Original Article

Wound Therapy

Pain Free Negative Pressure Wound Therapy

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ABSTRACT

Objective: Wound vacuum-assisted closure (VAC) is a technique used frequently by orthopedic surgeons to facilitate wound closure. Bedside VAC removal can be a source of great pain for patients, which we hypothesize can be decreased by topical lidocaine application.

Study Design: Prospective randomized double-blinded study

Place and Duration of Study: This study was conducted at the Plastic and Reconstructive Surgery Department of Liaquat National Hospital, Karachi from November 2015 to October 2017.

Materials and Methods: Non diabetic, adult patients requiring at least 2 extremity wound VAC dressing changes were involved. In a double-blinded fashion using crossover intervention technique, topical lidocaine (1%) was compared with topical normal saline (0.9% NaCl) after injection into the VAC sponge. The patients were evaluated using visual analog pain scores.

Results: A total of 72 patients were enrolled for a total of 144 VAC changes. The lidocaine infiltration was associated with 2.03 points less on the 0–10 visual analog scale for pain (P value <0.0001, during the VAC sponge removal.

Conclusion: The patients undergoing an extremity wound VAC dressing removal at the bedside should be pretreated with topical lidocaine because it decreases pain.

Key Words: Wound Vacuum-Assisted Closure Dressing, Soft-Tissue Management, Pain Management, NPWT, VAC

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INTRODUCTION

Vacuum-assisted closure (VAC) is a wound care technique that promotes wound healing by negative pressure on wound. This has been well documented in literature since 1970s[1–4]. NPWT is becoming a popular modality of treating acute wounds by many field of surgery and medicine[3–11] and treating diabetic foot ulcers and chronic wounds.[11–13] NPWT mechanically removes fluid from the wound, enhancing accelerated rate of granulation tissue formation, increased local blood perfusion and nutrient flow, a significant reduction in tissue bacteria levels[14,15]. Plastic surgeons commonly employ NPWT for several wound like wounds to which a split-thickness autologous skin graft is applied, infected wounds after debridement, open fracture wounds, acute soft tissue wounds (with exposed tendon, bone, hardware, and/or joint), fasciotomy wounds after compartment syndrome, chronic nonhealing wounds, surgical wounds that are difficult to close due to tension, wounds associated with moderate-to-severe irritation or drainage.[5] Despite its efficacy, the literature analyzing pain management associated with NPWT is scant.[3,6] Based on our clinical experience and few reports acknowledging pain associated with wound VAC dressings,[2–6] removal of the dressing usually is a particularly painful experience for patients; this is often perceived as a side effect to NPWT therapy. The essential, painful step involves removing the embedded foam from the wound bed, which is often extremely painful as healing granulation tissue containing regenerating nerve endings grow into the reticular network of the foam.[5] Although intravenous (i.v.) or oral (p.o.) pain medication dosage before the procedure are usually recommended and irrigation of foam with saline is the most commonly used technique for analgesia, it has been our hospital's experience that diluted lidocaine, infiltrated retrograde up the suction tube, can provide better analgesia than pain medications alone. The purpose of this study is to support the use of lidocaine to reduce pain associated with wound VAC dressing changes.

MATERIALS AND METHODS

This is a randomized, double-blinded, placebo controlled trial comparing the use of lidocaine with a normal saline for pain management during the removal of wound VAC dressings. Ethical committee approval was obtained before enrolling patients for the study.

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The design for this study relies upon the crossover intervention technique in which each study participant receives both possible interventions. The benefit of this technique is that each subject serves as his/her own control, making it ideal for prevention of confounding due to patient related differences, such as age ,gender, educational status, base line pain tolerance, wound size, site, therefore this technique significantly strengthens the power of the study by reducing the number of subjects needed for study.

Our inclusion criteria included

- Patients aged 18 or older
- Extremity wound VAC requiring at least two bedside VAC changes during a single hospital admission

Our exclusion criteria included

- Lidocaine allergy
- Diabetic or neuropathic wounds
- Local malignancy
- Pregnancy

We hypothesized that topical lidocaine would be a useful alternative or supplement to analgesic medications during wound VAC dressing removal. Once these criteria were satisfied, patients underwent the informed consent process for participation. Patient characteristics were then documented, including age, sex, wound size, location, and mechanism of injury into a predesigned proforma. Two bedside VAC dressing removals, each approximately 48 hours from the time of VAC dressing placement, were then scheduled. A standard VAC dressing, which consisted of reticulated polyurethane foam contoured to and embedded into the wound, covered with an occlusive dressing connected to an evacuation tube and a suction canister set intermittently at -125 mm Hg.

For each of 72 patients, one author prepared double-blinded samples of both 1% lidocaine and 0.9% normal saline in a clear syringe, labeled with the patient's name and either VAC change #1 or #2. The lidocaine dose was based on the standard maximum weight based dose of subcutaneous injectable lidocaine (4.5 mg/kg, with a maximum dose of 300 mg or 30 mL of 1% lidocaine).(16) The volume of normal saline was dosed to match the same volume of the calculated lidocaine volume. Patients were then asked to blindly choose one syringe for each session of VAC change randomly. Second author performed all the VAC sponge removals. Twenty minutes before VAC dressing removal, all patients rated their baseline wound pain on the 0–10 visual analog scale (VAS) and the solution of their choice either lidocaine or saline was injected retrograde up the VAC suction tube into the sponge .Twenty minutes later, during VAC sponge removal, all the patients rated their pain. During this period, the patients and their vital signs were monitored for local or systemic toxicity or adverse reaction.

RESULTS

we enrolled 78 patients who satisfied our inclusion and exclusion criteria for participation in this study. 6 patients refused to complete to complete the trial and were excluded. Patient characteristics are shown in Table 1. There were no local or systemic complications of the topical lidocaine. The randomization produced balance between the study drug and the study period, with lidocaine being given in the first period 33 out 72 times and in the second period 39 out of 72 times. Controlling for baseline pain, the patients experienced mean of 2.03 points less pain on the 10-point VAS during the VAC sponge removal when given lidocaine locally than when given saline [95% confidence interval, P-value <0.0001]. As demonstrated in

Figure 1. All the patients had an increase in pain above baseline during VAC sponge removal, this increase in pain above baseline, however, was less so after lidocaine administration [95% confidence interval, P-value <0.0001]. Although not powered to detect a correlation between pain and wound size. There were no adverse outcomes or toxicities related to topical lidocaine administration. Furthermore, there were no known adverse outcomes of wound VAC therapy as all wounds ultimately healed. This study, however, was not designed to evaluate the effect of wound VAC therapy with lidocaine administration on wound healing.

Table No.1: Patients Characteristics(Crossover intervention design), including age, gender, wound size, wound type, wound location and adverse events.

Total Patients	N=72
Total VAC changes	144
Mail, female	52,20
Ages (yrs)	
Mean±SD	38±15
Min-Max	18-54
Wound size (cm)	
Mean±SD	133±130
Min-Max	16-408
Would location, n	
Leg	36
Ankle	10
Thigh	7
Knee	14
Shoulder	1
Forearm	4
Wound type, n	
Fasciotomy	4
Gunshot	3
Chronic	16
Open fracture	19
Grafting	22
Wound infection	8
Adverse reactions	0

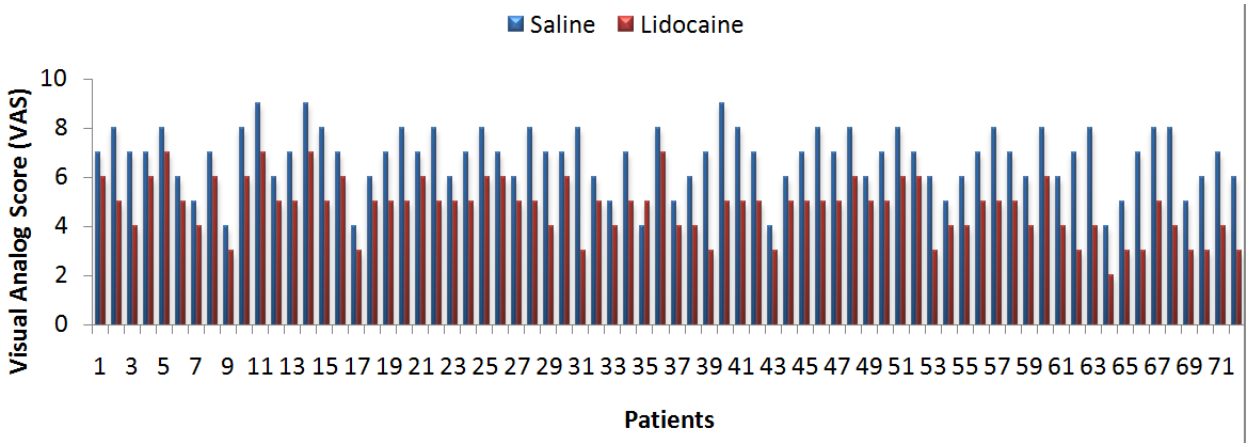

Figure No.1: Pain Scores

DISCUSSION

Although wound NPWT is a major advancement in wound management armamentarium, pain is only major side effect, frequently imposing anxiety and distress for patients. Pain is documented and treated as the fifth vital sign (6, 18–20). Lidocaine is a commonly used local anesthetic amino amide compound with an excellent track record with incidence of allergic reaction is approximately 0.7%. (17). Our study agree with the data from Franczyk et al,(6) which demonstrates a 2.0-point difference on the VAS scale during VAC removal .

Despite encouraging data, the major limitation of these studies is the usage of pain medication during the study period, the timing of VAC changes as longer duration of VAC is more painful to be removed. All VACs in this study were removed after being in place for 48 hours. Although no ideal duration of treatment or frequency of VAC change has been established in the literature. Although this study demonstrates the utility of lidocaine for VAC changes, it does not define the ideal lidocaine dose or dosing method. Further investigation is therefore necessary to define the dose, volume, and timing of lidocaine needed to provide adequate analgesia in relation to different types and sizes of wounds.

CONCLUSION

Topical lidocaine can be used for wound VAC dressing changes to decrease pain.

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Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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