Review Article

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Role of Cyclic Negative Pressure Wound Therapy in Pediatric Scald Burn

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Abstract:

Over the past decades, the application of "negative pressure" has evolved to a cornerstone in the treatment of acute and chronic wounds in almost all specialties.The cyclic NPWT system is similar to the intermittent mode in terms of using the same maximal sub atmospheric pressure, but the pressure never reaches zero in the cyclic mode. The role of cyclic negative pressure wound therapy (NPWT) in burns are widely studied. In this case report, cyclic NPWT was utilised in a child with scald burns to evaluate the efficacy.

Keywords: Cyclic negative pressure wound therapy, burns, scald.

Introduction

The cyclic NPWT system is similar to the intermittent mode in terms of using the same maximal sub atmospheric pressure, but the pressure never reaches zero in the cyclic mode. So, it continuously creates certain pressure gradient that oscillates between −125 mmHg and the preset sub atmospheric pressure. The cycle runs based on the changes in sub atmospheric pressure, not time, and thus its frequency reflects the wound volume.[1] The role of cyclic negative pressure wound therapy (NPWT) in burns are widely studied. In this case report, cyclic NPWT was utilised in a child with scald burns to evaluate the efficacy.

Materials and Methods

This study was conducted in a tertiary care centre in department of plastic surgery after getting the department ethical committee approval. Informed consent was obtained for examination and clinical photography. 1year old male child presented with accidental scald burns which was second degree superficial and deep(mixed) burn over right upper limb and anterior chest and abdomen (fig. 1). Child wound bed preparation was done following which cyclic NPWT was applied. Serial application of cyclic NPWT was done. (fig. 2). The pressure was cycled between -125 to 50 mm Hg in our patient.

Results

After serial application of cyclic NPWT for 14 days, the second degreeburn wound has significantly improved and in third degree burn cycle NPWT helped in wound healing and good uptake of skin graft. Child was pain free at the time of application of cyclic NPWT (fig. 3).

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Fig. 2. Cyclic negative pressure wound therapy application.

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Fig. 3. Scald burn wound after serial application of cyclic NPWT.

Discussion

Over the past decades, the application of "negative pressure" has evolved to a cornerstone in the treatment of acute and chronic wounds in almost all specialties. Various available synonyms reflect the past developments and current applications of the technique involving, amongst others, "Vacuum-assisted closure" (VAC), "Negative Pressure Wound Therapy" (NPWT), "closed incision Negative Pressure Therapy" (ciNPT), or "Negative Pressure Wound Therapy with instillation" (NPWTi).[2]

Since the introduction of the negative pressure wound therapy (NPWT) system by Morykwas and Argenta, it has been applied to a number of wounds and has become an influential and effective technique for healing simple and complex wounds. The conventional NPWT system adopts either 'intermittent' or 'continuous' mode.

While the continuous mode constantly applies a sub-atmospheric pressure of −125 mmHg, the intermittent mode creates a sub-atmospheric pressure of −125 mmHg for 5 minutes and a 2-minute resting phase of 0 mmHg.

In experiments performed on animal models, the intermittent mode showed increased perfusion level and formation of granulation tissue in the wound area compared with the continuous mode.3,4 Despite the effectiveness of intermittent mode in wound healing, it has been avoided in clinical application because of the pain occurring every few minutes during the initiation phase of the system to reach −125 mmHg. Thus, 'cyclic' mode would minimize the pain while maintaining the superior efficacy of the intermittent mode.

The cyclic NPWT system is similar to the intermittent mode in terms of using the same maximal sub atmospheric pressure, but the pressure never reaches zero in the cyclic mode. So, it continuously creates certain pressure gradient that oscillates between −125 mmHg and the preset sub atmospheric pressure. The cycle runs based on the changes in sub atmospheric pressure, not time, and thus its frequency reflects the wound volume.

Types of NPWT

1. Continuous NPWT- the continuous mode constantly applies a sub-atmospheric pressure of −125 mmHg.
2. Intermittent NPWT- the intermittent mode creates a sub-atmospheric pressure of −125 mmHg for 5 minutes and a 2-minute resting phase of 0 mmHg.
3. Cyclic NPWT- The cyclic NPWT system is similar to the intermittent mode in terms of using the same maximal sub atmospheric pressure, but the pressure never reaches zero in the cyclic mode. So, it continuously creates certain pressure gradient that oscillates between −125 mmHg and the preset sub atmospheric pressure.

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.

An ideal application of a NPWT dressing must respect the individual circumstances of each patient and treated wounds with respect to comorbidities, location of the wound, and tissue composition.[5]

Advantage of cyclic NPWT

1. Less painful when compared to intermittent NPWT.
2. Superior effects on local and remote cutaneous perfusion in the cyclic type compared to others.

In our study, child's scald burn wound showed rapid improvement and was pain free while on cyclic NPWT.

Conclusion

Cyclic NPWT shown to be a good adjuvant for the rapid improvement in pediatric scald burn. Cyclic NPWT shown to be less painful compared to other NPWT in pediatric scald burns.

Conflicts of interest- None.

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