

Role of Closed Incision Negative Pressure Wound Therapy in Electrical Burn Injury

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Abstract

Electrical burn may cause deep burn injury. These injuries may be complicated by surgical site infection (SSI). Various methods have been described in literature to prevent this complication. Recently application of negative pressure to a surgically closed wound has also emerged as a way of preventing this complication. The commercially available devices do exist for such type of dressings but are usually too costly. In this article we share our experience of using negative pressure wound therapy (NPWT) in cost effective manner.

Key Words: electrical burn; incisional negative pressure wound therapy; closed incision; ci-npwt

Introduction

Negative pressure wound therapy has changed the way by which acute and chronic wounds are managed.[1,2] Various randomized control trials have established its role in the management of chronic and acute wounds.³ Traditionally, after the primary closure of the wound, the incision site is covered with an occlusive or semi-occlusive dressing. In recent years negative pressure therapy also has been tried for the wound that has been surgically closed primarily, especially in cases that are at high risk of surgical site infection (SSI).[4, 5] In this article we share our experience of closed incision negative pressure wound therapy (ci-NPWT) in an electrical burn injury case.

Methodology

This study was conducted in the department of plastic surgery in a tertiary care centre. This study was conducted in January 2021. The patient was a 29 year male with an alleged history of electrical burn injury with a wound on the left eyebrow (Figure-1).



Figure 1: sutured wound

As the patient was at high risk of SSI, a decision was made to apply a customized NPWT. An informed and written consent was taken and departmental ethical approval was taken. A sterile sponge was taken of appropriate size. A small-caliber suction tube with multiple holes was passed through it. A single layer of non-adherent gauze was placed on the closed incision site. The sponge with suction tube in-situ was placed on the incision site. An adherent transparent occlusive dressing was placed. The continuous negative pressure of 100mm of Hg was applied for seven days (Figure-2).



Figure 2: closed incision site covered with foam and transparent adhesive dressing

The patient was assessed daily for any systemic sign of infection. Daily inspection through transparent dressing was done to look for any soakage, erythema of skin localized tenderness, or swelling. The dressing was removed after 7 days and the operative site was assessed.

Result

After application of ci-NPWT, a daily assessment was done, no systemic or local sign of infection was noted. The dressing was removed and the surgical site was inspected after seven days. The wound was healed well (Figure-3).



Figure 3: well healed wound without any complication

Sutures were removed on the next day. No wound dehiscence was noted.

Discussion

Despite advances in surgical practice, surgical site infections (SSI) are frequent complications in patients who undergo surgery. The cause of SSI may be pre-operative, intraoperative, and postoperative.[6] There are multiple factors that predispose the patient to SSI like- malnutrition, anemia, hypoproteinemia, smoking, DM, etc. Preventive measures should be taken at every step to control it. NPWT has recently emerged as a strategy to reduce the SSI, particularly in high-risk patients.[7,8] Apart from this, the wounds that are closed under tension may also be benefited from ci-NPWT.

Negative pressure wound vacuum therapy has an established treatment for open surgical incisions following infection or breakdown. Recently there has been the focus of new investigation in its use in closed surgical site. The first publication regarding closed incisions using NPWT (ciNPT) was in 2006 when Gomoll et al published his results utilizing a similarly modified incisional dressing. Various mechanisms has been proposed for NPWT [9, 10, 11]

Macroscopic Effects of NPWT

- Creates and maintains a moist wound environment, shortens time to wound closure
- Reduces wound edema



- Helps limit seroma formation
- Promotes more robust granulation tissue when compared to traditional occlusive dressing
- Stimulates wound contracture through macro deformation
- NPWT stabilizes healing tissues through a bolstering Effect
- Provides appositional forces to both superficial and deeper healing tissues
- Reduces size and complexity of the healing wound

Microscopic Effects of NPWT

- Increased expression of VEGF, IL-8 VEGF gradient increases toward the wound
- Vigorous angiogenesis in a parallel fashion, oriented toward the wound compared to fewer tortuous new vessels observed in controls
- Increases blood flow around the periphery of the wound; improves local delivery of antibiotics
- Stimulates cell proliferation through micro-deformation
- Decreases local blood flow in those tissues in closest proximity to the ROCF
- Removal of cytokines and other soluble inhibitors of wound healing (e.g., matrix metalloproteinases)
- Changes in the colonizing flora of the wound, may increase or not affect overall bacterial load
- Increased neovascularization

There are commercially available devices for ci-NPWT. These devices are expensive for routine use in the hospitalized patient. We have used a simple way of applying ci-NPWT cost-effectively.

Conclusion

SSI is a common problem; all preventive measures should be taken. In this study, we found that ci-NPWT helps in preventing SSI in high-risk cases. But since it is a single case study, a definite conclusion cannot be made. Large randomized control trials are required to confirm the efficacy of NPWT in the surgically closed wound.

Conflicts of interest: None..

Declarations Authors' contributions

All authors made contributions to the article

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