ORIGINAL ARTICLE

Vacuum Assisted Closure: an Important Armamentarium in Wound Management

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ABSTRACT

Background:: Delayed wound healing is a significant health problem. Failure of the wound to heal also imposes social and financial burdens. Vacuum-assisted closure (VAC) therapy has been developed as adjuvant and an alternative to the standard forms of wound management, which incorporates the use of negative pressure to optimize conditions for wound healing and requires fewer dressing changes.

Aim: To determine the outcome of VAC in term of decrease in wound size and formation of granulation tissue.

Methods: This descriptive case series study was carried out in the Department of Plastic Surgery at Services Hospital, Lahore and patients were admitted in the ward from January 2013 to December 2014. A total of 100 cases were enrolled to determine the outcome of VAC in term of decrease in wound size and formation of granulation tissue. Age and wound size was presented as a mean standard deviation gender and the outcome of VAC therapy were presented as frequency percentage.

Results: Outcome noted in 100 patients, where 90(90%) were having reduced wound size while 10(10%) did not reduce the wound size. Mean decrease in wound size was 32.03±25.12 before and after the application of VAC therapy formation of granulation tissue of VAC in the treatment of complex wound reveals 94(94%) were having formation of granulation tissue while 6(6%) had no formation of granulation tissue.

Conclusion: VAC therapy is an excellent tool in complex wound management.

Keywords: Complex wounds, management, vacuum assisted closure, decrease in wound size,

INTRODUCTIOIN

Injuries of lower leg and foot commonly occur in road traffic accidents and cause significant morbidity. Treatment of high energy lower extremity trauma with soft tissue and bony injury remains a formidable problem. Composite tissue defect, inadequate and tight local tissue and poor circulation make reconstruction a significant challenge. There are many possible surgical options, including skin grafts, local flaps, distant flaps and free flaps, but their usage is limited and problems exist in these regions[1].

The vacuum assisted closure therapy was first reported in 1990[2]. It has revolutionized the clinical management of the wounds. It was popularized by Argenta and Morykwas[3] in 1997. Some authors suggested that it should form part of the reconstructive ladder. It has been successfully used in the setting of wounds complicated by burns, infection, poor circulation, exposed bone or artificial implants and dehiscence[4,5,6]. An open cell sponge is placed in the wound, sealed with an adherent drape, and attached to a tube through which sub-atmospheric pressure is applied[7]. Sub-atmospheric pressure of 125±5mmHg, has been used in most of the studies[8].

It has been reported that the negative pressure facilitates healing by improving the rate of angiogenesis, endothelial proliferation, the integrity of the capillary basement membrane, capillary blood flow, capillary caliber and by decreasing interstitial oedema and bacterial burden within the wound.[9-11] Fabian et al[12] found that use of the vacuum-assisted closure device caused a significant increase in the rate of granulation tissue formation and all eventually achieved 100% wound granulation over a period of 20–45 days (mean, 30 days). VAC therapy is a useful adjunct to the standard treatment of chronic wounds. It is an extremely simple modality and does not require expensive equipment.

In our study we are determining the outcome of homemade VAC therapy in the treatment of complex wounds .It has been seen from previous literature that the success of VAC is high and it avoids use of anesthesia. Only mild analgesia is used. In view of great prevalence of problem in general public considering other modalities of treatment and usefulness of VAC therapy. It will be felt worthwhile to study this method and evaluate its outcome in our population.

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MATERIAL AND METHODS

Study was conducted in the Department of Plastic Surgery, Services Hospital, Lahore and total 100 patients were analyzed from January 2013 to January 2014. Study design was descriptive case series and sampling was non probability purposive sampling.

Inclusion and exclusion criteria: Patients of fifteen to forty years of age, belonging to either gender, post traumatic complex chronic Wound size 5x6cm 20x30cm of lower extremity were included. Patients of known coagulopathy (INR >1.5), chronic liver disease (AST> 40, ALT>60), contaminated wounds, malignant wounds, active osteomyelitis and exposed large vessel in the wound on clinical examination were exclude.

Patients who fulfilled the inclusion criteria were recruited .Informed consent obtained. Soft tissue defects measured in cm by measuring tape. For 1st 24 hours, 125-150mmHg of continuous negative pressure was applied and then continued with intermittent pressure cycles of 40 minutes ON and 20 minutes OFF for the next 24 hours. After 48 hours, the VAC dressing was changed. Wound inspection was done at every dressing, recording color and wound size and photograph were taken. Reduction in the size of the wound was measured in centimeter by a sterilized scale. The wound was washed thoroughly with normal saline and VAC re-applied in operation theater. The same routine continued until a satisfactory clean, granulating wound bed obtained for the definitive procedure (skin graft or flap). Data was collected using a pre-designed proforma. Outcome in term of decrease in wound size and presence of healthy granulation tissue was recorded. The qualitative variables like sex, nature of defect and sensory deficit in both groups presented as frequency, percentage and proportions.

RESULTS

A total of 100 cases fulfilling the inclusion/exclusion criteria were enrolled to determine the outcome of VAC in term of decrease in wound size and formation of granulation tissue. Age distribution of the patients was done which shows that 46(46%) were between 15-20 years and 54(54%) were between 21-40 year of age, mean±SD was calculated as 23.76±6.80 years (Table 1). Gender distribution of the patients was done which shows that 66(66%) were male while 34(34%) were females (Table 2). Outcome (mean decrease in wound size) of VAC in the treatment of complex wound was recorded (Table 3) where 90(90%) were having reduced wound size while 10(10%) did not reduce the wound size. Mean decrease in wound size was 32.03±25.12 before and after the application of VAC Therapy (Table 3). Outcome of VAC in the treatment of complex wound reveals 94(94%) were having formation of granulation tissue while 6(6%) had no formation of granulation tissue (Table 4).

Table 1: Distribution of the patients according to age (n=100)

Age (years)	n	%age
15-20	46	46
21-40	54	54

Mean±SD=23.76±6.80

Table 2: Distribution of patients according to gender (n=100)

Gender	No.	%
Male	66	66
Female	34	34

Table 3: Outcome (mean decrease in wound size) of vac in the treatment of complex wound (n=100)

Mean Decrease in wound size	Male	Female
Reduced	60(60%)	40(40%)
Not reduced	6(6%)	4(4%)

Table 4: Outcome (Formation Of Granulation Tissue) of Vaci in the treatment of complex wound (n=100)

Formation of granulation tissue	Male	Female	%age
Yes	63(15-40)	31(15-40)	94
No	3(15-22)	3(15-18)	6

DISCUSSION

Delayed wound healing is a significant health problem. In addition to the pain and suffering, failure of the wound to heal also imposes social and financial burdens. Vacuum-assisted closure therapy has been developed as an alternative to the standard forms of wound management, which incorporates the use of negative pressure to optimize conditions for wound healing and requires fewer painful dressing changes; it is a recent innovation, which is fast becoming a necessary addition as adjuvant therapy to hasten wound healing[13].

We planned this study to determine the outcome of home made VAC therapy in the treatment of complex wounds. It has been seen from previous literature that the success of VAC is high and it avoids use of anesthesia[14]. only mild analgesia is used. In view of great prevalence of problem in general public considering other modalities of treatment and usefulness of VAC therapy, it may be felt worthwhile to study this method and evaluate its outcome in our population.

In our study 46(46%) were between 15-20 years and 54(54%) were between 21-40 year of age, mean±SD was calculated as 23.76±6.80 years, 66(66%) were male while 34(34%) were females. Outcome (wound size) of VAC in the treatment of complex wound was recorded 90(90%) were having reduced wound size while 10(10%) did not reduce

the wound size. Outcome (formation of granulation tissue) of VAC in the treatment of complex wound reveals 94(94%) were having formation of granulation tissue while 6(6%) had no formation of granulation tissue.

Our findings are in agreement with Fabian et al[12] found that use of the vacuum-assisted closure device caused a significant increase in the rate of granulation tissue formation and all eventually achieved 100% wound granulation over a period of 20–45 days (mean 30 days). Mean wound size decreased from 12.64x9.68cm to 10.4x8.32cm in non-diabetics and from 10.5x8.7cm to 9.0x6.4cm in diabetic patients[15].

Another recent study by Aziz Nather[16] conducted at Singapore to determine the effectiveness of vacuum-assisted closure therapy in the healing of chronic diabetic foot ulcers revealed that VAC therapy was useful in the treatment of diabetic foot infection and ulcers. It was able to prepare ulcers well for closure via split-skin grafting or secondary closure in good time. This reduced cost of VAC therapy, as therapy was not prolonged to attain greater reduction in wound area. VAC therapy also provides a sterile, more controlled resting environment to large, exudating wound surfaces. Large diabetic foot ulcers were thus made more manageable. The difference with this study was that they included chronic diabetic foot ulcers only while we included other complex wounds also.

In this trial an additional benefit observed was the ability of VAC therapy to alleviate bacterial infection in a wound. In the study performed by Morykwas et al[17] VAC therapy achieved a clinically significant reduction in bacterial load of chronic wounds inflicted on a swine model by the fifth day.

Pain was not a predominant feature although some patients complained of discomfort during initial application of VAC; reduction in suction pressure helps to minimize it. In all our patients where VAC therapy was used, wound care was simplified and healing accelerated. The VAC device allowed optimal wound closure by preparing the wound for skin grafting or flap closure when required, in cases where the wounds did not heal completely with VAC therapy. Its use in the perineum presents a challenge, but with proper application, even the most complex perineal wounds can be healed. A cost-benefit analysis revealed that VAC therapy was genuinely cost-effective[18].

The limitation of the study was that we did not include any complications occurred during the treatment and in failed cases, which may be incorporated in further trials. However, in comparison with other studies, we are of the view that VAC application is an effective technique for the management of complex wounds. In our country, it is worthwhile and confidently used.

CONCLUSION

We concluded that the outcome of VAC in term of decrease in wound size and formation of granulation tissue is highly satisfactory and this technique can be used confidently in our population for the management of complex wounds.

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