بسم الله الرحمن الرحيم

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بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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Outcome Assessment of Closed Negative pressure wound therapy use to decrease Surgical Site Infection in Elective Paediatric Colorectal Procedures in Comparison with the Standard Wound Care

A Thesis Submitted for Partial Fulfilment for the Requirements of Doctorate Degree in Paediatric Surgery

By

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بِسْمِ اللهِ الرَّحْمنِ الرَّحِيمِ

قَالُواْ سُبْحَانَكَ لاَ عِلْمَ
لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ
أَنتَ الْعَلِيمُ الْحَكِيمُ

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Ahmed Mahmoud Ali Mohamed Moubarak

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Content

List of Abbreviations

Abbreviation	Full terminology
SSI	Surgical site infections
NPWT	Negative pressure wound therapy
SIP	Superficial Incisional Primary
SIS	Superficial Incisional Secondary
DIP	Deep Incisional Primary
DIS	Deep Incisional Secondary
NHSN	National Healthcare Safety Network
SIR	Standardized Infection Ratio
KCT	Kinetic Concepts Inc
CSI	closed surgical incision
COI	closed orthopaedic incisions
FDA	Food and Drug Administration
VEGF	vascular endothelial growth factor
RCTs	randomised controlled trials
PU	polyurethane
SC	standard care

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Outome Assessment of Closed Negative pressure wound therapy use to decrease Surgical Site Infection in Elective Paediatric Colorectal Procedures in Comparison with the Standard Wound Care.

Summary

Background: Surgical site infections (SSI) are the most common and costly of all hospital-acquired infections. Negative pressure wound therapy (NPWT) is a relatively new treatment option which considered in our study to decrease surgical nosocomial events in elective paediatric colorectal procedures in comparison with the standard wound care. **Method:** A randomized control study was conducted in paediatric surgery department. Lower statistical difference of infection frequency in NPWT group comparing to standard wound care group was revealed. **Results:** We enrolled 300 children who underwent a colorectal procedure. The study population was randomly allocated into two groups: Group A: standard wound care (n=150), Group B: negative pressure wound care (n=150). There was no statistical difference among the different group according to baseline characteristics, lab investigation and the surgical procedures. There was significant difference between the two groups according the frequency of infection (P value >0.001). Also, subgroup analysis regarding to the age group showed significant difference according to the frequency of the complication. Regarding hospitalization, there was statistical difference of the duration of hospitalization (P value >0.001). there was no statistical difference among the different group according to the frequency of infection, discharge and results of culture of the discharged infection. **Conclusion:** Our study concluded that NPWT use in the colorectal surgical procedure in paediatric has beneficial in the setting of decrease the incidence of SSI and the need for home nursing post-surgery and also decrease the duration of home nursing in those whom need it.

Key word: Negative pressure, Wound

Introduction and Rationale

Introduction and Rationale

Surgical site infections are both common and morbid. Surgical site infections are now the most common and costly of all hospital-acquired infections, accounting for 20% of all hospital-acquired infections. Surgical site infections are associated with increased length of stay and a 2- to 11-fold increase in the risk of mortality. Although most patients recover from an SSI without long-term adverse sequelae, 77% of mortality in patients with an SSI can be attributed to the infection itself **(Anderson et al. 2014; Bratzler et al. 2013)**.

The incidence of SSI is 2% to 5% in patients undergoing inpatient surgery. Estimated annual incidence varies widely, ranging from 160,000 to 300,000 in the US. These estimates are likely understated, given the surveillance challenges after discharge. The financial burden of SSI is considerable; it ranks as the costliest of the hospital-acquired infections. The annual cost of SSI in the US is estimated at $3.5 to $10 billion. Increased costs from SSIs are driven by increased length of stay, emergency department visits, and readmissions. On average, SSI extends hospital length of stay by 9.7 days, and increases the cost of hospitalization by more than $20,000 per admission. More than 90,000 readmissions annually are attributed to SSIs, costing an additional $700 million per year. Because up to 60% of SSIs were estimated to be preventable with the use of evidence-based measures, SSI has become a pay-for-performance metric and a target of quality improvement effort **(Mangram et al. 1999; Magill et al. 2014)**.

Resections of colonic and rectal segments have been associated with the highest rates of SSI amongst cases without perforation of gross intra-abdominal contamination, likely secondary to the inherently contaminated intra-luminal environment, in such circumstances, despite best practice recommendations of pre-operative antibiotic use and aseptic operative technique, SSIs are reported at rates of 15 to 30% **(Kobayashi et al. 2008; Konishi et al. 2006)**.

According to the literature, anastomotic dehiscence consecutive to colostomy closure in the pediatric population can occur with a frequency that varies from 0 to 12.5% ;and wound infection from 40 to 45%. Other complications such as anastomotic stricture **(Ekenze, Agugua-Obianyo, and Amah 2007)**.

Few interventions beyond pre-operative antibiotic prophylaxis and aseptic technique have been shown to decrease rates of SSI. Negative pressure wound therapy (NPWT) is a relatively new treatment concept, initially reported on in 1997 by Morykwas et al. as a novel therapy for chronic wounds **(Morykwas et al. 1997)**

The first identifiable report in the literature on incisional NPWT (iNPWT) is a case-series from Gomoll et al. in the setting of orthopedic trauma. They demonstrated a decrease in serous exudative rates and good healing of incisions post-operatively **(Gomoll, Lin, and Harris 2006)**.

Cardiac surgery patients are known to be susceptible to mediastinitis, associated with significant morbidity and mortality. A retrospective review of 57 such patients who received iNPWT was reported in 2009 whereby an absence of any sternal wound infections was demonstrated**(Atkins et al. 2009)**.

In 2009, Stannard randomized 263 blunt orthopedic trauma patients with high-risk tibial and calcaneal fractures requiring surgical stabilization to either usual care or iNPWT **(Stannard et al. 2009)**.

Here they demonstrated a relative risk of infection of 1.9 times higher in control patients with no significant difference in the injury severity scores of each group. In a recently published series, 27 patients, post abdomino-perineal resection, with significant risk factors for wound infection had iNPWT applied to their perineal incisions until the fifth post-operative day **(Chadi et al. 2014)**.

When compared to a recent historical control group, a statistically lower rate of perineal SSI was detected in the intervention group. Furthermore, on multivariate analysis, when other risk factors were controlled for, the use of iNPWT was found to be protective against the outcome of perineal SSI. Finally, Matatov et al. performed a retrospective cohort study using the same NPWT dressing as the current proposal and found a significant difference (24 % versus 6 %) in SSI compared to standard dressing following 115 femoral cut-downs for vascular procedures **(Matatov et al. 2013)**.

Decreased superficial surgical site infections, shortened hospital stay, and improved quality of life due to negative pressure wound therapy after colorectal procedures in children.