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# Indigenous VAC Therapy – Easier and Effective Treatment

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***Abstract:*** *The purpose of this study was to evaluate the use of negative pressure wound therapy in traumatic wounds. . Negative-pressure wound therapy (NPWT) is believed to accelerate wound healing by altering wound micro vascular blood flow. In our study we have used cost effective material as an alternative to the more expensive V.A.C set in the management of complex wounds.*

*This study is a prospective evaluation of NPWT in 15 patients with traumatic wounds. In our study we have used locally made NPWT set for wound therapy. We have treated patients with complex wounds in which bone and tendons are exposed. Dressing was changed for every 4 days till the desired granulations tissue is formed for skin cover.*

*This NPWT has showed excellent growth of granulation tissue in most of the cases. Most patients underwent split skin graft instead of flap cover which was more cost effective for the patient. The cost of this NPWT for 1 week per patient was less than 2000 rupees which was more cost effective compared to the cost commercial VAC set which was 10,000 rupees*

***Key terms:*** *Locally made NPWT, Cost Effective NPWT, Open traumatic wounds*

## I. Introduction

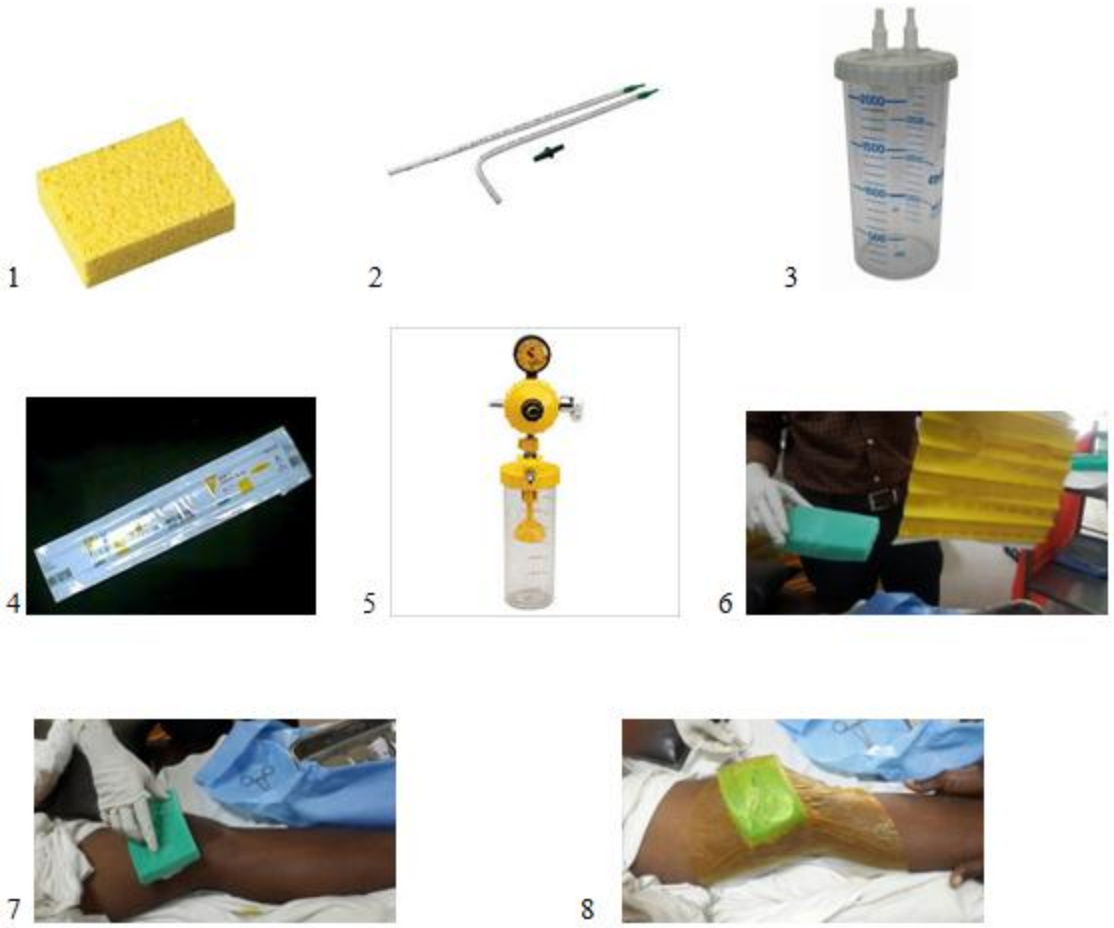
Negative-pressure wound therapy (NPWT) also known as topical negative pressure is a mode of therapy used to encourage wound healing. It is used as primary treatment of chronic and complex wounds and as an adjunct treatment for temporary closure and wound preparation preceding surgical procedures such as skin grafts and flap surgery [1,2]. This therapy has been widely and successfully used, although the physiologic basis of its effects is not yet fully understood. Numerous controversies exist regarding the mechanism of action, especially with regards to tissue perfusion. It is generally believed that increased blood flow induced by negative pressure plays a beneficial role and several studies have measured increased regional blood flow under negative pressure [2,3,4,5].

NPWT is used to treat minor wounds to complex wounds .The limiting factor in the usage of NPWT is the cost factor associated with it. NPWT applied for 2 weeks will cost approximately 10,000Rs to 20,000Rs. In our study we designed a NPWT using materials commonly available in hospital setting. The cost of this system comes around 2000Rs to 3000Rs for 2 weeks. This study is to determine the efficacy of this system in traumatic injuries.

## II. Materials and Methods

This study was done in Sri Ramachandra medical hospital and research institute. A study group of 15 patients were treated with NPWT. The NPWT systems in current use are effective but the cost of the system has remained a matter of concern. Thus we arranged a locally made setup for NPWT. The materials that were used were commonly available in our hospital and could be found in most hospitals.

All wound were thoroughly debrided and irrigated with normal saline before applying NPWT set. Single layer of gauze is applied over the wound, a sterile (normal sponge sterilized the previous day) sponge was cut and contoured to the wound. A slot was made through the center of the sponge to allow fixation of the suction tube. The sponge was pressured onto the wound with the suction tube and an airtight environment was created with use of a surgical adhesive dressing. The other end of the tube was connected to a drain which in turn was connected to suction apparatus. The suction pressure was maintained at 150mmhg. Dressing was changed for every 4 days till the desired granulation tissues has formed for Skin cover.




| **Material required** | **Cost** |
|---|---|
| 1. Sterile sponge | 20Rs |
| 2. Flexocath tube | 200Rs |
| 3. Chest drain | 700Rs |
| 4. Surgical adhesive dressing medium or large | 525-550Rs |
| **Total cost** | **1500Rs** |

## III. Results

Our study group consists of 15 patients. Analysis was done by visual inspection of the wound. In 10 cases of foot injury, 7 cases had bone and tendon exposed, of which 4 wounds were healed with single SSG and 2 cases required SSG twice. One patient post calcaneum fracture fixation had wound dehiscence and implant was exposed. NPWT for 2 weeks reduced size of the wound and infection subsided. Exposed implant did not allow formation of granulation tissue. Hence local flap cover was done. The other 3 cases took an average time of 4 days. 5 cases of other traumatic injuries required 1 week of NPWT for split skin graft. We have treated a wound of minimum size of 3 x 3 and maximum size of 13 x 8.5cm. Total cost of NPWT for 15 days was Rs 1500 to 2000 depending on the size of wound.

**Sample cases**

1) 29years old male with bimalleolar compound fracture with skin lose and bone and tendons exposed. Dressing changed 3 times with 5 days interval followed by skin cover.

2) 28 years old male with skin loss over knee. Dressing changed 2 times with 5 day interval followed by skin cover.

3) 45 year old male with resistant pseudomonas infected implant and wound dehiscence following calcaneum fracture fixation. Dressing changed 3 times with 5 days interval and size of the wound decreased. Granulation tissue formation was unsatisfactory due to the exposed implant. Patient underwent local flap cover.

## IV. Discussion

Since its first application NPWT has been used widely in the treatment of chronic and acute wounds. Many indications for the use of NPWT have been added since its first use. In our study we have included patients with acute traumatic injuries of the foot and certain open injuries. The mechanism of action of NPWT is it causes strain and stimulates cellular proliferation. It also causes mechanical evacuation of interstitial fluid. This in turn leads to increased micro circulation and there by secondary necrosis is reduced [6]. NPWT is believed to accelerate wound healing by improving tissue oxygenation this is in contrast to study by Yoo-seok Shan who stated that NPWT significantly reduces tissue oxygenation.

The cost of NPWT appears to be a limiting factor for its use in developing countries. The commercially used V A C systems cost around 10,000rs per week. Diaa Othman stated that wound management causes a significant burden of cost in National health services of United Kingdom. In our indigenous preparation of NPWT system the cost come around 1000rs per week for larger wounds.

Nauman A Gill stated that 125mmHg of suction pressure was most effective for his patient. Novak et al used a suction pressure of 125mmHg to 175 mmHg in his study. In our study a standard pressure of 150mmHg of suction pressure was applied for all patients. Early studies showed that applying this amount of pressure to a wound bed had the greatest effect on tissue re-growth and granulation tissue [6]. DeFranzo et al treated 75 patients with lower limb wounds and changed the dressings every 2 days while Banwell and Téot changed dressing every 4 days. Rozen et al used their own NPWT for skin grafts and applied it continuously for 5 to 7 days and reported 100% graft take in chronic ulcers. Gill et al changed dressing every 4 days in operation-theater to reduce the chance of infection. In our study dressing was changed every 4 days till desired granulation tissue is obtained. Milind et al in his indigenous NPWT used romavac drain for diabetic foot ulcers. In our study we have used ICD drain. The advantage of ICD drain is we can connect 2 tubes in bigger wounds for better suction. The third tube is connected to centralized suction. NPWT is a good option for patients with coexistent head injuries, thoracic injuries and abdomen injuries in which reconstruction is delayed. It also reduces wound contamination and thereby reduces the chance of nosocomial infections

In our study we had 10 patients with foot injuries with bone and tendon exposed traditionally these patients would have been treated with free flap cover which is more expensive. In all these patients granulation tissue was obtained with NPWT and only one patient required flap cover. NPWT has a limited role once the implant is exposed and when the sinus is small making it difficult for complete evacuation of fluid.

## V. Conclusion

The results of our study indicate that our cost effective NPWT system showed comparable results to commercially available NPWT at a fraction of the cost. Also it is available in almost any hospital and offers good patient compliance for healing compound fracture wounds and infected surgical wounds.

| SERIAL NUMBER | SEX | AGE | WOUND SITE | WOUND SIZE IN CM | DURATION OF NPWT IN DAYS | FINAL TREATMENT |
|---|---|---|---|---|---|---|
| **Foot injuries** | | | | | | |
| 1 | Male | 28 | Foot dorsal | 13 x 8.5 | 12 | Split skin graft |
| 2 | Male | 45 | Foot dorsal | 12 x 6.5 | 8 | Split skin graft |
| 3 | female | 38 | Ankle | 10 x 8.2 | 8 | Split skin graft |
| 4 | Male | 52 | Foot dorsal | 6.5 x 4 | 5 | Split skin graft twice |
| 5 | Male | 34 | Foot dorsal | 10 x 9.5 | 15 | Split skin graft twice |
| 6 | Male | 25 | Foot dorsal | 12.5 x 8.2 | 12 | Split skin graft |
| 7 | Male | 39 | Foot | 3.5 x 3 | 12 | Flap cover |
| 8 | Female | 50 | Foot dorsal | 10.5 x 6 | 5 | Split skin graft |
| 9 | Male | 40 | Ankle | 8 x 6 | 4 | Split skin graft |
| 10 | Female | 55 | Foot dorsal | 9.5 x 11 | 4 | Split skin graft |
| **Other Injuries** | | | | | | |
| 1 | Male | 35 | Knee | 7.5 x 6 | 8 | Split skin graft |
| 2 | Male | 29 | Arm | 8 x 4.5 | 10 | Split skin graft |
| 3 | Female | 42 | Distal leg | 6 .5 x 5.5 | 4 | Split skin graft |
| 4 | Male | 19 | Distal leg | 17.5 x 6 | 8 | Split skin graft |
| 5 | Male | 33 | Knee | 6.5 x 5 | 4 | Split skin graft |

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