Original Research Paper

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General Surgery

ROLE OF VACUUM ASSISTED CLOSURE IN SURGICAL WOUND PATIENTS

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ABSTRACT **Introduction** Delayed wound healing particularly in difficult wounds and in elderly with comorbidities is a major concern. It leads to pain, morbidity, prolonged treatment and require major reconstructive surgery. Vacuum- assisted closure (VAC) can be used as an alternative to the conventional methods of wound management. Use of negative pressure optimises the wound for spontaneous healing or by lesser reconstructive options. The VAC is a non pharmacologic/ non surgical means for modulating wound healing. The application of vacuum reduces edema, infection and increases local blood flow which promote healing. **Methods And Materials** The present study deals with 25 cases. The number of days per cycle and the total number of cycles for which the patient underwent vacuum dressing were noted. All selected cases were studied from admission up to the complete healing of wounds. Final outcome of the wound and complications of vacuum dressing, if any, were also noted. **Results** Most common age group was 40-60 years (48%) with 84% patients being male. 68% belonged to lower socio economic status. Average length of hospital stay was 30 days. Most of the wounds were present over lower limbs (68%). Most common organism cultured was *Staphylococcus aureus* (40%) followed by *Klebsiella pneumoniae* (32%). No patient reported of serious complications of vacuum dressing. **Conclusion** Vacuum dressing is a recent modality of treatment of wounds. Its introduction has changed the course of management of wounds. Based on the data from the present study and other studies available, vacuum dressing results in better healing, with minimal complications, and thus looks to be a promising alternative for the management of various wounds.

KEYWORDS : Vacuum assisted closure, wound, dressing

INTRODUCTION

A wound is defined as an injury creating a disruption in the normal anatomical structure and function of the skin. One of the most common causes for admission in surgical ward is non-healing ulcer, in which diabetes is the most common aetiology. Acute and chronic wounds affect at least 1% of the population. Regardless of aetiology, wounds are difficult to treat if coexisting factors (like infection or diabetes mellitus) prevent regular wound healing. The management of chronic wounds places a considerable burden on health services as it requires considerable manpower, frequent specialist consultation, and adjunct therapies. Fortunately, several important changes in the principles of wound care have taken place in recent decades.

Based on these new insights, a wide range of wound care techniques has been introduced. One of the most significant discoveries in wound management in recent decades was the improvement in wounds with Negative Pressure (vacuum) assisted Wound Therapy (NPWT). VAC is a universally accepted method for dressing. It has proved its efficacy for wound dressing: faster wound healing, shorter hospital stay.

Vacuum Assisted Closure (also called vacuum therapy, vacuum sealing or topical negative pressure therapy) is a sophisticated development of a standard surgical procedure: the use of vacuum assisted drainage to remove blood or serous fluid from a wound or operation site. It promotes wound healing by applying a vacuum through a special sealed dressing. The continued vacuum draws out fluid from the wound and increases blood flow to the area. The vacuum may be applied continuously or intermittently, depending on the type of the wound and clinical objectives.

The dressings used for the technique include open-cell foam dressings and gauze, sealed with an occlusive dressing intended to contain the vacuum at the wound site. NPWT devices allow delivery of fluids, such as saline or antibiotics to irrigate the wound (intermittent removal of used fluid supports the cleaning and drainage of the wound bed.)

METHODS AND MATERIALS

The study of 25 cases was conducted in the Department of Surgery of a tertiary care teaching hospital over a period of 3 years.

Inclusion Criteria:

All patients who underwent application of vacuum dressing over a wound site. Wound sites over any part of the body over which vacuum dressing was done.

Exclusion Criteria:

Wound having a fistula to organ or body cavity. Necrotic tissue in wound. Patients who did not consent to the procedure. Patients who took discharge against medical advice before completion of treatment of the wound.

Procedure

Complete clinical history along with co-morbid conditions and associated complications was elicited. Relevant clinical investigations of patients like local part x-rays, Doppler of limbs (if the wound was present on the limbs), wound culture report and routine blood investigations were recorded in case record form. The number of days per cycle and the total number of cycles for which the patient underwent vacuum dressing were noted. Wound parameters like length, breadth, depth, edge, granulation tissue and amount of slough were noted both pre vacuum dressing and post vacuum dressing and the outcome was calculated. All selected cases were studied from admission up to the complete healing of wounds. Final outcome of the wound and complications of vacuum dressing, if any, were also noted.

Ideal Method of application [7]:

It consists of a device that creates a vacuum in the wound using a wound filler of polyurethane foam, polyvinyl alcohol foam dressing or gauze. The foam, or gauze, is adapted exactly after the size of the wound, then the wound filler and the entire wound are covered with a transparent adhesive drape. A hole is cut in the drape and a suction tube is adapted. The tube is connected to the vacuum machine and a sub-atmospheric pressure of normally 80-125 mmHg is applied .

Figure 1. Wound immediately after debridement

Figure 2. Application of vacuum dressing over wound

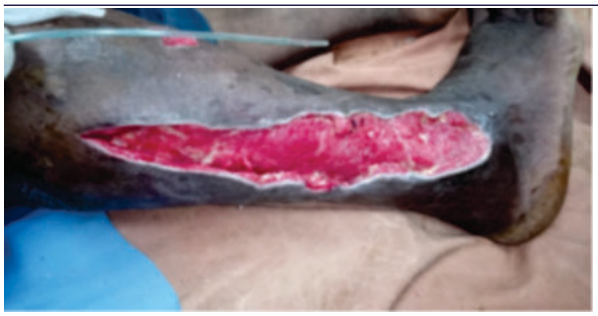

Figure 3. Wound after removal of vacuum dressing after 3 days.

Mechanism of VAC:

1. Wound contraction,
2. Stimulation of granulation tissue formation,
3. Continuous wound cleansing after adequate primary surgical
4. Continuous removal of exudate, and
5. Reduction of interstitial oedema.

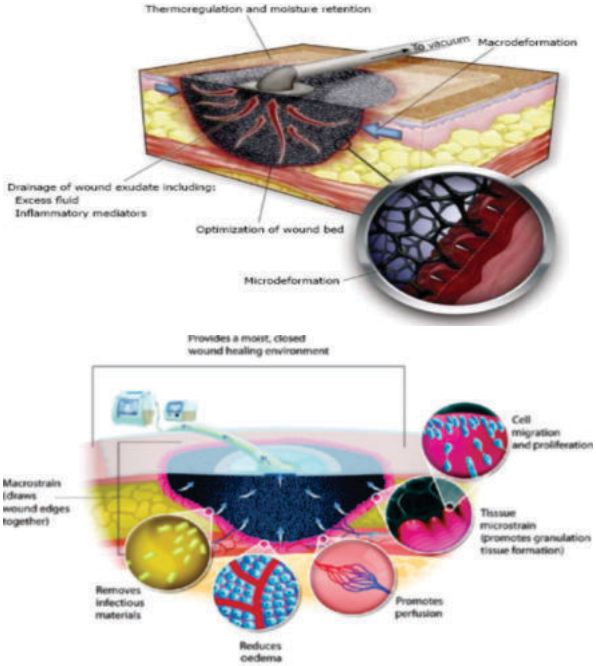

Figure 4. Mechanism of VAC.

Indications of VAC :

Acute/traumatic wounds
Open abdominal wounds
Dehisced sternal wounds following cardiac surgery
Failed Split-thickness skin graft
Fasciotomy
Diabetic foot ulcers
Venous leg ulcers
Pressure ulcers
Post amputation stump infections

Contraindications of VAC :

Untreated osteomyelitis
Non-enteric or unexplored fistulae
Presence of necrotic tissue
Malignant wounds
Direct placement over exposed structures e.g. tendons, ligaments, blood
vessels, anastomosis sites, organs and nerves.
Precautions should be taken for patients with active bleeding, with difficult
wound hemostasis and patients under anticoagulant therapy.

RESULTS

Table 1.

AGE GROUP	NO. OF PATIENTS
31-40	4 (16%)
41-50	6 (24%)
51-60	6 (24%)
61-70	4 (16%)
>70	5 (20%)

Mean patient age in this study is 48 years.

Table 2.

GENDER	NO. OF PATIENTS
Male	21 (84%)
Female	4 (16%)

In this study, 84% affected patients were male.

Table 3.

SITE OF WOUND	NO. OF PATIENTS
Lower limb	18 (68%)
Upper limb	3 (12%)
Abdomen	1 (8%)
Back	3 (12%)

In this study, most of the wounds were found in lower limbs (68%).

Table 4.

AETIOLOGY	NO. OF PATIENTS
Mechanical trauma	3 (12%)
Pressure sore	3 (12%)
Venous insufficiency	1 (4%)
Diabetic foot	8 (32%)
Arterial insufficiency	6 (24%)
Others	4 (16%)

In this study, the most common etiology was diabetic foot followed by arterial insufficiency, mechanical trauma, pressure sore.

Table 5.

COMORBIDITY	NO. OF PATIENTS
Diabetes mellitus	15 (60%)
Hypertension	10 (40%)
Cadiac disease	8 (32%)
Thyroid disease	2 (8%)

Diabetes mellitus is the significant cointributing factor in chronic non healing wounds.

Table 6.

OUTCOME	NO. OF PATIENTS
Split thickness skin graft	9 (36%)
Flap surgery	5 (20%)
Re- debridement	1 (4%)
Secondary suturing	8 (32%)
Revision amputation	2 (8%)

Majority patients underwent split thickness skin grafting or secondary suturing post sessions of vacuum dressing.

DISCUSSION

Out of 25 patients of in my study, most patients were of more than 40 years of age. A study conducted by Christopher engeland et al on effect of age and sex on wound healing suggested that wounds healed significantly more slowly in older adults compared with younger adults (P<.001) regardless of sex. In my study, 84% patients were male and 16% were female. In a study conducted Mangesh et al, 70% patients were male and 30% were female. In my study, average length of hospital stay was 30 days. A study of 48 patients conducted by Tolga Atay et al showed that average period of vacuum-assisted wound closure treatment was 11.6 days and yet the period of the hospitalization was more than 1 month. Most of the wounds were present on lower limbs (68%). In this study, most common aetiology of wound was diabetic foot (32%), followed by arterial insufficiency (24%). In my study, many cases showed growth of multiple organisms simultaneously. Antibiotic Sensitivity reports were collected and patients treated accordingly. Most common organism cultured was *Staphylococcus aureus* (40%) followed by *Klebsiella pneumoniae* in 32%. Out of 25, 6 (24%) patients complained of a tingling sensation and local site itching while the suction was applied. Only 1 (4%) patient had skin reaction. No patient reported of serious complications of vacuum dressing. In the study of 48 patients by Tolga Atay et al , four patients (8.3%) suffered from high pressure-related pain during the

process. Vacuum dressing had a significant effect on the final outcome of wounds. Wounds which seemingly needed a flap surgery in the first impression, with successive application of vacuum dressing cycles, could be covered with a simple split thickness skin graft. In a study conducted by Tolga Atay et al a total of 48 patients, who received vacuum-assisted wound closure. After the wounds became ready for surgery, 15 of them were treated with split thickness skin graft.

CONCLUSION

Vacuum dressing is a recent modality of treatment of wounds. Its introduction has changed the course of management of wounds. Based on the data from the present study and other studies available, vacuum dressing results in better healing, with minimal complications, and thus looks to be a promising alternative for the management of various wounds. Vacuum dressing leads to faster healing of the wounds, therefore decreasing the overall hospital stay. Hence, it is cost effective also. It reduces the inconvenience and discomfort caused to the patient by frequent change in dressings. It helps in reducing size of the wounds, has profound effect on wound depth and granulation as seen in my study. It promotes granulation tissue completely covering the tendon, thus enabling simple techniques (e.g., skin graft) rather than formal flap closure. Wounds with exposed underlying bone and chronic non-healing ulcers can be managed well with vacuum dressing. It reduces the number of amputations and re-debridement required. More number of wounds can be managed successfully with secondary closure or skin grafting after multiple cycles of vacuum dressing. This reduces patient morbidity and minimizes the overall effect on his quality of life. Good outcome of vacuum dressing also depends on its proper application.

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