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Original Research Article

Early versus late dressing removal in clean and contaminated midline laparotomy wounds: a non-randomized pilot study

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ABSTRACT

Background: This study was carried out to evaluate the efficacy of early versus late dressing removal in clean and contaminated midline laparotomy wounds.
Methods: Fifty patients aged ≥18 years who were admitted and operated for surgical procedures (both emergency and elective) were included in the study. All laparotomy wounds had fulfilled the CDC criteria. Twenty-five patients each were included in early dressing removal group and the late removal group. In early removal group, the laparotomy wound dressing was removed within 48 hours and in late removal group, was removed after 48 hours of surgery. The incidences of superficial and deep surgical site infection (SSI) in both groups were analysed. Other secondary parameters like incidence of wound dehiscence and secondary suturing were also analysed.
Results: Twenty-five patients each, in early removal group and in late removal group were included for final analysis. The incidence of superficial SSI (%) was significantly less in early removal group (65.50 versus 89.50; p= <0.001). The duration (days) required for complete wound healing (8.52 versus 10.65; p=0.734) was significantly less in the early removal group. The length of postoperative hospital stay (days) was significantly less in early removal group (10.30 versus 14.90; p= <0.001).
Conclusions: Early removal of dressing significantly reduces the incidence of superficial SSI in midline clean and contaminated laparotomy wounds. It also significantly reduces the duration required for complete wound healing and facilitates early discharge of the patient compared to late dressing removal.

Keywords: Early dressing removal, Late dressing removal, Postoperative stay, Quality of life, Surgical site infection, Wound dehiscence

INTRODUCTION

Adequate number of people undergo laparotomy during their life-time, resulting in surgical site infection (SSI).[1] After laparotomy, the incision is closed using stiches, staples, dermo bond or adhesive glue.[1,2] At the end of the laparotomy, the operative surgeon covers the closed laparotomy wound using sterile gauze and adhesive tape or an adhesive tape containing a sterile pad. There are currently no guidelines about the timing of wound inspection after the laparotomy without the risk of wound sepsis. Early dressing removal encourages early identification of SSI, which is favoured faster postoperative mobilisation of the patient. Avoidance of post-operative wound inspection for two to three days may result in significant accumulation of sweat and dirt, compromising wound hygiene.[1-3] Conversely, early removal of the surgical wound may also have an adverse

effect on wound healing by disturbing the healing environment.[1-4]

The morbidity rate following the incidence of SSI (both superficial and deep) has been reported to be as high as 34% to 45%.[1-3] Wound dehiscence is a condition which adds significant morbidity and prolongs the hospital stay. The most dreaded immediate complication is burst abdomen which requires urgent re-exploration. Other complications include deep seated abscess, sepsis (early complications) and high incidence of an incisional hernia (late complications) (69%).[1-5]

There have been considerable advances in the management of SSI over the recent years. Early dressing removal is believed be beneficial for early identification of the SSI (both superficial and deep).[4] Hence this study was done to compare the clinical efficacy of Early versus late dressing removal in clean and contaminated midline laparotomy wounds.

METHODS

Study design

The study was designed as a single centre, prospective, parallel armed, non-randomized pilot study. It was conducted for two years in a tertiary care centre in South India. Institute Human Ethics Committee (IEC) approval and informed consent was obtained. Entire information recorded was kept confidential, and patient was given full freedom to quit from the study at any point. All ethical principles mentioned in the Declaration of Helsinki were followed. It included a total of 50 patients who developed surgical site infection following midline laparotomy (clean and clean contaminated wounds) in elective and emergency operative procedures.

Study patients

All consecutive patients aged more than 18 years admitted for surgery (elective and emergency) were classified as clean and clean contaminated wounds (wound involving normal but colonized tissue) and were included in the study. Contaminated (wound containing foreign body or infected material) and infected wounds (wound with purulent discharge) were excluded from the study.

Patients with existing stoma, patients who developed post-operative ascites, those who required additional procedure, patients with advanced malignancy and multi organ dysfunction were excluded from the study. The two groups studied included group A- Early dressing removal and group B- Late dressing removal group and were compared. Patients who developed surgical site infection were assessed. Baseline characteristics of the patients such as demographic data, comorbidities and body mass index (BMI) were recorded.

Sample size

The sample size was not calculated as this was a pilot study and there were no prospective studies comparing early dressing removal and late dressing removal in surgical wounds. There was no sampling technique involved. So total sample size of 60 with 30 patients in each group were selected. A total of 50 patients were investigated, 25 in early dressing removal group and 25 in the late removal group (Figure 1).

Study groups

Group A- Early dressing removal

After the surgical procedure, in both clean and clean contaminated wound, rectus was closed with 1-0 prolene. The subcutaneous area was washed with betadine solution followed by saline. The skin was closed intermittently with 2-0 prolene with the subcutaneous layer. After closure, the wound was cleaned with betadine followed by sprit. The wound was allowed to dry for one minute. The wound was covered with two pieces of sterile gauze piece and water proof adhesive bandage or plaster (Dynoplast) was applied all over the wound. Per-operative antibiotics (based on the Institute protocol) were continued. The dressings were opened within 48 hours of surgery, and subsequently, were changed every day. Sutures were removed on the eighth postoperative day (Figure 2).

Subsequent dressing change was done after 48 hours or in case of excess wound soakage, whichever is earlier. The day of first appearance of granulation tissue was noted and the wound size was monitored diligently. Once wound contraction was noticed, the final decision to cover the wound either by a delayed secondary closure, split thickness skin grafting (SSG) or healing by secondary intention was taken by the treating surgeon.

Group B- Late dressing removal

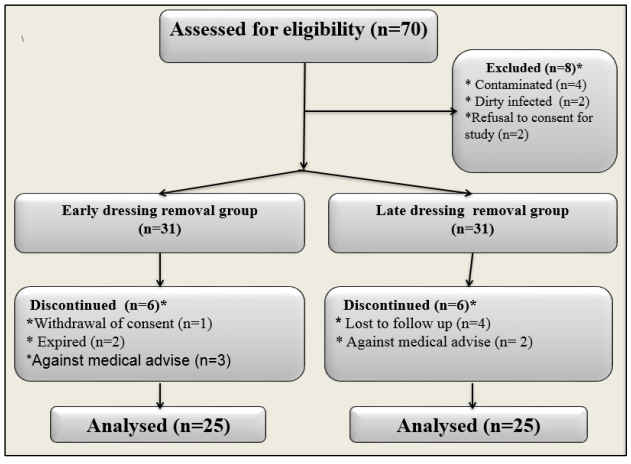

Figure 1: Study flow chart.

Similar to early dressing removal group, the wound was covered with sterile dressing. The dressing was removed after 48 hours of surgery. If there was excessive wound soakage, the dressing was inspected before 48 hours and that patient was included in early dressing removal group (Figure 1 study flow chart).

Parameters assessed

The primary outcome parameters studied were wound-related early morbidity (superficial and deep SSI) and wound-related delayed morbidity (wound dehiscence). The number of days required for complete healing either by primary intention (surgical) or secondary intention by granulation tissue cover was studied. Secondary outcome parameters like length of hospital stay, number of dressings changed and number of patients requiring additional antibiotic therapy were also studied. The patients in both the groups were followed up for a period of one month to detect early complications (wound dehiscence) and up to six months for late complications (incisional hernia). SSI (both superficial and deep) was defined by CDC criteria. Healing by primary intention was defined as complete healing (without any SSI) with healthy scar at the end of 15 days. Healing by secondary intention was defined as complete coverage of contracted wound surface with flat healthy granulation tissue at the end of one month. The end result of healing by secondary intention was formation of a weak scar tissue.

Statistical analysis

The data were analysed using SPSS software version 19.0 for Windows. Categorical variables were evaluated using Chi-square test or Fischer exact test. Continuous variables were evaluated using either a t-test or Mann Whitney test, based on whether data distribution was normal or not. Wound outcome parameters were assessed using mean±standard deviation. A p value of <0.05 is considered significant.

RESULTS

Men (n=27; 54 %) outnumbered women (n=23; 46%) in the entire study population, with a male to female ratio of 1.2: 1. BMI, age and gender distribution were comparable in both the groups. The distribution of comorbidities especially Diabetes mellitus (40% versus 60%; p= 0.679) were comparable in both the groups. Both groups were comparable in terms of indications for surgery, either emergency or elective (23 versus27; p =0.588) (Table 1).

Table 1: Comparison of baseline parameters between the study groups.

Demographic parameters		Early removal (n=25)	Late removal (n=25)	p-value
Gender [N (%)]	Male	13 (52%)	14 (64%)	0.236
	Female	12 (48%)	11 (44%)	
Age (mean±SD)		44.19±8.26	43.78±13.12	0.86
BMI (mean±SD)		23.2±4.2	22.47±3.67	0.456
Comorbidities [N (%)]	Diabetes	10 (40%)	15 (60%)	0.679
	Obesity	6 (24%)	3 (12%)	0.457
	Hypertension	4 (16%)	6 (24%)	0.560
Indication [N (%)]	Elective	13 (52%)	10 (40%)	0.588
	Emergency	12 (48%)	15 (60%)	

This distribution of indication for surgery was comparable and similar between the two groups (p=0.35) (Figure 2).

There was significant difference in the postoperative day of superficial SSI among the two groups [65.5 versus 89.5; p=0.001]. There was no significant difference in the postoperative day of deep SSI among the two groups (72.4 versus 78; p=0.604) (Figure 3).

There was a statistically significant difference between the two groups in terms of the number of days required for complete wound healing (8.5 versus 9.6; p=0.001). The mean number of dressings required to achieve complete wound healing was comparable between the groups. The difference in the mean length of postoperative hospital stay between the groups was statistically significant (24.3 versus 37.9; p=0.001).

All the patients in both groups at the end of one month, achieved wound cover either by primary intention (by surgery) or secondary intention. One patient (4%) in the early removal group developed wound dehiscence and another patient (4%) in the late removal group developed incisional hernia during the follow-up period.

Four patients underwent secondary suturing for wound dehiscence. One patient in each group achieved wound cover by secondary intention and skin grafting was done for wound dehiscence. One patient in early removal group underwent meshplasty for incisional hernia during the six months follow up period (Table 2).

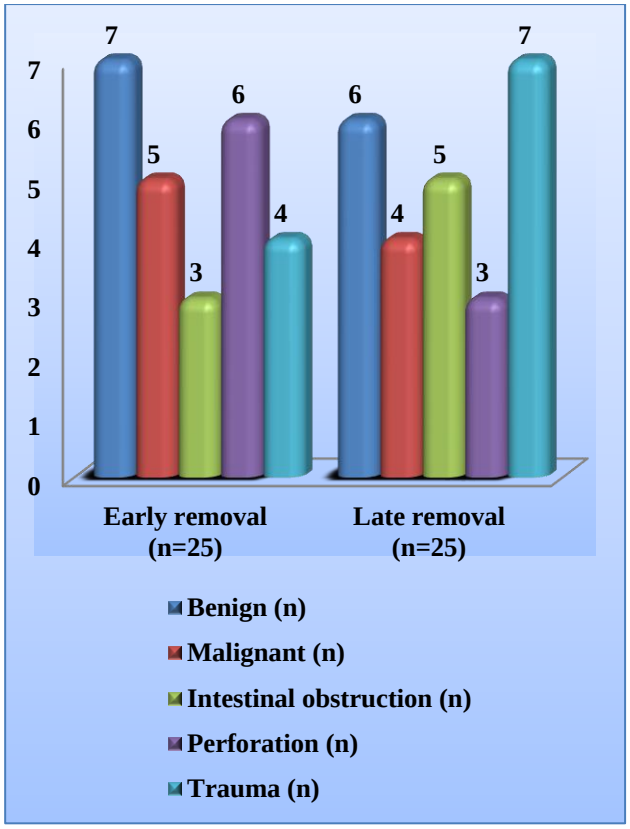

Figure 2: Distribution of indication for surgery between the study groups.

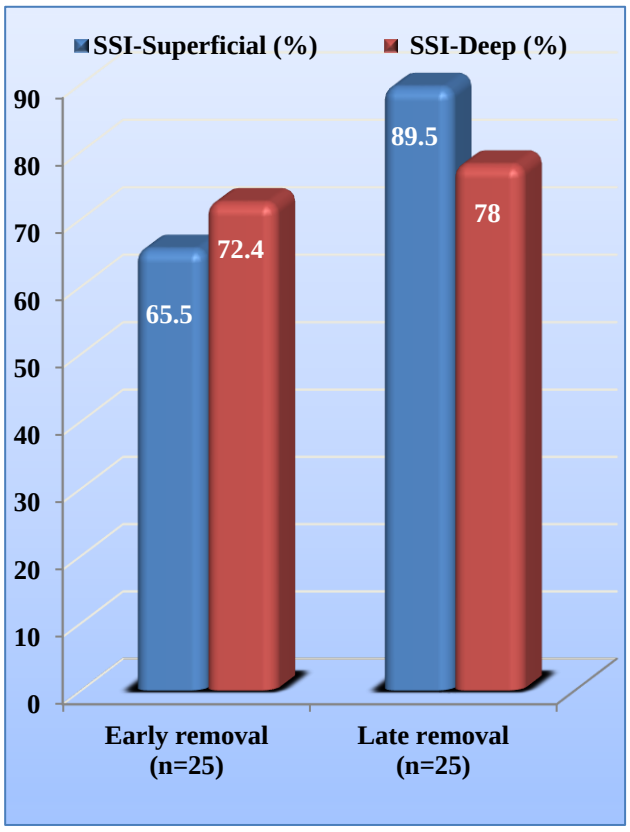

Figure 3: Incidence of SSI both superficial and deep (%) between the study groups.

Table 2: Comparison of wound parameters between the study groups.

Wound parameters	Early removal (n=25)	Late removal (n=25)	p-value
Number of days required for complete wound healing (N)	8.52	10.65	0.734
Number of dressings required for complete wound healing (N)	6.5	8	0.534
Mean length of postoperative hospital stay (days)	10.30	14.9	0.001
Follow up parameters			
Wound dehiscence (early) (%)	1 (4%)	-	-
Incisional hernia (late) (%)	-	1 (4%)	-

Intra-abdominal abscess or deep-seated abscesses were not reported in either group during the six months follow up period.

DISCUSSION

Demography

In this study, there was a male preponderance in both the study groups. Based on the gender distribution, there was no significant difference in the occurrence of SSI (both superficial and deep) among the study patients (p=0.236). This was similar to studies done by Toon CD et al., who reported that 64% in early dressing removal group and 64.8% in late dressing removal group were males.[1] The reason for male preponderance in wound dehiscence is unclear. The probable mechanism could be that males develop higher intra-abdominal pressure and wall tension, which can strain the tissues and wound edges causing sutures to cut through the muscle wall.[2]

About 88.6 % of the study population was below 50 years. This distribution resembled other studies. Toon CD et al. reported that 78.2% in early removal and 72% in late dressing removal belonged to the 30-50 years age group.[3] Middle age is associated with good tissue repair mechanism due to better functional integrity of the immune system.

A recent large retrospective study conducted by Eberhardt D et al found that BMI < 25 was not a definitive risk factor for wound dehiscence (p=0.456).[4] Considering the limited number of patients in this study, a larger sample size with more number of obese patients may provide valuable information on this association. Among all the comorbidities, diabetes was traditionally considered as a risk factor for SSI in multiple studies, but a study conducted by Dumville JC et al. showed that there was no significant effect of diabetes in the

occurrence of wound dehiscence.[5] This study also declared similar results.

Indication for surgery

The indication for surgery (elective or emergency) has a significant effect on wound healing. Frequent contamination of the wound and subsequent multiple dressing changes would result in SSI. Gavin NC et al. reported that the indication for surgery either elective or emergency, had a statistically significant effect on SSI in multivariate analysis (p=0.002).[6]

Patients who underwent surgery in an acute emergency setting were found to have a higher incidence of SSI in this study. 60 % of the entire study population underwent emergency laparotomy and infection risk was found to escalate parallelly. These results were similar to previous studies. Norman G et al reported that emergency surgery had 1.8 times increased risk of developing SSI (OR=1.8).[7]

Distribution of indication for surgery

In this study, it was found that the most common indication for surgery associated with SSI was traumatic perforation (n=7; 28%). The higher incidence of SSI in perforation of bowel is probably due to local factors like wound infection following contamination by the bowel contents. These dirty wounds were found to be associated with greater than 30% of SSI.[8] The presence of a co-existing stoma in the post-operative period further increased the chance of SSI in this study. Malignancy, on the other hand, induces changes in the immune system and causes cachexia and malnutrition, depressing the host tissue response to injury and healing. Several studies showed malignancy and sepsis as risk factors for post-operative SSI, but the study conducted by Van Dumville JC et al. failed to prove a similar association.[9]

Wound-related early morbidity parameters

SSI (superficial and deep)

Dumville JC et al reported a decline in the mean incidence of SSI in the early removal group, similar to the present study.[10] The subcutaneous edema gradually resolves in three to seven days, resulting in loosening of sutures. Meanwhile, the bowel edema may increase due to extensive dissection or bowel handling, leading to an increase in intra-abdominal pressure and cutting through of sutures. Early signs of wound dehiscence are usually evident after 72 hrs of closure such as erythema, seroma and serous wound discharge.

Number of days required for complete wound healing

This study showed that the number of days required for fascial closure and complete wound healing was significantly less in early removal group. Dumville JC et al reported a mean of ten days (range of 3-18 days) for complete wound healing in their patients.[6,10] The earlier dressing removal in their study patients in comparison to this study can be attributed to lesser likelihood of sepsis and poor general condition in trauma patients compared to patients with perforation and malignancy. Another major difference as contrasted from study by Dumville JC et al is that early dressing removal was studied in emergency surgery while the present study was done in both elective and emergency situations.[10]

Number of dressings required for complete wound healing

In this study, SSI (both superficial and deep) was found to enhance the number of dressings required for complete wound healing. The number of dressings was not evaluated as a separate parameter in similar studies. The removal of exudates by repeated dressings would help in reduction in cumulative load of toxic substances in the wound, which are detrimental to complete wound healing.[6]

Mean length of postoperative hospital stay (days)

In this study, patients in the early dressing removal group were discharged early compared to the late dressing removal group. Gavin NC and Toon CD et al. reported that there is no significant difference in the length of hospital stay among the compared groups (p= 0.06).[6,8] The early discharge of patients in the early dressing removal group was due to earlier detection of SSI (both superficial and deep) compared to the late dressing removal group. On prompt discovery of SSI, appropriate steps were taken to handle the infection. Hence, wound healing is faster in the early dressing removal group and patient recovery is early.

Wound-related late morbidity parameters

Similar to the present study, certain studies have evaluated the achievement of healthy scar as the end point. A patient developed incisional hernia at home after discharge from the hospital. It was due to wound dehiscence and the laparotomy wound healed by secondary intention. The incidence of incisional hernia in this study (4%) is similar to other studies by Toon CD et al (3.3%) and Gavin NC et al. (3%).[1,6]

In the current study, there were no untoward incidents like intra-abdominal abscess formation and burst abdomen. The follow-up period in the present study was six months, which may not be sufficient to detect late complications like incisional hernia. Toon CD et al reported the incidence of incisional hernia at the end of their follow up period as 2.3%, which was less compared to the present study.[1,8]

In the current study, apart from the difference in the incidence of SSI among the groups, there was no

remarkable difference in reaching the final end point of a healthy scar. After excluding the patients in whom final outcome could not be studied due to loss to follow up, mortality or discontinuation of treatment due to complications, all the other patients in both groups achieved complete wound healing.

The chances of complete wound healing would significantly decline if SSI (both superficial and deep) occurs within three days of laparotomy.[1,7,8] This is mainly due to infection and deranged wound healing. The management of SSI in the form of additional antibiotic cover, along with cleaning and dressing with antiseptic solution is a challenging task.

Limitation of the study: a study comparing a larger sample size would provide precise information. A shorter duration of follow up (6 months) was another limitation, as it may be insufficient to evaluate the long-term complications.[6,10] Hence prospective randomized controlled trials involving a larger sample size and prolonged follow up for ventral hernia is recommended.

CONCLUSION

Early removal of dressing significantly reduces the incidence of superficial SSI in midline clean and contaminated laparotomy wounds. It also significantly reduces the duration required for complete wound healing and facilitates early discharge of the patient compared to late dressing removal.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee IEC NO./IEC/C-P/34/2017

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