Our Initial Experience with VAC Suction in the Management of Infected Wounds: A Prospective Study

Shabir Ahmad Mir[1], Mohd Riyaz Lattoo[2], Sajad Ahmad Tak[3], Mushtaq Ahmad Mir[4], Mumtazdin Wani[5]

ABSTRACT

Introduction: Management of infected wounds is not always simple and easy. Vacuum-assisted closure (VAC) is a wound healing therapy that utilizes a dressing system that continuously or intermittently applies a negative pressure to the wound surface. Our aim was to assess the Feasibility and advantages of simplified version of otherwise costly VAC, or simple suction drainage in selected cases.

Material and methods: This prospective study was conducted in the unit 2nd of department of surgery at SMHS hospital, an associated hospital GMC Srinagar, over a period of 3 years from January 2014 to December 2016. During this period, 32 patients were subjected to vacuum suction treatment and were included in this study.

Results: Wall suction (VAC) was used in 26 patients. Mini Vac drain (USG guided) was used in 5 cases. In one patient of scalp infection conventional large size suction drain was used. The time taken for the wounds to become healthy was 3 to 7(average 3.5) days of VAC dressing or suction drainage. No antibiotics were given during suction drainage in 21 patients. Need for grafting by split skin grafting method was felt in only 2 patients. Mild discomfort (abnormal sensation) was reported in 21 patients. Hospital stay for patients managed by suction therapy ranged from12 hours (breast abcess) to 16 days with an average of 7 days. The total cost incurred in the patients undergoing VAC for a period of 15 days per patient was Rs. 800 ($ 12).

Conclusion: VAC seems to have revolutionary potential in the management of the difficult to treat infected wounds as far as its safety, speed and cost-effectiveness are considered.

Keywords: VAC, Wound, Infected, Suction, and Foam

INTRODUCTION

Management of infected wounds is not always simple and easy. Sometimes it becomes quite exhaustive to manage the infected wounds not responding to the conventional management. In such situations VAC suction provides a ray of hope. Wound healing is a complex process that includes cell migration leading to repair and closure. This sequence takes place with the removal of debris, control of infection, tissue granulation, contraction, connective tissue remodelling and maturation. When this sequence fails, a chronic wound without anatomical or functional integrity results.[1] Large wounds can also optimally be managed by VAC suction.

Vacuum Assisted Closure is in fact an active wound therapy first introduced by Morykwas and Argentain 1997 [5].[2] A high bacterial load interferes with the healing process of a wound. Vacuum-assisted closure (VAC) is a wound healing therapy that utilizes a dressing system that continuously or intermittently applies a negative pressure to the wound surface.[3] This surgical technique has been widely used from the last few decades for the management of acute and chronic wounds, and studies have demonstrated to improve wound healing.[3]

It is also known by pseudonyms - TNP (topical negative pressure), SPD (sub-atmospheric pressure), VST (Vacuum sealing technique) and SSS (sealed surface wound suction).[4] Use of VAC suction has extended to multiple types of wounds, like surgical wounds from abdominal, chest and cardiac (heart) surgical procedures.[5,6] Two main factors are considered to be responsible for the dramatic response seen in the wounds one being removal of fluid and other mechanical deformation. Removal of fluid decreases oedema, which decreases the interstitial pressure resulting in increased blood flow. Mechanical deformation causes a wide variety of molecular responses, including changes in ion concentration, permeability of cell membrane, release of second messengers, and stimulation of molecular pathways increasing the mitotic rate of stretched cells.[7] In 1995, a negative pressure wound therapy (NPWT) system, also known as vacuum-assisted closure9 (V.A.C™ Therapy, KCI, San Antonio, TX), became commercially available proving to be highly effective with good outcomes.[8] A randomized controlled trial was conducted in Australia in 2003 using VAC® device (KCI, San Antonio, TX) on pressure wounds, diabetic wounds, skin grafts and deep and complex wounds, which showed faster appearance of granulation tissue with early re-epithelialisation as compared to the standard dressings.[9] One of the greatest drawbacks of the commercially available V.A.C apparatus was the high cost, limiting its use on a daily basis in the financially backward regions.[10] We used a low cost NPWT using the centralized suction apparatus available in the wards with some minor

[1]Ex-senior Resident, Department of Surgery, Government Medical College Srinagar, J& K, [2]Assistant Professor, Department of Surgical Gastroenterology, SKIMS, Soura, J& K, [3]Senior resident, Department of Medicine, Government Medical College Srinagar, J& K, [4]Associate Professor, Department of surgery (Plastic Surgeon), Government Medical College Srinagar, J& K, [5]Professor, Department of Surgery, Anantnag Medical College, Kashmir, J& K; India.

Corresponding author: Dr Shabir Ahmad Mir, Wagar Budgam J&K, 191111, India

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pressure modifications and using material like autoclaved foam and Ryle's tube or intercostal chest tube drain.

MATERIAL AND METHODS

This prospective study was conducted in the unit 2nd of department of surgery at SMHS(Shri Maharaja Hari Singh) hospital, an associated hospital of GMC (Government Medical College) Srinagar, over a period of 3 years from January 2014 to December 2016. During this period, 32 patients were subjected to VAC suction treatment and were included in this study. Subjective as well as Objective assessment of wounds subjected to VAC suction was done after a period of 3 days. We applied a low cost NPWT using the centralized suction apparatus (wall mounted) available in the wards through materials like autoclaved bed foam and Ryle's tube or intercostal chest tube drain. It provided a constant pressure of -125 mm of Hg. The other material used for the vacuum dressings was foam with a thickness of about 1-2 inches which was sterilized in the hospital autoclave unit. A 16 gauze Nasogastric tube (Ryle's tube) or 20-28 Fr intercostals tube was used along with commercially available low cost transparent adhesive film.

The technique used for application of the vacuum apparatus was as follows:

- Debridement of the wound was performed and the adjacent area cleaned with 70% alcohol (spirit).
- Sterile foam was then cut in the shape of the wound and placed on it.
- A Ryle's tube with its perforated end or chest tube drain with its perforated end was kept over the foam.
- Second piece of foam was kept over the tube.
- An airtight dressing was applied over the sponge and tube with the help of a transparent adhesive film with just a small opening for the emerging other end of the tube, thus making it airtight.
- The other end of the tube was connected to the wall mounted centralized suction apparatus.
- A constant suction rate of -125 mm of Hg was provided.
- The pressure was applied continuously during the day as well as at night except for certain periods of ambulation.

The dressing was kept intact for 3 days and the wound was examined on the 3rd day. Sterility was maintained during application of VAC dressing. Care was taken to apply the vacuum dressing under strict sterile conditions. The VAC dressing was applied every 3days till satisfactory results. In some cases Mini Vac (breast abcess) or large size suction (scalp infection) drain suction was used.

RESULTS

A total of 32 patients (table 1 and 2) were included in this study (figure 1- 4). Of these 13 belonged to fire arm category. Others were breast abcess (5), scalp infection (1), diabetic foot (3), bed sore (3), and SSI, i.e., surgical site infection (7). Fire arm wound distribution included lower extremity (9), gluteal region (2) and trunk (2).

The time taken for the wounds to become healthy was 3 to 7(average 3.5) days of VAC dressing or suction drainage.

Location of wounds	Number of the patients
Fire arm wounds	13
Breast abcess	5
Scalp infection	1
Diabetic foot	3
Bed sore	3
SSIS	7

Table-1: Regional distribution of the wounds studied

Location	Number
Leg and thigh	7
Foot	2
Gluteal region	2
Trunk	2

Table-2: Distribution of fire arm wounds

Figure-1: VAC applied to surgical site infection.

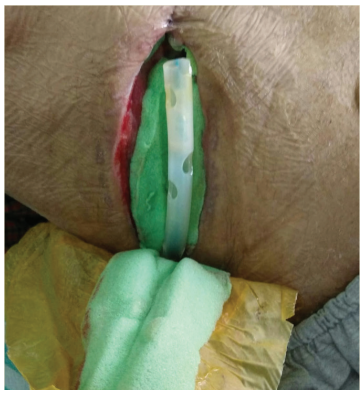

Figure-2: Healthy wound visible as the wrap is removed.

Figure-3: Scalp infection with ROMO VAC suction drain in place.

Figure-4: Scalp infection subsided after a period of suction drainage.

Antibiotic resistance was present initially in 7 cases before the application of suction therapy. No antibiotics were given during suction drainage in 21 patients. Need for grafting by split skin grafting was felt in 2 patients while closure of the wound after becoming healthy was needed in 7 patients. Mild discomfort (abnormal sensation) was reported in 21 patients. Hospital stay for patients managed by suction therapy was 12 hours (breast abcess) to 16 days (average7 days). In cases of wall mounted suction, pressure of -125 mm of Hg was applied.

The total cost incurred in the patients undergoing VAC for a period of 15 days per patient was Rs. 800 ($ 12).

Wall suction (VAC) was used in 26 patients. Baby VAC drain (USG guided) was used in 5 cases. In one patient of scalp infection, conventional suction drain was used.

DISSCUSSION

Ulcers, being on a significant rise due to multi factorial reasons, management of wounds is a constantly developing field of science, seeking ways and methods to promote more efficient, faster, safer and cost-effective modalities.[11] VAC seems to have revolutionary potential in the management of the difficult to treat infected wounds as far as its safety, speed of action and cost-effectiveness are considered. In our study, the total cost incurred in the patients undergoing VAC for a period of 15 days per patient was Rs. 800 ($ 12) which is much lower than the price of costly antibiotics needed otherwise in cases showing resistance to usual antibiotics. In our study average time taken for wound to become healthy was 3.5 days of suction therapy, which is much less than the average time of about 8 days for similar wounds managed by conventional approach. Hospital stay for patients managed by suction therapy was 12 hours (breast abcess) to 16 days (average 7 days).This is much lower than the average stay period in conventional method of about 13 days in our hospital, thus not only reducing the total expenditure for patients, but also reduces the chances of spread of infection to other patients in the ward. Hospital burden due to prolonged stay of patients for management of complicated wounds is reduced.

The VAC suction is not only useful in the eradication of infection but also has cost-effectiveness. It reduces the longer hospital stay and the foci of the infections are eradicated which have an ultimate effect on the reduction of mortality and morbidity.[12]

Antibiotic resistance was present initially in 7 cases before the application of suction therapy. VAC provided a sigh of relief for the management of wounds complicated by infections not responding to antibiotics. No antibiotics were given during suction drainage in 21 of our patients. The wounds, which were treated with vacuum therapy, showed reduced levels of bacteria.[13] It also showed that wound treated with vacuum therapy requires fewer courses of antibiotics as compared to other wounds which treated conventionally.[14] Need for secondary closure or skin grafting was reduced to a great extent in our patients.

Argenta et al has discouraged using wall suction stating large controlled volumes might induce wound desiccation, but certain other studies like the ones by Shalom etal used wall mounted suction successfully for 15 patients with chronic wounds.[15,16]

The cost of commercially available V.A.C is Rs. 600,000 ($7500) for the unit and Rs. 6000 ($75) for each dressing change.[17] The cost of our modified version of VAC (Rs. 800 i,e $12 for a period of 15 days per patient) using wall mounted suction available in our wards is much lower and affordable than the commercially available one.

CONCLUSION

VAC seems to have revolutionary potential in the management of the difficult to treat infected wounds as far as its safety, speed and cost-effectiveness is considered. Average time taken to become healthy by the wounds is much less than the average time taken for similar wounds managed by conventional protocol. Hospital stay for patients managed by suction therapy is much lower than the average stay period in conventional method, thus not only reducing the total financial burden for patients, but also reduces the chances of spread of infection to other patients in the ward. Hospital burden due to prolonged stay of patients for management of complicated wounds is reduced. Wounds treated with vacuum therapy have lesser requirement of antibiotics as compared to other wounds which are treated by conventional approach. Need for secondary closure or skin grafting is reduced to a great extent by virtue of VAC. The cost of modified version of VAC using wall mounted suction available in hospital wards is much lower and affordable than the commercially available one.

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