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A STUDY ON THE EFFICACY OF NEGATIVE PRESSURE APPLICATION IN THE MANAGEMENT OF PRESSURE ULCERS

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Summary

In 22 patients with pressure ulcers negative pressure was applied using adhesive drape and suction drain. By this method open wounds were converted into a controlled closed wound. It was found to reduce the tissue oedema, induration, bacterial content of the wounds, wound size, and discharge. Negative pressure was found to favour granulation tissue formation. This technique is cost effective and can be an adjuvant management of chronic infected wounds.

Keywords: Pressure, Negative, Ulcer

Introduction

Management of chronic and difficult wound has been a challenge to the medical profession in general and plastic surgeons in particular. A method using negative pressure to manage these wounds has been tried in our department with very encouraging results. The concept of managing wound by application of negative pressure was first described in the literature [1] by Argenta et al and Fleischmann et al in 1993. Mullner et al[1], in a clinical prospective study, have evaluated the efficacy of a vacuum sealing technique in dealing with wounds with copious secretion. The technique provides a controlled close wound environment. It has been shown to reduce the tissue oedema and induration. Significant alteration in the bacterial flora has been achieved following negative pressure application. Suction of the infected fluid from the wound site resulted in a relatively clean wound bed. Negative pressure application has been found to favour granulation tissue formation and shrinkage of wound size. The study was undertaken to devise a cost effective apparatus which can provide the requisite negative pressure at the wound site, to evaluate the positive effects and determine it's role as a complimentary or alternate method of wound management.

Methods

From April 98 to October 99 all twenty seven patients of pressure ulcers under this study were divided into two groups: i) Control group comprising of 5 patients where traditional conservative management was done, and ii) Study group comprising of 22 patients where negative pressure was applied. Various causes of pressure ulcers were post traumatic paraplegia, old age, debilitation with prolonged period of immobilization and neurological illness. Only criteria for patient selection was a stable general condition with no medical or surgical contraindication for vacuum application. The wound size ranged from 46cm^2 to 72cm^2 and the depth ranged from 0.8 to 2.6cm. The duration of pressure ulcers ranged from 2 weeks to 5 months.

The procedure for application of negative pressure device was exclusively a bed side procedure. The materials used for this procedure included a sterilized piece of foam or wet cotton wool, non collapsible drinage tube with multiple side holes, tube insertion device , a low power continuous suction apparatus (Romovac) and transparent adhesive dressing (opsite) (Fig 1). At different stages of healing repeated bacteriological assessment and photographic recording was done.

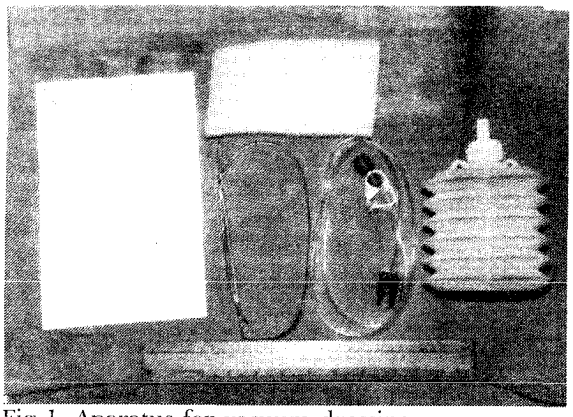

Fig 1. Aparatus for vacuum dressing

Application of Negative Pressure

1. The area of the wound was measured by taking an impression of the wound on a transperent plastic sheet with graduations marked on it. Changes in the wound size were assessed before application of negative pressure and during every change of dressing.

2. The skin surface adjoining the wound was cleaned with solvent ether to remove all traces of oil and grease to ensure better adhesiveness of the opsite.

3. The perforated end of the drinage tube was placed on the wound surface and the other end was passed subcutaneously with the help of a tube insertion device to emerge through a skin opening at least 10cm from the wound margin avoiding bony prominences on the route of the tube.

4. Wet sterile cotton foam was trimmed appropriately according to the size of the wound and placed over the wound surface covering the perforated suction tube.

5. The surface of the wound along with the foam/wet cotton wool were covered with an adhesive drape (opsite) extending 5 cm beyond the margin of the wound over intact skin to create an air tight seal. The open wound was thus converted into a controlled closed wound.

6. The proximal end of the evacuation tube leads to a low power continous suction apparatus. The suction device was charged to attain negative pressure at wound site. A mean negative pressure of 100 to 160mm Hg was exerted at the wound site. Recharging of the system was done very 5-6 hours. The volume and physical characteristics of evacuated fluid was recorded daily.

7. Change of dressing was done every 7-8 days or if dressing developed a leak, whichever was earlier. Wounds under study were treated until there was considerable improvement in the clinical appearance. Results of both groups were compared.

Results

Appearance of wound

By 15th day all 22 wounds in the study group were clinically clean (determined by appearance of healthy granulation tissue, amount of slough and discharge). In the control group only 60%(3/5) of the wounds were clean at the end of 20th day.

Reduction in wound size

An average reduction in wound area by 13.22% was observed at the end of 10th day, 28.3% at the end of 15th day and 33.7% at 20th day in the study group (Fig 2a, 2b). This compared well with 5.1% reduction on the 10th day 13.2% at the end of 15 days and 18.2% at the end of 20th day in the control group.

Discussion

Negative pressure application has been found to improve the clinical appearance of granulation tissue, reduction in amount of discharge, slough and significant reduction in the wound size.

Mullner etal[1] have recommended the use of negative pressure to promote the healing of wounds with copious secretions as in selected cases of sacral ulcers, acute traumatic soft tis-

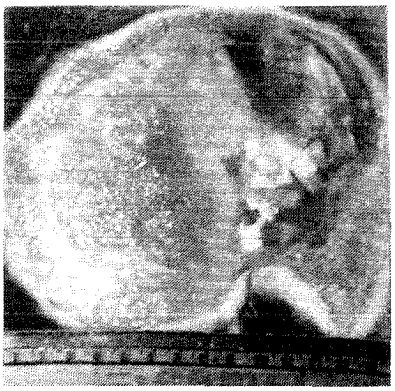

Fig 2a. Day 0- sacral ulcer with slough and unhealthy granulation with exposes bone.

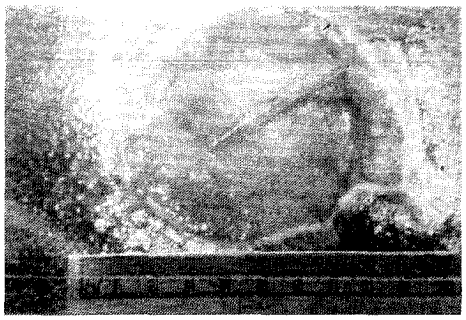

Fig 2b. Day 20 - Slough disappeared, granulation healthy, bone covered by granulation

sue defects and for soft tissue defects complicated by exposed bone and/or implant. The suggested mechanisms involved in hastening the wound healing due to negative pressure are:

i) the negative pressure prevents the creation of a moist cavity as secretions and debris are continuously removed, thereby enhancing the formation of healthy granulation.

ii) The constant negative pressure at the wound/foam interface appears to draw the granulation tissue centrally. The clean covered environment maximizes the quality of the granulation which appears healthy, durable and adheres to the bone/implant surface.

Argenta et al[1] in their study have found significant increase in blood flow, granulation tissue formation and significant reduction in bacterial count and wound size following application of negative pressure.

It was observed that there was some amount of bleeding from the wound with each change of dressing. This could be attributed to the excess vascularity and ingrowth of granulation tissue in the dressing following vacuum application.

The application of negative pressure over granulating wound was found to be more economical as compared to coventional conservative management. The total procedural pain was also considerably less as compared to daily dressing in conventional conservative method.

Conclusion

Vacuum application was found to accelerate wound healing. It is an easy and cost effective procedure. The frequency of dressings are reduced which result in reduction of associated pain.

References

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