ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, S Iss 4 ,2022

A Brief Discussion of Vacuum Aided Closure Technique

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ABSTRACT:-

Background: The treatment doctors have always been concerned with how to manage wounds that are challenging to heal. The number of patients coming with wounds that are challenging to heal has dramatically increased. The management of these wounds has traditionally been done using conventional procedures, but not necessarily with the desired outcomes. Therefore, a newer, creative strategy that could be helpful in wounds that are difficult to heal and that produces results that are on par with or better than those produced by conventional techniques is what is required right now.

Keywords: Vacuum Therapy, Vacuum Sealing, Negative Pressure, Negative Pressure Wound Devices, Wounds, Closure, Healing.

INTRODUCTION: -

Damage or disturbance to the typical anatomical structure and function is referred to as a wound. This can cause damage to other structures such tendons, muscles, arteries, nerves, parenchymal organs, and even bone. It can also cause a simple breach in the skin's epithelial integrity. Correct, effective wound treatment is crucial since wound healing continues to be a hard clinical problem. To have a high rate of success with wound healing is the main goal of working clinicians. The relevance of cutting-edge wound care procedures is crucial in nations like India where the risk of wound infection is high due to a number of reasons. The scientific community has always sought out novel and more efficient methods for managing wounds, with a focus on novel therapeutic strategies and the creation of technologies for both acute and chronic wound management. There have been very few notable accomplishments documented in the scientific literature up to this point. Chronic wounds and other difficult-to-manage wounds continue to provide a problem for clinicians despite several breakthroughs.

Negative pressure wound therapy (NPWT) employing vacuum assisted closure (VAC) is one of the comparatively more recent techniques that is very promising and helpful in the management of wounds that are challenging to heal. In this succinct overview, we emphasise the critical role that the negative pressure wound device (NPWD) plays in the efficient healing of wounds. We will also talk about how crucial this method is in a rising nation like India. Fleischmann et al. first reported the use of sub-atmospheric pressure for an extended period of time to promote debridement and healing after the successful use of this technique

ISSN PRINT 2319 1775 Online 2320 7876

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in 15 patients with open fractures in 1993. This practise of exposing a wound to sub-atmospheric pressure is comparatively new. According to their investigation, the treatment strategy of lowering the pressure inside the incision was quite successful. However, Argenta and Morykwas published the first reports on the use of negative pressure wound devices in 1997. It has been demonstrated that applying controlled degrees of negative pressure speeds up debridement and encourages healing in a variety of wound types.

There is evidence that applying negative pressure in a cyclical pattern of five minutes on and two minutes off is the most effective way to achieve this optimal level, which looks to be roughly 125 mmHg below ambient [6]. For establishing the negative pressure, earlier investigations used more traditional techniques such a wall suction equipment or surgical vacuum bottles [6]. However, using these standard procedures came with a number of issues [7]. A commercial vacuum aided closure (VAC) promotion system was released on the American market in 1995 [6]. VAC is also referred to as vacuum treatment, vacuum sealing, or topical negative pressure therapy. The VAC, a piece of equipment, was created to address various issues with traditional techniques for creating negative pressure. A microprocessor-controlled vacuum device at the centre of the system can deliver controlled amounts of intermittent or continuous subatmospheric pressure ranging from 25 to 200 mmHg [6]. Later, this fundamental VAC model underwent a variety of improvements.

The mode of action

Morykwas et al. 1997 [8] made the initial attempt to elucidate the physiological underpinnings of the observed positive therapeutic findings utilising NPWT. Morykwas and associates proposed that a number of mechanisms might be in charge of the VAC's advantageous outcomes [6]. They hypothesised that removing interstitial fluid would reduce localised edoema, improve blood flow, and thus result in a decrease in tissue bacterial numbers. Since then, it has been hypothesised that the application of sub-atmospheric pressure results in mechanical deformation or stress within the tissue, which increases the production of protein and matrix molecules and angiogenesis [9, 10]. The VAC treatment involves applying localised negative pressure to a specific dressing that is placed inside the wound cavity or on top of a flap or graft to help remove interstitial fluid, which reduces localised edoema and improves blood flow. Resulting in a reduction in tissue bacterial numbers. Additionally, the creation of protein and matrix molecules speeds up cell proliferation in response to mechanical deformation of cells [6]. The approach has produced positive outcomes in the research mentioned, and it is also more affordable than traditional therapies, especially for wounds that are challenging to cure [6].

Medical evidence

One of the most crucial therapeutic modalities employed in contemporary wound management is negative pressure wound therapy employing the VAC [10]. There have already been a lot of clinical trials conducted on both humans and animals. The majority of

ISSN PRINT 2319 1775 Online 2320 7876

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these investigations have shown that using VAC is comparable to and occasionally even superior than using traditional wound closure procedures [6]. In 1997, Argenta and Morykwas published the findings of their investigation on 300 humans, 296 of whom responded well to the VAC [4]. Similar to this, a great deal of other papers have discussed the use of VAC in the treatment of a range of wound types, including soft tissue injuries prior to surgical closure [7], extensive degloving injuries [8, 9], different grafting or reconstructive surgery [10], and infected sternotomy wounds. The best therapeutic option, according to Smith et al. 1997's retrospective study of open abdomen management and temporary abdominal closure, is VAC [4]. In a review of 14 RCTs by Vikatmaa et al. (2008), it was found that NPWT was consistently at least as beneficial as the control treatment and occasionally even more so [5]. Other regions in the world have experienced similar events [6].

Additionally, VAC has been utilised to treat donor sites, particularly those that are challenging to treat with traditional methods [7], like the radial forearm [8]. The use of the VAC in the closure of laparotomy wounds was demonstrated by Andrabi et al. in 2007 to be significantly faster and more effective than conventional technique [9]. In the treatment of burns, VAC has also been utilised in conjunction with split thickness skin grafts, and it is touted as being especially beneficial for body areas with deep or irregular contours, such the axilla, hand, or perineum. Many case studies have documented the effective use of VAC in a range of chronic or non-healing wounds. Leg ulcers, persistent pressure sores from a below-the-knee amputation wound, a possible Brown Recluse spider bite, a group of 30 patients with chronic wounds judged inappropriate for reconstructive surgery, 26 of whom reacted satisfactorily to the treatment [4].

The approach

The VAC uses a six-step process. The VAC steps are listed below, as described by Thomas in 2001 [6]: The perforated drain tube is then situated on top of the foam, and a second piece of foam is placed over the top. The foam dressing is first cut with scissors to roughly the size of the wound. A single piece of foam may be used for shallower wounds, and the drainage tube is inserted inside of it. The foam, the first few inches of the drainage tube, and the surrounding healthy skin are then covered with the adhesive transparent membrane that is provided. At this point, it's crucial to make sure the membrane creates a strong seal with both the skin and the drainage tube. When the vacuum is activated, the air is sucked out of the foam, causing it to collapse inward and draw the edges of the wound in with it. Fluid within the wound is taken up by the foam and transported into the disposable container within the main vacuum unit [6]. The distal end of the drain is connected to the VAC unit, which is programmed to produce the necessary level of pressure.

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The cost of health care

Some of the practical issues related to the VAC system's use were examined by Greer et al. in 1999 [7]. Even though the technique appears to be very expensive because it requires spending money on the VAC machine's purchase price or rental fees, it is also necessary to buy disposable foam dressings, drainage tubes, canisters, and adhesive drapes, all of which could easily cost more than 25 per day [6]. However, there are studies of the VAC's cost-effectiveness in the scientific literature [4]. The wound healing process takes less time in the VAC than it does in traditional treatments, which may be one of the causes. According to Moues et al. 2005 research, NPWT had significantly lower nursing costs ($p = 0.043$) but significantly higher material costs (p 0.001) [2]. Future research will be needed to evaluate the cost-effectiveness of VAC therapy to more traditional wound management techniques.

The Indian viewpoint

Public health is one of several difficulties that low income nations are dealing with [3]. There have not been many in-depth reports on the usage of NPWT in Indian studies. Only a few Indian research have offered insights into the application of NPWT in Indian settings. In nations like India, where the patient load on the healthcare facilities is quite enormous, the NPWT utilising the VAC is unquestionably advantageous. There is an urgent need for quicker and less expensive wound healing methods in nations like India, where more than 40% of the population makes less than $1 USD a day and where only a small portion of the government budget is allocated to health. The exponentially expanding population will benefit greatly from the health knowledge regarding the newer, less expensive procedures [7]. Any wound healing approach that will perform as well as or occasionally better than the standard methods in such a situation is unquestionably beneficial [6]. According to Hussain et al. 2012, the VAC offers some benefits, including being simple to use, not requiring hospital admission, high patient satisfaction and compliance, requiring little training to maintain vacuum at home, and providing the patient with enough mobility [6]. For hospitals that are already overburdened, the VAC will also shorten the overall length of stay [7]. Additionally, fewer follow-ups will be done in cases involving the VAC. However, the situation is worse in rural places [5]. Given that VAC is not available everywhere in underdeveloped nations and that using VAC in rural regions is particularly challenging due to concerns with topography, device availability, cost, etc. [6]

CONCLUSION:-

Therefore, it is crucial to use local alternatives for wound care that can be applied in poor nations' rural areas. The results from the published studies thus far indicate that the VAC is a promising technique in the lack of larger trials with suitable sample sizes from various population groups. Analyzing the cost efficiency of the VAC over traditional procedures will be made easier with more study. But until then, the facts from the scientific literature point to

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VAC as a cost-effective therapy that produces comparable or occasionally better wound healing with few major side effects.

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