wound. The periphery of the flap showed signs of ischemia and necrosis (Fig.3) and had to be removed. The remaining flap was sufficient to cover the wound site. This provided sufficient coverage, in order to properly seal the osteosynthesis material, exposed bone and surrounding tissue [20]. The donor site was covered by using a split skin graft. The flap was bandaged with sterile materials every day and local evolution was observed for another 10 days with daily wound care procedures [21].



Fig.3. Flap prior to wound coverage

31 days after presenting to the Emergency Department his wound presented good integration of the skin graft and flap, no donor site complications, dry with no pathological secretions and was thus considered satisfactory to be discharged from the Hospital.

This case is important because it deals in a controversial matter regarding VAC therapy, infected wounds, fractures, open reduction with internal fixation material [22], in combination with PRP and followed by a fasciocutaneous flap [23,24,25].

The known literature shows examples of osteosynthesis plate infections treated by retaining hardware, irrigation, debridement and antibiotic treatment with a success rate of 68-71% and an average infection healing

period of 130 days. Clinical healing occurred after 31 days in our case, thus proving the value of the VAC+PRP solution for such cases.

Conclusions

This case proved the value of VAC therapy in a wider spectrum of pathologies. The application of NPWT on infected wounds with osteosynthesis materials showed improved cleansing of the site, assisted in the proliferation of granulation tissue and shortened the length of hospital stay, improving the healing process overall.

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