Original Case Series

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Evaluation of Outcome of Vacuum Assisted Closure of Wounds in Orthopaedics and Trauma: A Clinical Study

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Abstract

Background: Wound healing is a complex process which includes removal of dead tissues, control of bacterial load, control of inflammation, increased blood flow, formation of granulation tissue, contracture, remodeling of connective tissue matrix and finally maturation. This usually requires lengthy hospital stays and expert nursing home care which is not always possible. Vacuum assisted closure (VAC) also called as Negative pressure wound therapy (NPWT) is a new modality of managing chronic and acute wounds.VAC therapy accelerates process of wound healing, thereby, reducing hospital stays and cost of treatment. The aim of our study was to evaluate the efficacy of locally constructed Negative pressure wound therapy in orthopaedic patients with acute and chronic wounds. *Materials and Methods:* VAC was applied after thorough debridement in 21 patients from orthopaedic inward department, Government medical college, Latur, Maharashtra, India. Initial assessment of all the wounds was done. After the thorough debridement, vacuum assisted closure of wounds was done. Negative pressure is set to in between 120-150 mm of Hg. *Results:* Analysis was done with visual inspection of wounds and end point was taken as completely granulated wound, free of discharge and ready for skin grafting or spontaneous healing with secondary intention. Age distribution of the patients was between 25 to 63 years with mean age of 43 years. There was rapid progress in the wounds with respect to decrease in oedema, formation of granulation tissue, reduction in the size of wound. We were able to cover wounds earlier. This also has reduced hospital stay of the patients and reduced the cost of treatment by a great margin. *Conclusion:* VAC therapy proves to be a safe and effective treatment modality for soft tissue injuries.

Keywords: Vacuum Assisted Closure (VAC); Negative Pressure Wound Therapy (NPWT).

Introduction

Acute and chronic wounds contribute a major share in orthopaedically ill patients. These are major causes of morbidity and also impair the quality of life. Wound healing is a complex process which includes removal of dead tissues, control of bacterial load, control of inflammation, increased blood flow, formation of granulation tissue, contracture, remodeling of connective tissue matrix and finally maturation [1].

High energy fractures are increasing in numbers and these requires both soft tissue and bony stability. In these types of injuries, treatment involves thorough and meticulous debridement. This results in tissue defects which precludes primary closures, delayed primary closures, secondary closures or healing by secondary intentions. This usually requires lengthy hospital stays and expert nursing home care which is not always possible. This also increases financial burden on patient's part.

Vacuum assisted closure also called as Negative

pressure wound therapy is a new modality of managing chronic and acute wounds. The principle of this therapy involves the application of uniform sub atmospheric pressure, which helps draw interstitial fluid from wounds, thereby, accelerating granulation tissue growth and faster wound healing. This reduces significantly period between the debridement and definitive surgical closure [2,3].

This also reduces effective hospital stay and treatment cost of the patient. Vacuum assisted closures reduces interstitial and serous fluid from wound, reduces bacterial load and oedema, promotes angiogenesis, increases blood flow and hence oxygen supply and increases granulation [4].

The aim of our study was to evaluate the efficacy of locally constructed Negative pressure wound therapy (NPWT) in orthopaedic patients with acute and chronic wounds.

Material and Methods

VAC was applied after thorough debridement in 21 patients from orthopaedic inward department, Government medical college, Latur, Maharashtra, India. The inclusion criterion was chronic ulcers, post traumatic large wounds with defect and pressure sores. The exclusion criterion was wounds with bony infection, bleeding wounds, malignancy, patients with allergy to adhesive dressings, wound with fistulas, patients on steroid or immunosuppressive therapy and wounds with exposed neurovasculature.

The materials that were used for the VAC therapy were easily available in the hospital. Initial assessment of all the wounds was done. After thorough debridement, vacuum assisted closure of wounds was done. A single layer of wet gauge was applied over the debrided wound. Sterile foam was cut just larger than the size of bed of wound. Sponge was cut horizontally in two parts partially and Ryle's tube was put in between the layers of sponge through a slot. Sponge was secured in an airtight environment over the wound with the help of sterile surgical adhesive dressing. The other end of Ryle's tube was connected to wall mounted central suction tubings. Negative pressure is set to in between 120-150 mm of Hg. Negative pressure was applied for a period of 5-7 minutes every hourly for 4 days.

Results

Our study consists of 21 patients. Analysis was done with visual inspection and end point was taken as completely granulated wound, free of discharge and ready for skin grafting or spontaneous healing with secondary intention. Age distribution of the patients was between 25 to 63 years with mean age of 43 years. RTA was found to be the most common cause with 19 (90.47%) patients, followed by industrial injury in 01 (4.76%) patient and 01(4.76%) patient with an injury by fall from height. Out of 21 patients 16 (76.19%) were male and 5 (23.80%) were female patients. Throughout the treatment, all the patients remained comfortable. 02 of the patients felt intense pain at the initiation of negative suction but the pain was reduced after the suction pressure was decreased. We were not able to measure the amount of discharge through the wound as of a sponge over wound and also as of coagulation of discharge partially. We have found rapid progress in the wounds with respect to decrease in the oedema, formation of granulation tissue and reduction in the size of wound. We were able to cover wounds earlier. This also has reduced hospital stay of the patients and reduced the cost of treatment by a great margin.

In 17 cases, we were able to cover the wounds by skin grafting. 02 cases healed simultaneously with secondary intention. In one of the patients, wound was over the anterior aspect of lower third of tibia with soft tissue defect and the bone was exposed. It was covered with local rotational flap. In one of the patients, wound was extending anteromedially over ankle joint exposing tendo achilles. In this particular case, SSG was done and the wound was healed eventually with secondary intention.

Discussion

Soft tissue defects from post traumatic causes, chronic non healing ulcers, diabetic ulcers, pressure sores constitutes major causes for long hospital stays of the patients worldwide. VAC or Negative pressure wound therapy has been used successfully to help prepare wound beds for rapid definitive wound closure procedures. The contraindications for the use of VAC therapy are malignancy, fistulae at the site of wound, patients on immunosuppressive or steroid therapy, wounds with underlying bone infections. The mechanism of action of VAC therapy is to create negative uniform sub atmospheric environment, thereby, reducing tissue oedema, promoting angiogenesis, improving vascularity and oxygen supply, formation of granulation tissue and contracture of size of wound [5,6,7].

Increased blood flow and application of sub

atmospheric pressure to the wounds decreases bacterial colonization [2].

Increase in circulation and oxygenation to compromised tissue enhances resistance to infection [8].

Also, increased blood flow provides greater amounts of oxygen available to neutrophils for oxidative bursts which eventually decreases bacterial load by killing them [9].

Compound injuries with large defects have high chances for delayed and non union. Early coverage of bones, tendons and neurovascular structures is crucial for better results. VAC therapy help reduce the time between initial debridement and definitive procedure to cover the wound. Also, the biggest advantage of VAC therapy is reduced number of dressings required compared to conventional dressing therapy. It also has reduced financial burden. We were able to do early definitive fixation for bony injuries in these patients.

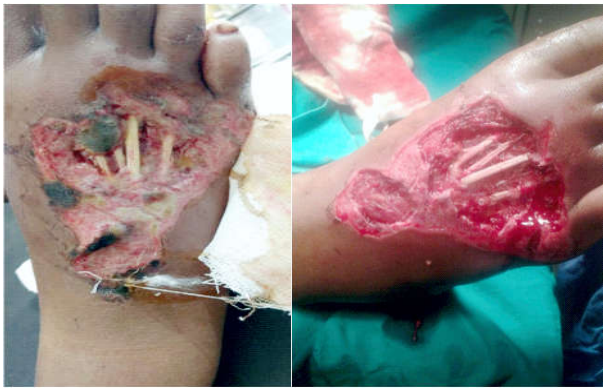
In our series, we have used the material that is easily available in our hospital. Also, we have used readily installed central suction bedside units in our hospital for suction purpose. This way we were able to achieve better results effectively and efficiently while cutting the cost of treatment at the same time.

VAC therapy proves to be safe and effective treatment modality for soft tissue injuries.

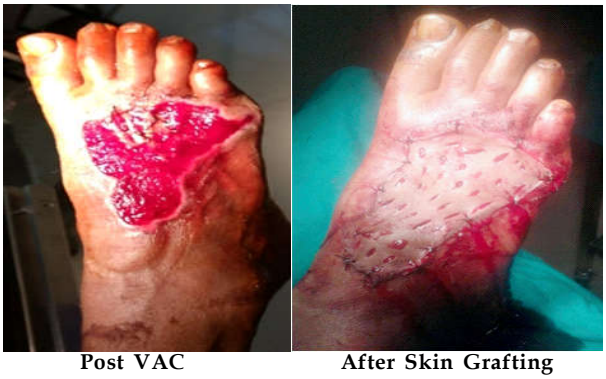
Cases

Case 1

25 years male patient with h/o RTA with degloving injury over the dorsal aspect of Rt foot came to our hospital, 8 days after injury. The wound was assessed, debridement was done and VAC dressing was applied. After visual assessment of healthy granulation tissue, skin grafting was done as a definitive procedure.



PRE VAC **After Debridement**



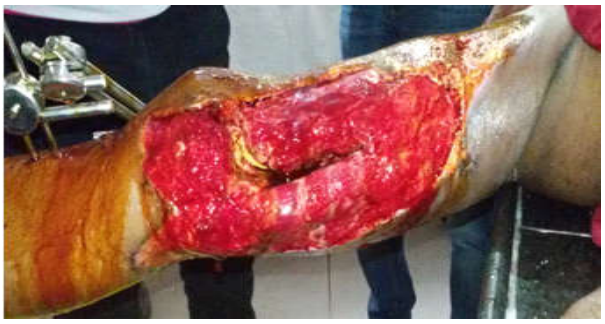
Post VAC **After Skin Grafting**

Graft Accepted

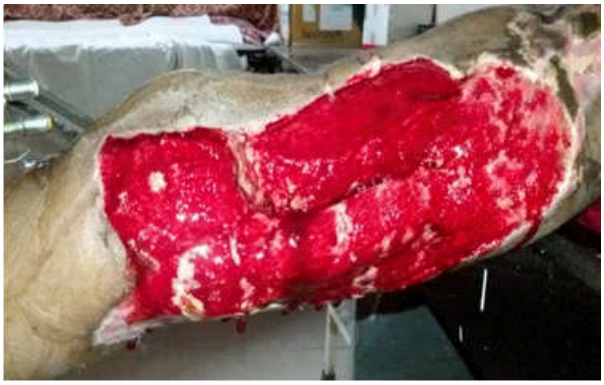
Case 2

25 years female patient with h/o RTA with Gustilo Anderson's compound Grade III B segmental fracture Rt femur with intercondylar extension with degloving injury over anteromedial aspect of Rt thigh came to our hospital. Thorough debridement with bony stabilization was done and VAC dressing was applied. Skin grafting was done after appearance of healthy granulation tissue.

Pre VAC

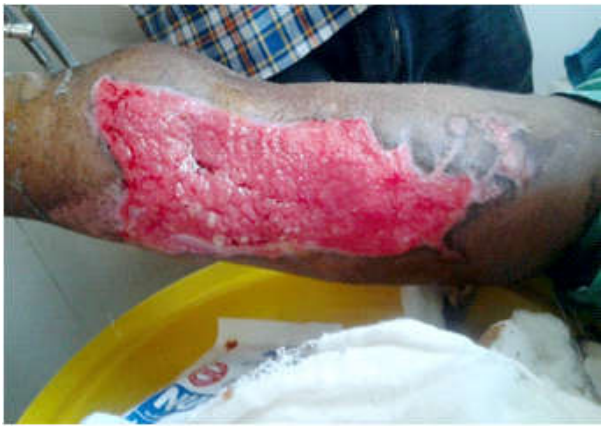


Post VAC 1

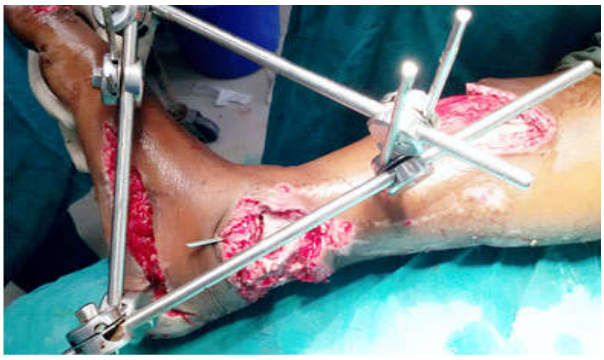


Post VAC 2

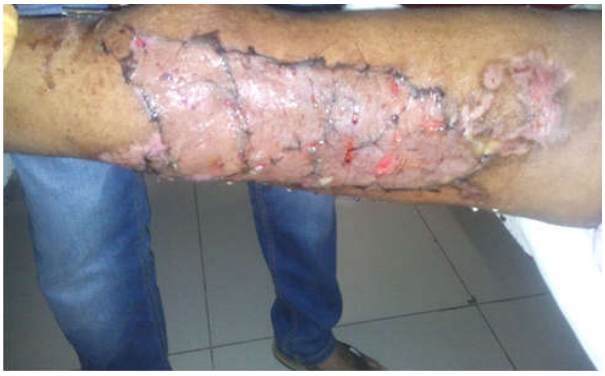
Pre VAC



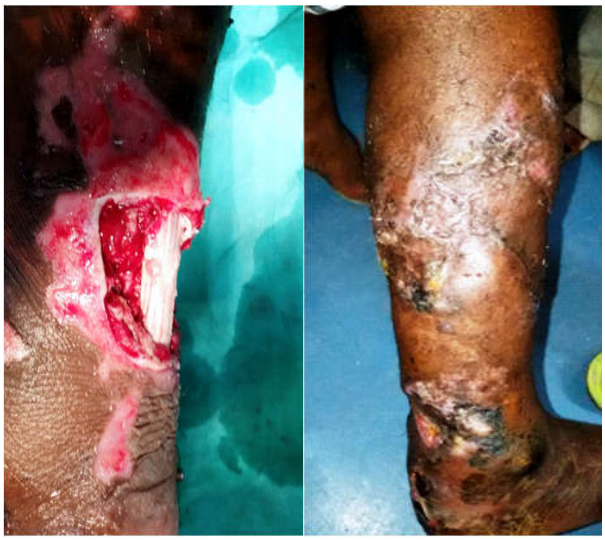
Post VAC 3



Post VAC



Skin Grafting



Post Vac With Exposed Ta **Final Healing**

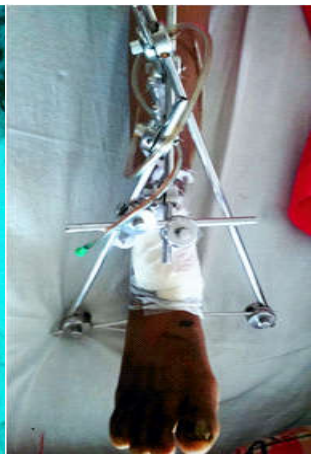
Case 3

28 years male patient with h/o RTA with closed fracture Rt shaft femur with Gustilo Anderson's Grade III A fracture dislocation Rt ankle joint with degloving injury over anteromedial aspect of Rt ankle joint extending posteriorly and over anterolateral aspect of Rt lower leg with tendon injury. Thorough debridement with bony stabilisation with external fixator was done. VAC dressing was applied. Skin grafting was done after appearance of healthy granulation tissue.

Case 4

35 years male patient with h/o RTA with Gustilo Anderson's Grade III A fracture Rt lower third tibia came to our hospital. After meticulous debridment VAC dressing was applied. Skin grafting was done after appearance of granulation tissue.

Pre VAC



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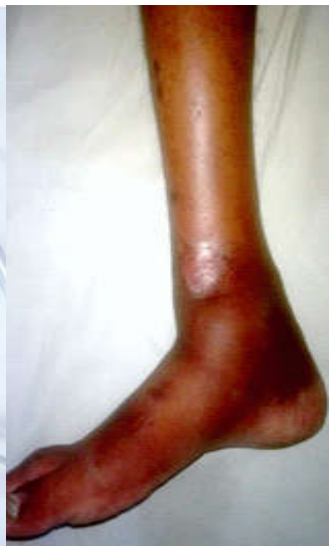
Post VAC



Final Healing

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