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Original Research Article

Loose knots and surgical site infections in abdominal surgeries (clean-contaminated and contaminated wounds)

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ABSTRACT

Background: Surgical site infections (SSIs) are associated with high healthcare costs and worsen the post-operative course of a considerable proportion of general abdominal surgical patients. SSIs raise the risk of post-operative morbidity and mortality, necessitating hospitalization, intravenous antibiotics, and potentially surgical reintervention. The aim of the study was to compare the outcome of intermittent loose knots and the conventional vertical mattress suturing in patients undergoing abdominal surgeries.
Methods: This prospective comparative study was done in patients undergoing emergency abdominal surgeries for any cause. Patients were divided into 2 groups- (a) group 1 (45 patients): intermittent loose knots between conventional vertical mattress sutures; (b) group 2 (45 patients): conventional vertical mattress suturing.
Results: In this study, 31% of patients were in the 41-50 years age group, 53.3% of patients were male. Among various abdominal surgery opted, laparotomy was the most commonly performed procedure (47%). In this study, group 1 patients shown a decrease in wound gap, secondary wound closure and delayed wound approximation than group 2 patients.
Conclusions: Loose knots in between conventional vertical mattress sutures are better than conventional vertical mattress suturing in terms of wound gap, secondary wound closure and delayed wound approximation.

Keywords: Surgical site infection, Vertical mattress, Loose knot

INTRODUCTION

Surgical site infection (SSI) is the second most common post-operative complication (3-5%) after pneumonia and the most common (20%) among the Hospital acquired infection (HAI).[1,2] SSIs increase the post-operative morbidity of the patient and form the most common cause of post-operative readmission. Patients with an SSI have a 2-11 times higher risk of death compared with operative patients without an SSI.[3] The nature of the procedure, the incision location, and whether a bodily cavity or hollow viscus is entered after surgery all affect the microbiology of SSI. Most SSIs are caused by skin flora inoculated into the incision during surgery.[4] Host-derived factors contribute importantly to the risk of SSI, including increased age, obesity, malnutrition, diabetes mellitus, hypocholesterolemia, and several other factors.[5] Reduced serum albumin concentration, increasing age, tracheostomy, and amputations were linked to early infection, whereas a dialysis shunt, vascular repair, and early infection were linked to hospital readmission in multivariable analysis.[6] A clearly modifiable factor is the type of surgical wound closure used, which is also known to be associated with the risk for SSIs. Although it is thought that skin closure of a contaminated or filthy incision increases the incidence of SSIs, few reliable

studies are evaluating the variety of wound closure procedures available to surgeons.[7] This study is directed to study the loose suturing technique and its outcomes.

Aim

The aim of the study was to compare the outcome of intermittent loose knots and the conventional vertical mattress suturing in patients undergoing abdominal surgeries.

METHODS

This prospective comparative study was conducted in the department of general surgery at ESIC Medical College and PGIMSR, Chennai, from December 2020 to May 2021 in patients requiring abdominal surgeries- clean-contaminated and contaminated wounds as defined by ACS-NSQIP, shall be randomly allocated to two groups using the closed envelope method (random allocation cards shall be made using computer-generated random numbers and kept within the envelope) and shall undergo skin closure by group 1: intermittent loose knots in between conventional vertical mattress sutures, and group 2: conventional vertical mattress suturing. Institutional ethics committee approval and informed consent from the patients was obtained.

Inclusion criteria

Male and female patients, adults above 18 years of age, patients undergoing emergency abdominal surgeries for any cause, patients assessed under I/II/III, patients consenting for the procedure were included.

Exclusion criteria

Patients not consenting to the procedure were excluded. Non-probabilistic consecutive sampling. To estimate a difference in surgical site infections between the two groups- traditional vertical mattress sutures (60%) vs intermittent loose knots suturing (30%) with a 95% confidence and 80% power, the sample size would be 45 in each arm.

Group 1

After correction of the underlying abdominal condition, just before skin closure, the surrounding area was cleaned with betadine. Skin was closed using intermittent vertical mattress sutures throughout the length except for a region in the middle of every 8 cm length of the wound. A loose knot was taken in this region, leaving a space of 1.5 cm from both the proximal and distal sutures and also between the two wound edges.

Group 2

Skin was closed using the conventional vertical mattress suturing. Data were collected and analysed using SPSS version 21. Data were presented as frequency and percentage; categorical variables were analysed using the Pearson Chi-square test. Significance was defined by a p value less than 0.05 using a two-tailed test.

RESULTS

In this study, 90 patients were divided into groups 1: intermittent loose knots between conventional vertical mattress sutures, group 2: conventional vertical mattress suturing. The patients included 48 males, 42 females, as depicted in Figure 1.

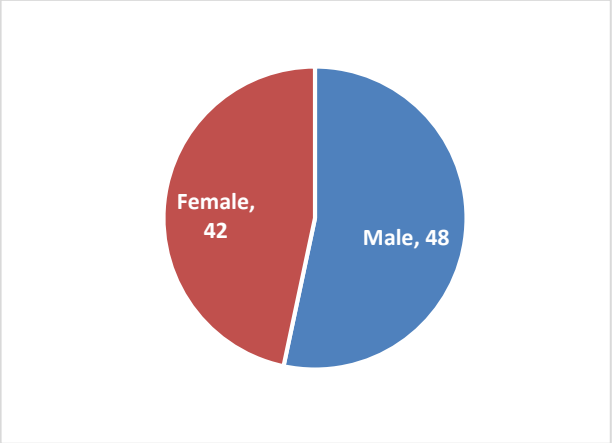

Figure 1: Gender distribution.

In this study, 31% of patients were in the 41-50 years age group, followed by 30% of patients in 31 to 40 years (Figure 2).

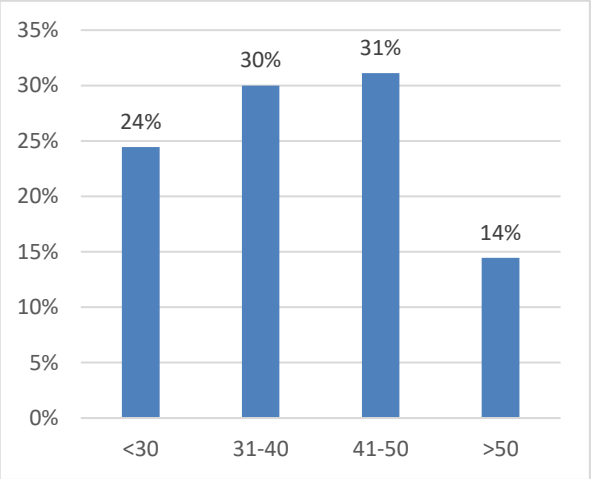

Figure 2: Age group distribution.

Among various abdominal surgery opted, laparotomy was the most commonly performed procedure (47%), followed by hernia repair (39%), appendicectomy (12%) followed cholecystectomy (2%) was observed as shown in Figure 3.

In this study, the incidence of SSI was 51.1% in group 1 and 57.8% in group 2 (p=0.525). The wound gap is low as

4.4% in group 1 and 28.9% in group 2 (p<0.0001). Secondary wound closure was required in 4.4% of patients in group 1 and 28.9% in group 2 (p=0.002). Delayed wound approximation was noted in 4.4% of patients in the group and 66.7% of patients in group 2 (p<0.0001). Big and thick and scarring was developed in 13.3% of patients in group 1 and 57.8% of patients in group 2 (p<0.0001). Post-operative wound complications like fever, pain swelling, or any wound discharge from the surgery site were higher in group 2 patients (57.8%), (p=0.001). Increase hospital stay was noted in group 2 patients (44.4%) (p<0.0001) (Figure 4).

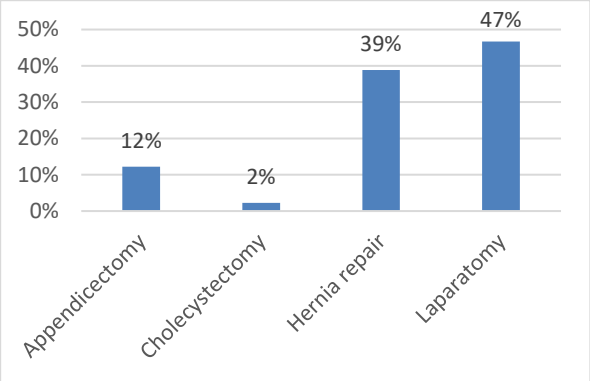

Figure 3: Procedures distribution.

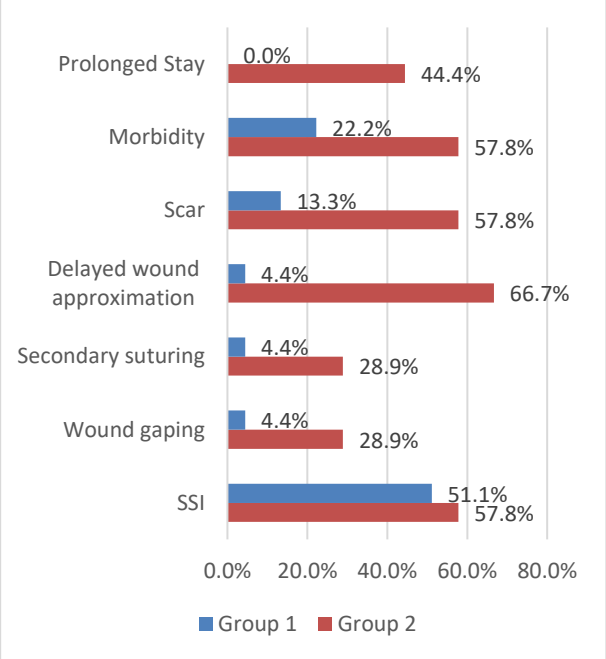

Figure 4: Outcome parameters.

DISCUSSION

SSIs are commonly acknowledged as one of the most common causes of nosocomial infections in the world. They remain a serious public health concern, leading to increased antibiotic use, associated expenditures, prolonged hospitalization, and higher morbidity and mortality rates among patients.[8] According to several research, the SSI rate varies globally and from hospital to hospital, ranging from 2.5 percent to 41.9 percent.[9]

A universally applicable option for optimising surgical site healing in every patient may be the selection of the 'correct' suturing material and the 'correct' suturing technique for skin closure. Six randomised trials since 1981 have studied the occurrence of wound infections after using staples or sutures in visceral surgery.[10,11] The study populations and designs were heterogeneous, and different suturing techniques and materials were used, so no unequivocal results in favor of sutures or staples were collected.[12] A Japanese study showed in a subgroup analysis that was using subcoreal sutures in the subgroup of patients who had surgery of the lower gastrointestinal tract resulted in a significantly lower rate of surgical site infections than staples. Another prospective randomised trial from 2016 of 401 patients showed no the difference in the occurrence of surgical site infections between subcuticular sutures or staples used in abdominal surgery.[13] *"Prevention of incisional surgical site infection using a subcuticular absorbable suture in elective surgery for gastrointestinal cancer*" conducted in Japan considered the most important factor in reducing the incidence of SSI to be the subcuticular space and its condition, and this new method can be used to eradicate dead space and to prevent SSI after gastric and colorectal cancer surgery.[14]

An incision defines clean wounds into non-viscus, non-infected, non-inflamed tissue that is afterwards mainly closed. Intentional, controlled penetration into a hollow viscus (respiratory, alimentary, genital, or urinary tract) without subsequent contamination results in clean-contaminated wounds.

Accidental visceral entrance, surgeries complicated by excessive spillage, departure from sterile methods, or incision into an area of purulent inflammation are all examples of contaminated wounds.

Surgery on tissue with residual devitalized tissue, foreign substances, fecal contamination, ruptured viscus, or an established, ongoing clinical infection are examples of dirty wounds. In the literature, a near-linear link between rising wound categorization and subsequent SSI has been documented. SSI complicates as few as 1.3 percent of clean wounds and as many as 40% of dirty cases. Aside from wound categorization, emergency surgeries, long procedure lengths, nonabsorbable suture, foreign bodies, extensive subcutaneous electrocautery, significant blood loss, and hypothermia have all been linked to an elevated risk of SSI.

Limitations to this study included a relatively small sample size eligible for further analyses. A larger sample size might have been possible with a multi-center approach, but such study design did not allow for control of potential interobserver variability.

CONCLUSION

The incidence of wound gaping and secondary suturing is less in loose knots between conventional vertical mattress sutures. Loose knots in between conventional vertical mattress sutures reduced the hospital stay significantly. The incidence of wound gaping and secondary suturing are significantly lesser than the conventional vertical mattress suturing method.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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