

Comparative study between mass closure suturing technique and Hughes repair in emergency midline laparotomies



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ABSTRACT

Background: The most alarming post-operative consequences for patients and doctors are wound infection and dehiscence. Post-operative wound infection and dehiscence lengthen the hospital stay after surgery. **Aims and Objectives:** The present study examined the incidence of wound infection, wound dehiscence, duration of hospital stay, and burst abdomen between conventional and Hughes repair techniques of midline laparotomy wound closure. **Materials and Methods:** A 12-month prospective study was performed in the General Surgery Department at Government Rajaji Hospital in Madurai. In total, 80 patients, divided randomly into two groups of 40 each, received emergency midline laparotomies for various reasons. The primary outcome measures the infection incidence, wound dehiscence, and burst abdomen at the end of 10 days by the assessing surgeon. **Results:** In the study group, 30 (75%) were males, and females were 10 (25%). In the control group, males were 29 (72.5%), and females were 11 (27.5%). The mean age in the study and control groups was 42.4 ± 11.927 and 41.7 ± 13.607 , respectively. There was a significant difference in surgery duration between groups. Most patients, i.e., 27 (67.5%) and 19 (47.5%), had wound infection and dehiscence in the control group, respectively. There was a significant difference in wound infection ($P=0.025$), wound dehiscence ($P=0.002$), duration of hospital stay ($P<0.001$), and burst abdomen ($P=0.02$) between groups. **Conclusion:** Hughes repair is associated with less incidence of wound infection, wound dehiscence, burst abdomen, and duration of hospital stay compared to patients whose abdomen was closed using the conventional continuous technique.

Key words: Hughes repair; Abdominal closure; Laparotomy; Conventional continuous technique; Mass closure suturing

INTRODUCTION

Wound infection and wound dehiscence are the most feared complications that patients and surgeons encounter in the post-operative period.¹ Surgical intervention will always result in wounds. The surgeon's primary duty is to minimize these effects, remove or repair damaged structures, and use the healing process to restore function. Despite advancements in wound management and surgical expertise, wound management is still a major concern for surgeons and their teams. Before an abdominal wound heals completely, distinct layers may begin to separate. This is

referred to as abdominal wound dehiscence (AWD). Other interchangeable words include evisceration, burst abdomen, abdominal wound disruption, and acute laparotomy wound failure. AWD generally occurs when a wound is not strong enough to sustain the stresses imposed on it.^{1,2} The risk of a burst abdomen, the necessity for prompt treatment, the chance of repeat dehiscence, surgical site infection, and mortality make it one of the post-operative consequences that surgeons fear the most.³

Approximately 1–3% of patients who undergo an abdominal procedure experience acute wound failure.

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Dehiscence can appear any time after surgery, but it often appears 7–10 days later. Many different things can cause the dehiscence of a wound. Technical errors such as inserting sutures too far apart, too tight together, or under too much tension are frequently responsible for acute wound failure. Localized wound issues such as hematoma and infection might increase the risk of localized dehiscence. Deep wound infection is one of the most frequent reasons for localized wound separation.^{1,3-5}

In addition to factors that adversely impact wound healing, increased intra-abdominal pressure significantly contributes to wound disruption. The rate of wound failure in elective situations is the same whether the closure is completed using a continuous or interrupted approach. However, continuous closure is problematic in emergencies since a single suture tear impairs the entire closure.⁶⁻⁸

The length of the hospital stay is increased by post-operative wound infection and dehiscence, which adds to the patient's financial and emotional burden. Paying close attention to technical details during fascial closure, such as proper suture spacing, adequate fascia bite depth, patient relaxation, and achieving tension-free closure, can prevent acute wound failure and its terrible complications. Interrupted closure is frequently the best option for patients with extremely high risk. Alternative closure techniques must be chosen when primary closure cannot be achieved without excessive tension.^{9,10} This study aimed to examine the incidence of wound infection, wound dehiscence, duration of hospital stay, and burst abdomen between conventional and Hughes repair techniques of midline laparotomy wound closure.

Aims and objectives

The objective of this study is to compare the incidence of wound infection, wound dehiscence, duration of hospital stay and burst abdomen between conventional and Hughes repair technique of midline laparotomy wound closure.

MATERIALS AND METHODS

In this prospective study, efficacy of Hughes repair technique compared to conventional technique for rectal sheath closure in midline emergency laparotomies in terms of wound infection, wound dehiscence, burst abdomen, and duration of hospital stay are analyzed. This study was performed at the Department of General Surgery at Government Rajaji Hospital, Madurai, for 12 months.

Inclusion criteria

Aged >18 years, patients consented to the study, and both sexes and emergency laparotomies were included in the study.

Exclusion criteria

Patients aged <18, in immunocompromised states, and with previous mesh repair were excluded from the study.

A total of 80 patients who underwent emergency midline laparotomies for various indications were included and randomized into two groups of 40 patients each. The informed consent was obtained before the study started.

- Group A: Comprises patients with abdominal wall closure using the Hughes repair method. This method involves suture approximating the rectus sheath with muscle in one layer, intermittently using one prolene. Prolene entered and left the body 2 cm from the borders of the wounds and 1 cm from either side of the edge of Linea alba. One centimeter separated the two neighboring sutures (Figure 2). With 2-0 ethilon, the skin was sutured separately.
- Group B: Patients who underwent standard closure with a single-size prolene suture. Conventional closure involves continually closing the rectus fascia using muscle first. On both sides, the sutures were positioned 2 cm from the linea alba's margin, with a 1 cm space between each one. Ethilon 2-0 sutures that were interrupted were used to seal the skin. After 10 days, the evaluating

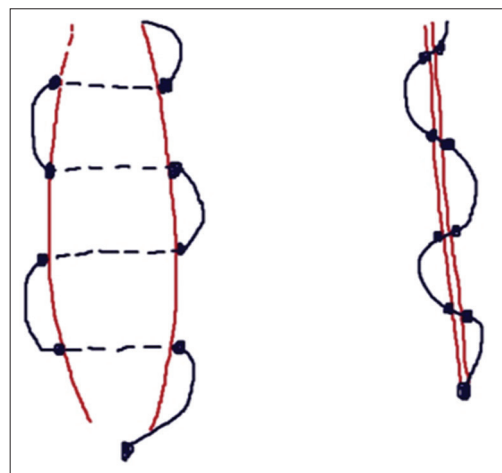


Figure 1: Conventional technique of closure

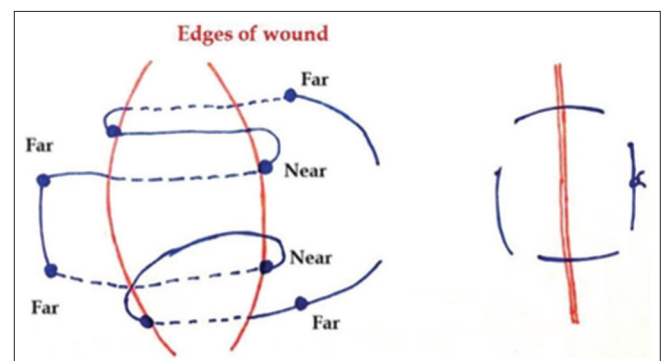


Figure 2: Hughes repair technique

surgeon calculates the incidence of wound infection, wound dehiscence, and burst abdomen (Figure 1).

Data analysis was done using SPSS version 18 software. Range, frequencies, percentages, means, standard deviations, and “P” values were calculated by one-way ANOVA, and the Chi-square test was used to test the significance of the difference between quantitative variables. A $P < 0.05$ was considered as statistically significant.

RESULTS

Among 80 patients in the study group, males were 30 (75%) and females were 10 (25%). In the control group, males were 29 (72.5%) and females were 11 (27.5%). There was no significant difference in gender between groups ($P = 1.00$). The mean age in the study groups was 42.4 ± 11.927 and in the control group was 41.7 ± 13.607 . There was no significant difference in age groups ($P = 0.807$). We observed a statistically insignificant difference in the indication of surgery between groups ($P = 0.822$) (Table 1).

There was a significant difference in surgery duration between groups ($P < 0.001$). Most patients, 27 (67.5%),

had wound infection in the control group. There was a significant difference in wound infection between groups ($P = 0.025$). Most patients, 19 (47.5%), had wound dehiscence in the control group, and there was a significant difference in wound dehiscence between groups ($P = 0.002$).

Most patients stayed between 10 and 14 days in the hospital among both groups, and there was a significant difference in the duration of hospital stay between groups ($P < 0.001$).

Burst abdomens were more highly observed in the control group in 15 (37.5%) patients than in the study group. We have seen a significant difference in burst abdomen between groups ($P = 0.02$) (Table 1).

DISCUSSION

Wound healing is a distinctive biological process in the human body and is attained through four exactly and exceedingly programmed phases, i.e., hemostasis, inflammation, proliferation, and remodeling. For a wound to heal properly, each of the four stages must occur in the appropriate sequence and amount of time. Various variables may affect this method, resulting in ineffective or subpar wound healing. The issues include oxygenation, infections, hormones associated with aging and sex, stress, diabetes, obesity, medications, alcohol, tobacco use, and food. Medicines that hasten wound healing and cure of damaged wounds may be developed due to a fuller understanding of how these factors affect repair.¹¹ Therefore, this study evaluated the incidence of wound infection, wound dehiscence, duration of hospital stay, and burst abdomen between conventional and Hughes repair techniques of midline laparotomy wound closure.

The present study reported that the average age of patients in the study groups was 42.4 ± 11.927 , and the control group was 41.7 ± 13.607 . In a study conducted by Spiliotis et al. in 2007, 3500 abdominal laparotomies were performed at the surgery departments of Mesologgi General Hospital and Urban Community Teaching Hospital, with a mean age of 69.5 years. In the same study, it was reported that 15 patients developed wound dehiscence.¹²

According to a study by Ramneesh et al., the age group of 31–40 years had the highest wound dehiscence (22%), likely due to the higher incidence of acute abdomen during this decade. Furthermore, this study reported male predominance (37/50). It is consistent with our study, as it also noted that male participants were more in both study and control groups than female participants.¹³

The key elements for post-operative wound healing during surgical operations are measures to lower the risk of

Parameters	Study group (%)	Control group (%)	P-value
Gender			
Male	30 (75)	29 (72.5)	1
Female	10 (25)	11 (27.5)	
Age			0.807
<35	12 (30)	16 (40)	
36–45	14 (35)	10 (25)	
>45	14 (35)	14 (35)	
Indication for surgery			0.822
Perforative peritonitis	17 (42.5)	15 (37.5)	
Intestinal obstruction	11 (27.5)	11 (27.5)	
Mesenteric ischemia	3 (7.5)	5 (12.5)	
Blunt injury abdomen	5 (12.5)	3 (7.5)	
Penetrating injury abdomen	4 (10)	6 (15)	
Duration of surgery			<0.001
1–2 h	0	14 (35)	
2–3 h	23 (57.5)	24 (60)	
3–4 h	17 (42.5)	2 (5)	
Wound infection			0.025
Yes	16 (40)	27 (67.5)	
No	24 (60)	13 (32.5)	
Wound dehiscence			0.002
Yes	5 (12.5)	19 (47.5)	
No	35 (87.5)	21 (52.5)	
Duration of hospital stay			<0.001
7–10 days	15 (37.5)	5 (12.5)	
10–14 days	20 (50)	19 (47.5)	
14–21 days	5 (12.5)	16 (40)	
Burst abdomen			0.02
Yes	5 (12.5)	15 (37.5)	
No	35 (87.5)	25 (62.5)	

infections and tissue hypoxia. A significant factor could be the form of abdominal closure. It is advised to use a continuous closure rather than one that is under stress.¹⁴ The present study reported that most patients (47.5%) had wound dehiscence in the control group. There was a significant difference in wound dehiscence between groups ($P=0.002$). Following other studies,^{14,15} our study reveals a significantly higher incidence of post-operative wound dehiscence.

The Hughes repair is named after Professor Hughes, who demonstrated that this method is superior to mesh repair in an incisional hernia. Godara et al. also tested this method and found the same findings.¹⁶ According to published data, assessing this technique as a primary closure method for emergency laparotomies is inadequate. Rajasekaran et al.,¹⁷ evaluated it for primary closure. Still, they assessed all patients who had undergone emergency and elective laparotomies. In contrast, our work focused only on the closure of emergency midline laparotomies. The study by Rajasekaran et al. reported that incisional hernias are far less common in Hughes abdominal repair than in traditional abdominal closure. The study concluded that Hughes's abdominal wall closure is superior to conventional closure in preventing future wound dehiscence in emergency and elective laparotomy patients.¹⁷

Hughes repair is associated with less incidence of wound infection, wound dehiscence, burst abdomen, and less duration of hospital stay. It is safe and associated with minimal morbidity. However, the data are insufficient to conclude that this approach could be the gold standard for primary closure in emergency midline laparotomy. More research into this technique is therefore encouraged.

Limitations of the study

The study's limitations include a small sample size, lack of randomization details, single-center design, limited follow-up duration, absence of blinding, incomplete patient information, insufficient statistical analysis details, and inadequate consideration of confounding factors. These factors may impact the generalizability and validity of the findings.

CONCLUSION

It has been noted that, despite the Hughes repair technique taking longer than the traditional continuous technique to close the abdomen, there is a lower incidence of wound infection, wound dehiscence, burst abdomen, and a shorter hospital stay in these patients. Hence, this method would be taken into consideration. Nevertheless, further prospective studies, given more clinical variables and a larger sample

size to assess post-operative outcomes, are desirable to confirm the procedure's safety.

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Author's Contribution:

PMK- Manuscript preparation; **PS**- Review manuscript, performed the procedure; **RJB**- Protocol review, review manuscript; **SR**- Literature review, data collection, data analysis; **MR**- Study design, editing manuscript.

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