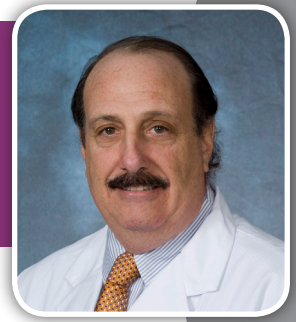


A Literature Review:

Managing Incisions with Closed Incision Negative Pressure Therapy

Tom Wolvos, MSc, MD, FACS



Dr. Tom Wolvos practices general surgery, advanced wound care, and hyperbaric oxygen therapy in Scottsdale Arizona. He is the editor of the Scottsdale Wound Management Guide, a comprehensive guide for the wound care clinician and sits on the editorial advisory board for the International Wound Journal and Wounds. Dr. Wolvos has written extensively and presented nationally and internationally on negative pressure wound therapy and advanced wound care.

Introduction

THE considerable impact of surgical incision complications (eg, infection, dehiscence) on both patients and healthcare resources has made incision management a critical concern. Negative Pressure Wound Therapy (NPWT) has revolutionized the treatment of complex open wounds and in recent years has been applied over closed surgical incisions. This review summarizes findings in the literature related to immediate application of closed incision negative pressure therapy (CINPT) over closed incisions in the sterile field in the operating room.

Studies have identified a variety of patient conditions and medical procedures that contribute to the development of complications such as infection and dehiscence (Table 1). These complications increase the morbidity of the patient and may prolong surgical site healing. CINPT has been used over the incisions of patients with comorbidities and treatment factors indicative of potential for developing surgical incision complications.

Closed Incision Negative Pressure Therapy

CINPT can be applied using either traditional NPWT (V.A.C.[®] Therapy; KCI, an Acclity company, San Antonio, TX) or a portable, disposable NPWT system (Prevena[™] Incision Management System; KCI, an Acclity company, San Antonio, TX). Each system produces continuous negative pressure transmitted through a covered, reticulated open-cell foam dressing placed over a nonadherent interface layer that protects the closed incision and surrounding tissue.

The disposable therapy unit and its associated foam dressings (Prevena[™] Peel & Place[™] Dressing and Prevena[™] Customizable[™] Dressing, KCI, an Acclity company, San Antonio, TX) are designed for up to 7 days of continuous therapy. A polyester fabric interface layer with 0.019% ionic silver to reduce bacterial colonization within the fabric is built into these dressings, so they can be immediately placed on the incision line in the sterile field. The Prevena[™] Peel & Place[™] Dressing is used to manage incisions ≤ 20 cm in length; the Prevena[™] Customizable[™] Dressing is scored so it can

be cut to fit closed incisions of varying lengths and shapes.

Closed Incision Negative Pressure Therapy Over Orthopedic Incisions

A multicenter, prospective, randomized controlled trial (RCT) of 249 patients with 263 fractures compared CINPT to standard postoperative dressings (Control) in patients with high energy lower extremity trauma with tibial plateau, pilon or calcaneal fractures.² CINPT patients, compared to Control patients, had statistically significantly fewer infections (23 vs 14 respectively; $p=0.049$) and wound dehiscences after discharge (20 vs 12, $p=0.044$) following treatment of the fractures with open reduction internal fixation.²

Closed Incision Negative Pressure Therapy Over Sternotomy Incisions

A prospective comparative study analyzed 150 consecutive obese (BMI ≥ 30) cardiac surgery patients, whose sternotomy wound incisions were treated with either CINPT ($n=75$) or conventional sterile wound dressings (Control; $n=75$). All patients in both groups were followed for at least 90 days. There were no significant preoperative differences between the groups. The CINPT group had significantly fewer wound infections than the Control group: 3/75 (4%) vs. 12/75 (16%), respectively; $p=0.0266$. In the CINPT group, 71/75 (95%) of the incisions were primarily closed when the dressing was removed in 6 to 7 days. No wound infections occurred after this closure. In contrast, 9 of the 12 reported Control group wound infections occurred beyond postoperative day 7 and up to day 35.³

- Diabetes
- Cigarette smoking
- Obesity
- Malnutrition
- High energy mechanism of action
- Revision surgery
- Compromised soft-tissue
- Poor vascular status
- Extensive soft-tissue dissection
- High risk of hematoma formation
- High risk of wound contamination
- Incisions closed under tension
- Surgical incisions with ongoing drainage
- Chronic steroid use
- Chronic renal failure
- Immunocompromised
- Patients receiving ongoing chemotherapy
- Surgery in an area that has received previous radiation therapy
- Age >65
- Higher American Society of Anesthesiologist score

Table 1. Patient risk factors that may predict poor wound healing¹

Closed Incision Negative Pressure Therapy Over Groin Incisions

A comparative retrospective study evaluated the infection incidence and severity in 90 pts with 115 groin incisions that were treated with either CINPT (n=41 pts with 52 incisions) or a skin adhesive or absorbent (n=49 pts with 63 incisions; Control). Mean times of wound evaluation in the CINPT group were 7 and 33 days postoperatively vs 10 and 40 days in the Control group. CINPT -treated incisions had a significantly lower overall rate of infection: 3/52 (6%) vs 19/63 (30%), $p=0.0011$. The 3 infections in the CINPT group were all rated as Szilagyi grade I, whereas the 19 in the Control group included 10 (16%) grade I, 7 (11%) grade II, and 2 (3%) grade III infections.⁴

Closed Incision Negative Pressure Therapy Over Abdominal Wall Incisions

A retrospective review of patients who underwent abdominal wall reconstruction to repair large ventral hernias evaluated 23 patients who were treated with CINPT

(group I) and 33 patients with standard gauze dressings (group II). CINPT dressing was applied intraoperatively and removed after 5 days. Compared to standard dressing patients, CINPT patients had significantly better overall wound complication rates: 63.6% vs. 22%, respectively ($p=0.020$) as well as skin dehiscence rates: 39% vs. 9%, respectively ($p=0.014$). Rates of infection, skin and fat necrosis, seroma, and hernia recurrence were also lower for CINPT patients.⁵

Discussion

Through application of negative pressure to the incision site, CINPT helps to hold incision edges together and to remove fluid from closed surgical incisions that are still draining. A nonclinical bench top study using a simulated incision model reported that sutured incisions with CINPT resisted separation 51% better than those with sutures only, and stapled incisions with CINPT resisted separation 43% better than those with staples only.⁶ CINPT also protects the incision site from external

contamination via the occlusive drape that covers the dressing.

Summary

In these studies the application of CINPT over closed incisions after surgery for a variety of incisions was associated with reduced complication rates compared to standard of care surgical dressings. It would be worthwhile to compare these findings with those of reported for use of CINPT over closed incisions in other types of surgery.

References:

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