Mixed Outcomes with Incisional Negative Pressure Wound Therapy for Reducing Surgical Site Infections Following Lower Extremity Orthopaedic Trauma: A Systematic Review of Level I and II Evidence

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INTRODUCTION:

Incisional negative pressure wound therapy (iNPWT) is an emerging adjunct to standard dressings for managing surgical wounds following orthopaedic trauma, particularly in lower extremity fractures. Unlike traditional wound care, which relies on standard closure techniques and simple dressings, iNPWT provides mechanical support at the incision site and may reduce the risk of surgical site infections (SSIs). However, evidence on its effectiveness remains mixed. This systematic review evaluates the current high-level evidence comparing iNPWT to standard dressings for SSI prevention in lower extremity orthopaedic trauma surgery.

METHODS:

A comprehensive literature search was performed using PubMed and MEDLINE from January 2009 to February 2025. Studies were included if they were randomized controlled trials or prospective comparative studies evaluating incisional negative pressure wound therapy (iNPWT) versus standard dressings in patients with lower extremity fractures. Extracted data included surgical site infection (SSI) rates, wound complications, fracture type, and patient-reported outcomes. Relevant outcomes were synthesized and analyzed across studies.

RESULTS:

Of 52 articles identified, seven studies (n = 2,913 patients) met inclusion criteria, including four randomized controlled trials and three prospective cohort studies. Five of the seven studies reported reduced surgical site infection (SSI) rates with incisional negative pressure wound therapy (iNPWT), though results were heterogeneous and varied in methodological quality. In patients with high-risk open fractures, one study demonstrated a significantly lower infection rate with iNPWT (5.3%) compared to standard care (28%, p = 0.024). Another study observed no infections in the iNPWT group versus a 10.2% infection rate in controls, though not statistically significant (p = 0.565). A third trial reported a significant reduction in elderly hip fracture patients, with an SSI rate of 1.9% in the iNPWT group versus 6.4% with standard dressings (risk ratio 0.29; 95% CI, 0.10–0.85). In contrast, larger multicenter trials reported no statistically significant differences in infection rates or patient-reported outcomes.

DISCUSSION AND CONCLUSION:

While iNPWT may reduce surgical site infections in select high-risk fracture populations, current Level I and II evidence does not support its broad superiority over standard dressings. Benefits appear most pronounced in patients with severe open fractures or hip fractures; however, large randomized trials have not demonstrated consistent efficacy across broader populations. Interpretation is limited by heterogeneity in patient demographics, fracture types, and definitions of SSI. Despite these limitations, iNPWT is safe, well-tolerated, and may improve patient satisfaction postoperatively. Further high-quality studies are needed to refine indications and identify patient subgroups most likely to benefit from iNPWT in lower extremity orthopaedic trauma.