Utilizing negative pressure therapy for postoperative incision management: A case series

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Statement of Purpose

We present a retrospective case series of closed incision management through negative pressure wound therapy in a high risk population. Those patients include tobacco users, uncontrolled diabetics, patients with multiple co-morbidities, history of previous wound complications, and osteomyelitis.

Introduction

Negative pressure wound therapy (NPWT) technology is widespread in both surgical and sub-surgical specialties worldwide. Surgical incisions have been traditionally closed solely by primary intention using sutures, staples, and adhesives glues or strips. However, NPWT offers a novel alternative, referred to as closed incision management CIM (1).

NPWT entails the controlled application of continuous or intermittent sub-atmospheric pressure to the wound bed classically through a pressure-manifold type dressing. Open wounds have shown clinical success with use of NPWT which has brought about their use on closed surgical incisions (1). NPWT has long been established as a reliable and cost-effective modality for wound closure (2).

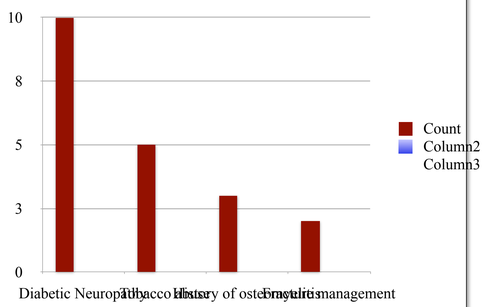
Lower extremity literature focuses on the use of NPWT for DM ulcerations, skin grafting, pressure ulcer, trauma, and dehiscence (3). However, due to the documented success, use of NPWT on surgical incisions seems to be a logical progression. In recent literature, authors advocate the use of NPWT in the management of low-energy trauma and elective hindfoot and ankle reconstruction, believing it allows decreased pain, swelling, and time to healing (4).

There are a growing number of NPWT devices, with differing dressing and devices with varying therapeutic pressure setting between 40 to 80 mm Hg and 125 mm Hg (3). We chose the PICO ® device by Smith & Nephew ® which utilizes 80 mm Hg with an advanced dressing that eliminates the need for a bulky canister.

Case Series

We retrospectively reviewed a total of 12 patients where we utilized a negative pressure system at the incision site postoperatively. The utilized system was the PICO negative pressure device ® by Smith & Nephew ® which essentially comprised of a one-step and one-dressing system at 80 mmHg. All patients had dressing changes at 7-days postoperatively where the incisions were inspected and the negative pressure was discontinued. At that point, the patients were placed in moderately compressive postoperative bandage and well-padded fiberglass/plaster casts to follow their postoperative protocol. The incisions were assessed for dehiscence during the first 7-days and during the entire post-operative course. All patients were immobilized in a cast for a minimum of 6 weeks.

Pre-operative demographics



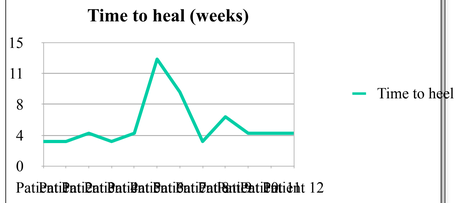
Surgical technique

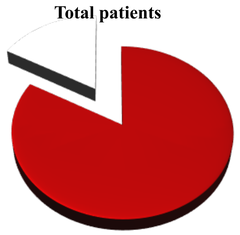
All postoperative skin incisions were closed using horizontal mattress sutures with a number 2-0 Nylon and/or 0-Nylon. Deep tissue layers were closed using 0-Vicryl sutures. The 4 inch x 11 inch sized negative pressure system was the selection of choice in all but one case, were a 6 inch x 8 inch piece was used. The device was added directly over the incision site and the seal was confirmed prior to application of the sterile dressing. At that point, postoperative dressing is applied which comprises of 4-inch gauze, and 6 x 4-inch kerilix applied from the foot to the leg in a compressive manner to control postoperative edema. Finally, a stockinette and below the knee plaster cast then applied next.

Motor powered by AA lithium batteries connecting to the negative pressure system/dressing.

Results

The results were overall favorable. All patients had their incisions inspected at the 1, 4, and 6 week marks. 10 of the 12 patients went on to heal at an average of 3.8 weeks. 2 of 12 patients had a full-wound dehiscence but eventually healed. One of whom required a a subsequent split thickness skin graft harvest from the thigh after management of the postoperative infection. No patients had deep seeded infections postoperatively





Discussion and Conclusion

Fleishmann first described the concept of healing wounds through negative or sub-atmospheric pressure on traumatic, acute, and chronic wounds in 1993 (5). The theory still remains simple; that is to convert a chaotic open wound to a controlled and optimized closed wound. The mechanism of action of NPWT through sub-atmospheric pressure causes a physical contraction of wound beds optimizing the wound environment to improve angiogenesis.

NPWT is believed to decrease the bacterial bio-burden in wound beds through the application of continuous suction (3). Ultimately, NPWT maintains a moist wound healing environment, promotes granulation tissue formation and wound contraction while removing exudates and slough from the wound bed (3,2,5,6) . NPWT derives its beneficial effects on wound healing from multiple interactions with changes effected both on a microscopic and macroscopic level (5).

A 2011 prospective study of 19 patients who were status post total hip arthroplasty were placed into randomized groups, with use of either a standard dressing or NPWT. The results were significant and the study concluded that NPWT not only decreased development of postoperative seromas but also improved wound healing (7). Stannard et al performed a study in 2012 of 249 patients with 263 lower extremity fractures which concluded that the application of NPWT to surgical incisions immediately after surgical fixation and closure should be considered after below the knee high risk traumatic fractures (8).

In conclusion, closed incision management has several benefits to offer surgeons who deal with complicated skin incisions. Not only does this utilization of NPWT offer an expedited wound closure, but it can results in decreased surgical costs, reduced risk of infection, and shorter to no hospitalization.

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