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Vacuum Assisted Wound Closure for Management of Different Types of Wounds

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ABSTRACT

Purpose: The aim of this study is to compare the effectiveness of Vacuum assisted closure with routine wound dressings for different types of wounds like traumatic wounds, specially open fractures of the lower limbs, post surgical wound dehiscence, gunshot wounds, diabetic foot wounds, deep burn wounds, pressure ulcers and chronic fistula wounds.

Patients and Methods: Forty one patients with different types of acute, subacute and chronic wounds were treated by routine wound dressings and VAC therapy. We used 4 Vacuum assisted closure machines and the study lasted for about 2 years in the Dammam Medical Complex, Dammam, Saudi Arabia.

Results: The Vacuum assisted closure dressing is an important effective tool in the treatment of acute, sub acute and chronic wounds.

Vacuum assisted closure effectiveness was found to be better than the usual routine dressings, resources were better utilized and costs were decreased.

Conclusion: Despite the significant costs involved, the Vacuum assisted closure technique has proved to be more effective and better in financial terms when compared to conventional treatments in the management of difficult to heal acute traumatic, sub acute and chronic wounds.

INTRODUCTION

The Vacuum assisted closure is also called Vacuum therapy, Vacuum sealing and Topical negative pressure therapy.

VAC is a non-invasive, dynamic, controlled, localized negative pressure to promote chronic, acute, sub acute and traumatic wound healing.

History of VAC: Research started in 1989 by Dr. Louis Argenta and Prof. Michael MoryKwas, School of Medicine, North Carolina, USA.

The practice of exposing a wound to subatmospheric pressure for an extended period to promote debridement and healing was first described by Fleisch Mann et al. **[1]**. Following the successful use of this technique in 15 patients with open fracture. They reported that the treatment resulted in efficient cleaning and conditioning of the wounds, with marked proliferation of granulation tissue.

Argenta and M MoryK presented their experience using the vacuum assisted wound closure device **[2]**. They presented their 9 years' experience with 175 chronic wounds, 94 subacute wounds and 31 acute wounds. They reported that the wounds had enhanced granulation tissue and were all treated successfully.

Negative pressure wound therapy in practice is a simple concept that involves creating a negative pressure environment at the wound site. This type of wound management results in decreased wound healing time and facilitate wound care in situations that otherwise might be considered difficult or non healing.

It has become a favored method for wound management because of its simple nature and ability to manage complex wounds with high efficacy ranging from treatment of wounds with exposed bone, tendon, or hardware, to management of acute burn, or even as an adjunct to skin grafting **[3]**.

Before starting VAC therapy, it is important to define treatment aims, objectives and clinical end points. In some circumstances the objective will be to avoid further complications and to control symptoms, rather than to influence the time to healing. Examples of clinical end points for VAC therapy include 50% volume reduction, 80% granulation tissue formation or complete closure **[4]**.

PATIENTS AND METHODS

During the period from October 2006 to December 2008, in the Plastic Surgery Department, Dammam Medical Complex, Dammam, Saudi Arabia, forty one patients had different types of wounds which were treated by routine wound dressing and Vacuum assisted closure therapy. 32 patients were

males and 9 patients were females. Their ages ranged from 7 to 68 years.

Indication of VAC in our study:

1- Chronic wounds: Such as pressure ulcers (4 patients), diabetic wounds (5 patients) and chronic fistula wounds (1 patient).
2- Subacute wounds: Such as surgical wound dehiscence (2 patients).
3- Acute wounds: Such as open fractures of lower extremity (14 patients), gun shot and fasciotomy wounds (1 patient) and deep burns (2 patients).

Application of VAC dressing:

First: A sponge must be selected and cut to fit the wound size. The sponge used most commonly is black, reticulated polyurethane ether foam with pore sizes from 400 to 600Mm. The sponge should be applied so that it fills the wound without overlapping on to normal skin, if possible.

Second: An important aspect of application relates to creating an air tight seal. The seal is created by applying an adhesive occlusive dressing over the sponge and on to the surrounding skin. It is critical that the seal be able to withstand the negative pressure without leaking (Fig. A).

Third: The important element is application of the Vacuum. The Vacuum tubing includes a disk at the end to facilitate attaching the tubing to the sponge and creating a good seal. The suction tube is attached to a collection Canister that is attached to an adjustable Vacuum pump (Fig. B).

Usually, continuous 75 to 125mmHg Vacuum pressure is used for most wound types and we increased the pressure up to 200mmHg in some chronic wounds for better effect.

It is recommended that the dressing be changed every other or every third day.

RESULTS

It is believed that the negative pressure helps by the removal of interstitial fluid, decreasing localized oedema, increasing blood flow, decreasing tissue bacterial level, increasing granulation tissue formation, promote healing and decreasing wound size.

The VAC therapy results in reduction in the size and improvement in the granulation for all chronic and subacute wounds and these were covered later by skin grafts.

The VAC therapy results in direct closure of most of the moderate sized acute traumatic wounds without surgical intervension.

VAC effectiveness remains better than the usual routine dressings, resources are better utilized and costs are decreasd.

The following figures show preoperative and postoperative results of some cases with VAC therapy.

Fig. (A): Creating an air tight seal.

Fig. (B): Vacuum equipement.

Fig. (1-A): Gunshot Lt leg with exposed plate.

Fig. (1-B): 2 weeks post application of VAC therapy.

Fig. (1-C): 4 weeks post application of VAC therapy.

Fig. (1-D): Complete closure 2 months post application of VAC therapy.

Fig. (2-A): Crush injury Lt foot and ankle.

Fig. (2-B): 3 weeks post debridement and VAC therapy.

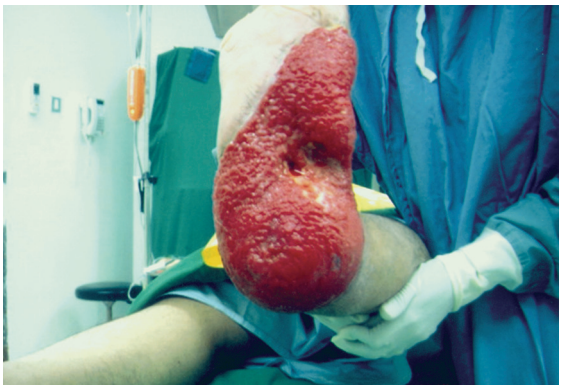

Fig. (2-C): 6 weeks post application of VAC therapy.

Fig. (2-D): Post coverage by skin graft.

Fig. (3-A): Crush injury Rt foot with exposed 5th metatarsal bone.

Fig. (3-B): 2 weeks post application of VAC therapy.

Fig. (3-C): 4 weeks post coverage with skin graft.

Fig. (4-A): Diabetic Lt foot raw area.

Fig. (4-B): Application of VAC machine for the Diabetic Lt Foot raw area.

Fig. (4-C): 2 weeks post application of VAC machine for the diabetic Lt foot case.

Fig. (5-A): Crush injury Rt Foot.

Fig. (5-B): 2 weeks post application of VAC machine.

DISCUSSION

Vacuum assisted closure therapy has helped to improve wound care outcomes and has led to a number of dramatic changes in clinical practice over the last decade **[5,6]**.

VAC therapy should be used after any underlying disease has been diagnosed and managed and after appropriate debridement of non-viable tissue.

VAC therapy can be an effective adjunct to revascularization in Diabetic Foot wounds.

VAC therapy should be used only after surgical drainage of any infection with concomitant systemic antibiotic therapy.

In diabetic foot wound it is not always appropriate to start VAC Therapy immediately following surgery and it may be beneficial to observe the

wound for 1-2 days prior to application and the decision to select VAC Therapy will depend on: Viability of the skin edge, Capillary bleeding, whether the infection has been addressed and necrotic tissue has been removed **[7]**.

VAC therapy is contraindicated in wound malignancy, untreated osteomyelitis, non-enteric or unexplored fistulae and necrotic tissue with Eschar present, presence of exposed organs or blood vessels, active bleeding, patient on anticoagulants and severe wound infection.

VAC therapy can be used for skin grafts to facilitate stabilization of skin grafts and improved donor site healing **[8]**.

Two recent studies found the cost effectiveness to be comparable to traditional wound therapy with clinical benefits **[9,10]**.

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