Original article:
Vacuum assisted closure (vac)- our experience
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Abstract
Objective- To assess the efficacy of VAC therapy in management of chronic ulcers in our institution.
Materials and method-case records of patients with chronic leg ulcers presenting at the surgery unit in Father Muller Medical College Mangalore, who were managed using the vacuum assisted closure (VAC) device were reviewed. The period of study was from January 2014 to December 2015.
Result- A total of 98 patients were on VAC in this period of time of which 20 patients had VAC applied over skin grafted wound. All 78 patients had positive results with the graft uptake being 100% in all 20 patients.
Conclusion- The use of VAC therapy is effective and a safe adjunct to conventional and established modalities for management of chronic ulcers and also exceptionally effective in venous traumatic and even post mesh-grafted ulcers.

Key words- VAC therapy, chronic venous ulcer, negative pressure dressing

I. Introduction
Vacuum assisted therapy (VAC) is the controlled use of subatmospheric pressure to a wound by applying negative pressure through specialized open pore foam dressing to help promote healing by removing fluid from open wounds, which reduces edema and improves local circulation by opening collapsed capillaries and promoting granulation tissue formation.
VAC has been shown to accelerate debridement and promote healing in many different types of wounds. The optimum level of negative pressure appears to be around 125 mmHg below ambient and there is evidence that this is most effective if applied in a cyclical fashion of five minutes on and two minutes off. It also decreases tissue bacterial levels. Additionally, mechanical deformation of cells is thought to result in protein and matrix molecule synthesis, which increases the rate of cell proliferation. Despite the significant costs involved, the technique is said to compare favourably in financial terms with conventional treatments in the management of difficult to heal wounds.
Chronic ulcer include diabetic foot, chronic venous ulcers and traumatic non healing ulcers.
Diabetic foot is an umbrella term for foot problems in patients with diabetes mellitus. Foot disorders such as ulcerations, infection and gangrene which are the most common and complex and costly sequel of diabetes. The optimal therapy for management of diabetic wound is limited to this date.
Several million patients suffer from non healing wounds in a variety of anatomical locations, costing health systems millions of dollars. The cost and management of these wounds varies in different centres. Prior to the advent of wound VAC the treatment of non healing wounds consisted of traditional modalities such as wet to dry dressings, debridement, and topical antibiotics...
with closure of these wounds taking several weeks or months. The advent of wound VAC has substantially increased wound closure rates and reduced morbidity and health costs for many patients.

II. Materials and methods

There were 98 patients obtained in this retrospective study with ulcers of different etiology like chronic venous ulcers, diabetic ulcers, cellulitic post debridement ulcers and traumatic ulcers. and also 20 of the 98 patients underwent VAC therapy on the mesh skin grafted ulcers.

Data was collected for age sex, predisposing factors duration of vac treatment and wound healing rates and graft uptake in case of grafted ulcers.

The patient underwent operative and non operative debridement until unhealthy bleeding tissue and bone were removed. In the 10 patients VAC was applied on the meshed, skin grafted wounds. It was initiated by placing a foam dressing in the open wound or over the skin grafted ulcer. The polyurethane foam has a non collapsible evacuation tube embedded, a vacuum pump and a transparent adhesive tape. The foam is cut and contoured to fit the size of the wound, the foam is then connected through the evacuation tube with a vacuum pump. The wound is then sealed with an adhesive tape ensuring equal distribution of pressure in all spaces within system. The suction generates enough vacuum in the wound, producing a high contact zone in the wound foam interface and a vacuum seal is then achieved. The evacuation tube is connected to a caniater and the latter is connected to the adjustable vacuum pump which generates a negative pressure between 125-200mm of Hg. The dressing was removed once there was no discharge in the canister or 6-7 days whichever is earlier. and the wound was inspected for healing, size and granulation tissue whether the grafts are taken.

III. Result

The VAC therapy was tolerated well by all patients and remained comfortable and mobile with the device insitu there was progressive diminision in size of wound and granulation tissue was evident in all cases. Removal of the VAC was done after an median of 10 days (range 3-23 days).

1. Sex distribution

Out of 98 patients, 65 were male patients and 33 were female patients.

![Sex distribution](image1)

fig:1 sex distribution

2. Etiological distribution

Out of 98 patients most common were venous ulcers, then diabetic ulcers and then traumatic ulcers mostly in young age group and grafted patients were 10.

![Age distribution](image2)

fig:2 age distribution

Of 98 patients, 6 were of age between 20-30 most of them were with traumatic ulcers. 40-60 years age group were diabetic foot cases in majority.
Of 98 patients, 74 patients had VAC therapy as 1 setting, whereas 20 of them had 2 settings of VAC therapy and 4 of the patients had VAC therapy in 3 settings of which 3 were diabetic ulcers and 1 was venous non healing ulcer.

IV. Discussion

Surgical drainage is fundamental to surgical practice and is used with the aim of minimising postoperative collection formation and wound healing problems. The first case with negative pressure treatment of pressure ulcers and chronic wounds was described in 1993 by Argenta et al. Since then it has been used in variety of wounds including diabetic ulcers, abdominal wounds, sternal wounds, and spinal wounds. The device also has been shown to reduce edema, bacterial colonization, and reduces excess fluid. These effects seem to shorten the duration of wound healing. It has been suggested that successful healing correlates with less than $10^3$ organisms per gram tissue. The number achieved with wound VAC therapy is usually less than $10^3$.

Complications in the wound VAC are infrequent if the patient population is properly selected. These include bleeding from wound at the time of sponge change due to excessive growth of granulation tissue into the sponge if it has been left in place longer than 5 days. Pain is short lived and can be controlled with oral analgesics. Allergic reaction to drape have been reported as well managed with topical steroids and antihistamines. VAC therapy has helped treat more than 8,00,000 patients globally in all care settings from acute to extended home care settings. Uptodate there are over 300
peer reviewed articles published as the body of clinical evidence which support VAC therapy. Soft tissue loss from infections, vascular and traumatic disorders, often results in poor healing and painful wounds, where VAC therapy has been used as an adjunct to prepare the wounds for definitive treatment at a later date. The contraindications for application of VAC therapy are presence of fistulae related to the site of VAC therapy, necrotic tissue in the eschar, untreated osteomyelitis and malignancy in the wound.\(^\text{10}\) Research endeavours are underway to elucidate the biochemical effects induced by VAC therapy and it is hypothesised that the application of micromechanical forces may stimulate wound healing through promotion of cell division, angiogenesis and local elaboration of growth factors.\(^\text{11}\) The physiologic changes facilitate the removal of bacteria from the wound.\(^\text{12}\) Additionally the cyclical application of subatmospheric pressure alters cytoskeleton of the cells in the wound bed, triggering a cascade of intracellular signals that increases the rate of cell division and subsequent formation of granulomatous tissue.\(^\text{13}\) Graft movement, fluid accumulation under the graft or infection are key reasons for failure of successful graft take. In case of VAC placement following meshed skin graft, once the negative pressure is applied, the graft is immobilized, fluid removed through fenestration and excellent opposition maintained even in areas with an irregular contour.

1. **VAC on grafted wounds.**

\[\text{fig:7 after 1}^{\text{st}} \text{ application}\]

\[\text{fig: 8 after skin grafting}\]

\[\text{fig: 9 after VAC application over graft}\]

**V. Conclusion**

In our experience the use of VAC therapy assisted healing of the wound simplified the management of wound, both for the patients and the staffs. The limitation of the study being comparison of ulcers of different etiology and cost factor associated with the vac therapy. VAC is an useful adjunct in the management of benign chronic ulcers. It is exceptionally useful in venous and post traumatic ulcers and increases the graft uptake rate.
References


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