Skin Closure After Infected Laparotomy (SCAIL):

An EAST Multicenter Trial

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Purpose:
The use of closed incisional negative pressure wound therapy (ciNPWT) has been demonstrated to reduce the risk of surgical site infections (SSI) across several surgical specialties, including General Surgery, Orthopedics, Gynecology, and Vascular Surgery. This data is often limited to elective surgeries and low risk surgical wounds. A recent randomized control trial in elective Colorectal and Hepatobiliary patients did not show a significant benefit for ciNPWT. The data for ciNPWT in emergency general surgery (EGS) and/or trauma is limited but does suggest positive results for SSI reduction. Due to this heterogeneity in the literature and complexities of the patient population, the management of contaminated laparotomy incisions remains a controversial topic in EGS and trauma. Several institutions prefer to leave laparotomy incisions open, with or without NPWT, in favor of healing by secondary intention. This method has been shown to prolong wound healing time by up to 48-days post fascial closure. Recent evidence suggests that SSI rates following emergent laparotomies with the use of ciNPWT may be as low as 3-7%, which is similar to open wound management techniques. The purpose of this study is to determine if ciNPWT is non-inferior to open wound management and incision closure with traditional dressings. The results of this study will help create evidence-based practice management guidelines for Acute Care Surgery patients.

Study Design:
Pragmatic, prospective non-inferiority trial comparing the use of ciNPWT to open wound management with or without vac therapy.

Primary Aim:
1. To determine if ciNPWT is non-inferior to open wound management for minimizing SSI following contaminated laparotomies in trauma and EGS patients.

Secondary Aim:
1. To compare wound closure rates between ciNPWT and open wound management

2. To compare complication rates between ciNPWT and open wound management
3. To compare MME equivalents during hospitalization between ciNPWT and open wound management

Hypothesis
ciNPWT for wound management is non-inferior to open wound management with or without vac therapy for minimizing surgical site infections in contaminated laparotomies in acute care surgery patients.

Inclusion:
Adult patients, ≥18 years old
Undergo midline laparotomy with one of 2 definitive wound management strategies*:
1) Open wound management (secondary healing) with or without negative pressure wound therapy
2) Primary closure with incisional negative pressure wound therapy

Class III-IV surgical wounds[a-b]
1. Emergency General Surgery laparotomy with gross spillage, perforation, purulent/feculent peritonitis or bowel necrosis
2. Trauma laparotomy (blunt or penetrating) with full thickness stomach, small bowel and/or colon injuries

* Wound classification based on initial laparotomy, definitive wound closure strategy may occur during subsequent planned re-opening (initial damage control laparotomy)

Exclude:
Pregnant patients
Incarcerated patients
Laparoscopic operations with extraction sites (i.e. laparoscopic colectomies)
Class I (Clean) and Class II (Clean Contaminated) Wounds
Wounds undergoing delayed primary closure
Laparotomies for unplanned return to the OR after initial fascial closure
Died within 24 hours of fascial closure

Primary Outcome
Surgical site infection[c] within 30 days from initial laparotomy.

Data collection and collaboration

Participating centers will identify patients from their respective hospital trauma registries retrospectively. Individual data user agreements will be executed between Baylor Scott & White-Temple and the participating centers as needed. We will establish a secure REDcap database here at BSW with the help of our regulatory department and create a unique REDcap link for every participating center. Password protected REDcap link will be shared with collaborating sites for data entry. Each center will input their abstracted patient data into

REDCap hosted by Baylor Scott & White-Temple. Participating centers will be restricted to accessing only their data, in REDCap. Participating centers that wish to conduct further analysis of the collaborative data can request a full data set from Baylor Scott & White-Temple.

Statistical Plan

This is a prospective, non-inferiority trial comparing two wound management strategies in contaminated (Class III and IV) laparotomies in trauma and EGS patients. A non-inferiority trial was chosen to compare a novel treatment modality (ciNPWT) to the gold standard wound management strategy for contaminated wounds (open-healing by secondary intention). Power analysis was performed based on previously published superficial SSI rates in open contaminated laparotomy wounds (4%- Feather et al.) and ciNPWT contaminated laparotomy wounds (7%- Hall et al.) 247 patients will be required in each treatment group for a total of 494 patients with an alpha of 5% and non-inferiority limit of 3%. It is estimated that 10 centers will be required to participate, enrolling 50 patients from each center.

Data on pre-, intra-, and post-operative variables will be obtained. Categorical variables will be compared with a chi-square test (or Fisher's exact test if cell counts are low). Continuous variables will be compared using a two-sample t-test (or Wilcoxon rank-sum test).). To determine non-inferiority the difference between the SSI rate resulting from ciNPWT and the gold standard wound management will be calculated along with a one-sided 95% confidence interval. If the upper bound of the confidence interval falls below the 3% limit, we will conclude that the novel method is non-inferior to the gold standard. In addition, multivariate logistic regression analysis will be performed to determine risk factors for SSI. Wound closure techniques in patients undergoing damage control laparotomy with open abdomen management will be compared in a subgroup analysis.

Risk Analysis

Patients will be managed according to each participating institution's protocols and standard of care. Patients will not be subject to randomization or experimental treatments. Participation in this study poses minimal physical, psychological, emotional, economic, legal and financial risk to the patient or participating centers.

Benefit:

Participation in this study will help current and future patients by identifying the appropriate management of contaminated wounds that may ultimately minimize patient pain and discomfort by promoting wound healing and reducing surgical site infections. This benefit to patient care is thought to outweigh the minimal risk associated with participation in this study.

Privacy:

All de-identified data will be stored in a password protected REDCAP database that is maintained by the sponsoring institution. Participating institutions will be granted access to the database after verification of IRB approval at each site.

The patient's MRN will be used to access electronic medical record and collect information needed to complete the study. No other confidential information will be accessed, and patients will be assigned a unique ID to minimize the risk to loss of confidentiality. All files will be password protected. The master list of code numbers assigned to each subject will be stored in a separate database only accessible by the PI. Data collection documents will be available to the principal investigator or key subject personnel on the research team. Coded data will be archived in the PI's office computer as a password-protected file for 3 years. The data will be deleted from the PI's hard drive 3 years after study completion.

We will utilize the trauma registry to obtain MRNs of patients meeting the set inclusion criteria. Remainder of the data collection will be carried out using our provided data collection tool and electronic medical records. Patients will not be contacted to obtain information and will have no time commitment. Only the PI and other members of the research team that have been granted access will have access to the database.

All data will be stored on a Baylor Scott & White approved, password protected secure server and will not be shared with anyone outside of the approved research personnel. Patients will only be identifiable by medical record number. Date of surgery will be removed after data collection is complete.

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[a] **Class III: Contaminated**- Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered including necrotic tissue without evidence of purulent drainage (e.g. dry gangrene) are included in this category. Examples of "Contaminated" cases include appendectomy for inflamed appendicitis, bile spillage during cholecystectomy, or open cardiac massage. Open surgical wounds returning to the OR. Examples of major break in sterile technique include but are not limited to non-sterile equipment or debris found in the operative field

[b] **Class IV: Dirty/Infected**- : Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation. Examples of "Dirty/Infected" cases include excision and drainage of abscess, perforated bowel, peritonitis, ruptured appendix.

[C]**Surgical Site Infections:**
Superficial: within 30 days of surgery, involves skin or subcutaneous tissues and one of the following: 1) purulent drainage; 2) organisms isolated from aseptically obtained culture of wound; 3) one sign of infection: pain, tenderness, swelling, redness, heat AND superficial incision deliberately opened

Deep: within 30 days of surgery, involves deep soft tissues (fascia and/or muscle) with one of the following: 1) purulent drainage from deep incision not involving organ space; 2) spontaneous fascial dehiscence or deliberately opened due to signs of infection; NOTE: infection involving both superficial and deep incision sites should be reported as deep SSI.

Organ space: within 30 days of surgery, involves any part of the anatomy, other than the incision, which was opened or manipulated during an operation with one of the following: 1) purulent drainage from a drain, isolated organisms from aseptically obtained cultures from organ space tissues, abscess involving organ space found during examination, reoperation, or pathological or radiological evaluation