

Role of Cyclic Negative Pressure Wound Therapy (NPWT) in Pediatric Scald Burn

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How to cite this article:

Dhira Shobith Munipati, Ravi Kumar Chittoria, Barath Kumar Singh. P/Role of Cyclic Negative Pressure Wound Therapy (NPWT) in Pediatric Scald Burn/Indian J Trauma Emerg Pediatr.2023;15(1):21-23.

ABSTRACT

Burns and related injuries are common causes of deaths and disability. The highest incidences of burn cases occur in children and adults. In children less than 2 years of age, contact with hot surfaces and scald burns are the most common presentation to the hospital. The practice of cooking at ground level or sleeping with a burning lamp are some of the causes. Early management of this type of burns results in better outcomes. In this case we describe the role of negative pressure wound therapy (NPWT) as an adjuvant in the management of paediatric thermal burns.

Keywords: Cyclic Negative Pressure Wound Therapy; Thermal Burns; Wounds.

INTRODUCTION

Burns are one of the leading causes of morbidity and mortality in children. Basic knowledge about thermal injury is important in the management of children presenting with burns. A study by Davis in 1990 quoted 2 million incidences of burns per year in the Indian Subcontinent. Forty percent of burn victims are under 15 years of age. Scalds and hot liquids make up 90% of burn

injuries to children. Common sites are at home around the kitchen and open fire places. There are various literatures suggesting the role of cyclic negative pressure wound therapy (NPWT) in the management of wounds.¹ In this case report, we assess the role of cyclic negative pressure wound therapy in the management of paediatric scald burns.

MATERIALS AND METHODS

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Informed consent was obtained from the parents of the children under study. Department scientific committee approval was obtained. It is a single centre, non-randomized, non-controlled study. The patient under study was a 4 years old male, with no other known comorbidities presented with mixed second-degree scald burns to the left chest, abdomen and neck constituting 15% of total burn surface area (Figure 1). Cyclic NPWT was applied

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Received on: 15.12.2022

Accepted on: 22.01.2023



Fig. 1: Thermal burns involving bilateral lower limb and post tangential excision and skin grafting.

to the burns wound after admission (Figure 2). Patient underwent repeat cyclic NPWT which helps in fasten the wound healing. Cyclic negative pressure wound therapy was used to regulate moisture because the wound was naturally moist. Two sessions of cyclic negative pressure wound therapy was given. The pressure in Cyclic NPWT was between -50 mm Hg to -125 mm Hg changing from time to time as by machine controlled.



Fig. 2: Application of Cyclical NPWT



Fig. 3: Healed burn wound day 14

RESULTS

Wound bed gradually improved, burn wounds healed well within 14 days. The patient compliance to Cyclic NPWT is good with less pain and fasten the wound healing. It decreases the repeated change of exudative soakage of external dressing.

DISCUSSION

NPWT requires a device which is connected through a special set that generates a negative pressure over the wound bed. Various mechanisms that are thought to act both at tissue and cellular level include reduction of the edema, improvement of local blood flow, induction of angiogenesis and granulation, wound margin epithelialization, and facilitation of cell migration and proliferation.² Macrostrain mechanisms of NPWT involve removal of exudates and infectious materials and contraction of wound margin. NPWT has been shown to be safe and effective in post debridement wounds. Hence NPWT was started, and size of the wound was measured at the time of change of dressing. One of the complications of NPWT, excessive bleeding was not noted in our patients. Platelets act as regulators of inflammation, angiogenesis, cell migration, and

proliferation with the release of various growth factors and anti-inflammatory cytokines which is thought to help in faster and better healing of the wounds. In our experience it was noted that irrespective of the aetiology of the wound and the comorbidities there was a visible decrease in the size of the wound, with formation of healthy granulation tissue. The cyclic mode operates its negative pressure in a manner similar to the sine wave by cycling through the designated negative pressures.⁴ Once it hits the upper target pressure of -125 mmHg, the pressure system shuts off and the pressure slowly drops till the lower target pressure is reached, regardless of time. As the change in the intralesional pressure is measured, the drop velocity of the pressure is closely associated with the defect volume in the cyclic mode. In other words, the larger the volume of defect, the shorter the time taken for completing one cycle of the system.⁵

Human and animal's studies have shown increased growth of granulation tissue, increased blood flow, diminution of the wound area, and regulation of inflammatory response with VAC therapy. VAC causes wound contraction, stabilization of the wound environment, decreased oedema with removal of wound exudates, and micro deformation of cells. These effects allow VAC to accelerate wound healing by virtue of increase blood flow; reduced bacterial load; and improved wound bed preparation for subsequent coverage.⁶ The compression of tissue by negative pressure causes tissue hypoxia due to decreased perfusion beneath the foam which stimulates angio-neogenesis, and local vasodilatation due to release of nitric oxide.

Micro deformation/micro strain of cells due to VAC causes tissue expansion effect with release of growth factors. This tissue expansion effect is due to the differential pressure in the tissues after negative pressure application. The pressure within the cells is positive; while the pressure outside the cells and beneath the dressing is negative. This may lead to expansion of cells, growth of granulation tissue and pulling of wound edges closer to one another reducing wound size.

CONCLUSION

Cyclic application of negative pressure results in a superior local enhancement of cutaneous microcirculation with regards to blood flow and consecutive tissue oxygenation. Beyond that, repeated alterations between different levels of negative pressure due to cyclic application represent a greater stimulus for remote conditioning effects, indicating a superior local interaction with the underlying tissue. Hence, we were able to manage Scald burns using cyclic NPWT successfully.

Conflicts of interest: None.

Authors' contributions: All authors made contributions to the article.

Availability of data and materials: Not applicable.

Financial support and sponsorship: None.

Consent for publication: Not applicable.

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