Closed Incision Negative Pressure Wound Therapy Reduces Surgical Site Infection Following Emergency Laparotomy

# Jordan N. C. Chung1; Omar Ali1; Emma Hawthornwaite, MB ChB, BSc2; Thomas Watkinson, MBBS2; Ursula Blythe, MB ChB, BSc2; Niamh McKigney, MBBS, MRCS2; Deena P. Harji, MB ChB, PhD, FRCS2; Ben Griffiths, MB ChB, BSc, FRCS3

1Newcastle University Medical School, Newcastle, UK; 2Health Education North East, Newcastle, UK; 3Department of Colorectal Surgery, Royal Victoria Infirmary, Newcastle, UK

## OBJECTIVE

This study aims to compare rates of surgical site infection (SSI) between patients receiving closed incision negative pressure therapy (ciNPT) and standard surgical dressing following emergency laparotomy through a propensity matched analysis.

**BACKGROUND**

Surgical site infection contributes to a significant proportion of post-operative morbidity in patients undergoing emergency laparotomy.1,2 SSIs cause significant patient burden, increase length of stay and have economic implications. ciNPT has been shown to help reduce SSI rates in patients undergoing elective laparotomy; however, there is limited evidence for their use in the emergency setting.3,4

## METHODS

A registry-based, prospective cohort study was undertaken using data from National Emergency Laparotomy Audit (NELA) database at our centre between January 2014 and December 2019. ciNPT\* was applied to the midline laparotomy incision under sterile conditions. Negative pressure consisted of continuous -125 mmHg for 7 days or until discharge if prior to this. The control group consisted of patients undergoing a standard surgical dressing.

The primary outcome measure was SSI as defined by the Centers for Disease Control (CDC) criteria. Secondary outcomes included 30-day postoperative morbidity, length of stay, 30-day mortality, and readmission rates. Propensity score matching (PSM) was performed in a 1:1 ratio to mitigate for

### RESULTS

A total of 1484 patients were identified from the NELA dataset (**Figure 1**). Patients were excluded if they underwent emergency laparoscopic surgery, required negative pressure wound therapy for laparostomy management or underwent a trauma laparotomy. PSM resulted in two equally matched cohorts with 237 patients in each arm.

There were no significant differences in age, sex, Charlson Cormobidity Index, American Society of Anaesthesiologists score, or smoking status between groups (**Table 1**). The rate of preoperative antibiotics and predicted NELA mortality were also similar. There were significant differences in the types of preoperative skin preparation used (p<0.001) and predicted morbidity (p<0.001) between the two groups (**Table 2**).

Despite having higher initial predicted morbidity rates, the ciNPT group had no higher rates of 30-day morbidity, length of stay, reoperation, or mortality (**Table 3**). The overall incidence of SSI was 120 of 474 patients (25.3%). The rate of SSI in ciNPT cohort was 16.9%, compared to 33.8% in the standard surgical dressing cohort (p<0.001; **Figure 3**). The rate of superficial and deep infections were higher in the standard dressing arm compared to the ciNPT (p<0.001).

### CONCLUSION

In this study patient population, ciNPT in emergency laparotomy patients was associated with a reduction in SSI rates compared to standard dressings.

## FIGURES

Patients identified undergoing emergency laparotomy in the NELA database (n=1484)

Eligible patients (n=1185)

Propensity Score Matching (1:1)

**Control (n=237)**

**ciNPT (n=237)**

**Figure 1.** Flow chart of patients included in study

Patients excluded (n=299)

**Table 1.** Patient baseline characteristics

**Table 2.** Preoperative characteristics

|  |  |  |  |
| --- | --- | --- | --- |
|  | **ciNPT** | **Control** | **P Value** |
| Antibiotics | 195 (89.4%) | 171 (86.8%) | 0.40 |
| **Skin preparation** Povidone iodine aqueous Chlorhexidine aqueous  2% Chlorhexidine gluconate  Unspecified | 91 (40.8%)  18 (8.1%)  121 (54.2%)  7 (2.9%) | 170 (74.6%)  9 (3.9%)  55 (24.1%)  3 (1.2%) | <0.001 |
| Predicted morbidity | 69.3 | 62.1 | <0.001 |

**Table 3.** Postoperative outcomes

|  |  |  |  |
| --- | --- | --- | --- |
|  | **ciNPT** | **Control** | **P Value** |
| Total surgical site infections | 40 (16.9%) | 80 (33.8%) | <0.001 |
| **Surgical Site Infection Type**  Superficial  Deep  Organ space  Unspecified | 19 (47.5%)  3 (7.5%)  14 (35.0%)  4 (10.0%) | 47 (58.7%)  12 (15.0%)  17 (21.2%)  4 (5.0%) | <0.001 |
| 30-day morbidity | 131 (55.3%) | 146 (61.6%) | 0.16 |
| Length of stay (days) | 15.9 | 15.9 | 0.97 |
| Reoperation | 11 (4.6%) | 18 (7.6%) | 0.29 |
| 30-day mortality | 12 (5.1%) | 9 (3.8%) | 0.07 |

40%

p<0.001

35%

**40/237**

**16.9%**

**80/237**

**33.8%**

30%

**Total SSI Rate**

25%

20%

15%

10%

5%

0%

selection bias.

**References:** 1. Alkaaki A, Al-Radi OO, Khoja A, et al. Can J Surg. 2019;62(2):111-

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|  |  |  |  |
| --- | --- | --- | --- |
|  | **ciNPT** | **Control** | **P Value** |
| Age (years, mean±SD) | 57±19 | 60±17 | 0.14 |
| Male Female | 125 (52.7%)  112 (47.3%) | 106 (44.7%)  131 (55.3%) | 0.98 |
| **ASA score**  1  2  3  4  5 | 23 (9.7%)  79 (33.3%)  94 (39.7%)  38 (16.0%)  3 (1.3%) | 24 (10.1%)  76 (32.1%)  96 (40.5%)  36 (15.2%)  5 (2.1%) | 0.95 |
| Smoker | 40 (17.2%) | 40 (18.7%) | 0.35 |
| **Charlson Comorbidity Index**  0  1-2  3-4  >4  Missing data | 43 (19.0%)  62 (27.4%)  62 (27.4%)  59 (26.1%)  11 (4.6%) | 52 (22.7%)  60 (26.2%)  58 (25.3%)  59 (25.8%)  18 (7.5%) | 0.80 |

As with any case study, the results and outcomes should not be interpreted as a guarantee or warranty of similar results. Individual results may vary depending on the patient’s circumstances and condition.

NOTE: Specific indications, limitations, contraindications, warnings, precautions and safety information exist for these products and therapies. Please consult a clinician and product instructions for use prior to application. Rx only.

**Control ciNPT**

**Figure 3.** Total rates of surgical site infections

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