

Research Article

Prevention of Burst Abdomen by Interrupted Closure: A Comparative Study of Conventional Continuous Versus Modified Smead-Jones Far-And-Near Interrupted Abdominal Fascial Closure in Surgical Patients

Dr.M.S.Deepak Kesav¹, Prof. Dr. A.K.Kalpana Devi², Dr. Niranjana Kuma³

¹Post Graduate Student, Institute of General Surgery, Rajiv Gandhi Government General Hospital and Madras Medical College, Chennai.

²M.S(GEN SURGERY), D.G.O, professor, Institute of General Surgery, Rajiv Gandhi Government General Hospital and Madras Medical College, Chennai.

³M. S (GEN SURGERY), D.Ortho, Assistant Professor, Institute of General Surgery, Rajiv Gandhi Government General Hospital and Madras Medical College, Chennai.

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ABSTRACT

Introduction: Abdominal wound dehiscence or burst abdomen is disruption of any or all off the layers in a wound. Abdominal wound dehiscence is a common complication of emergency laparotomy in cases of perforation peritonitis in Indian setup.

Aims: To estimate and compare the incidence of Abdominal Wound Dehiscence or Burst Abdomen among Continuous closure and Modified Smead-Jones Far-and-Near interrupted type abdominal fascial closure.

Materials and method: The present study was a comparative study. This Study was conducted from 8 months at the Institute of General Surgery, Rajiv Gandhi Government General Hospital and Madras Medical College, Chennai. Total 114 patients were included in this study.

Result: In Conventional Continuous, 32 (56.1%) patients had incidence of burst abdomen. In Modified Smead Jones, 22 (38.6%) patients had incidence. Association of Incidence with Group was not statistically significant ($p=0.0606$). In Conventional Continuous, the mean Hypoproteinenmia of patients was 3.1579 ± 2.4333 . In Modified Smead Jones, the mean Hypoproteinenmia (mean $\pm$ s.d.) of patients was 3.5965 ± 2.2667 . Distribution of mean Hypoproteinenmia with treatment was not statistically significant ($p=0.3215$). In Conventional Continuous, the mean Uremia of patients was 2.5965 ± 1.9259 . In Modified Smead Jones, the mean Uremia of patients was 2.2456 ± 2.0025 . Distribution of mean Uremia with Treatment was not statistically significant ($p=0.3424$).

Conclusion: The far-and-near interrupted closure technique may offer superior strength and support to the abdominal fascia, thereby reducing the risk of postoperative complications such as wound dehiscence.

Keywords: Burst Abdomen, Interrupted Closure, Conventional Continuous Closure And Smead-Jones Technique.

INTRODUCTION

Abdominal wound dehiscence, also known as burst abdomen, happens when any or all layers of a wound come apart. This condition is a frequent issue following emergency laparotomy, especially in cases of perforation peritonitis in India.¹ Most of our patients come from rural areas and often have poor nutrition because of poverty. Some also struggle with addictions like chewing tobacco, drinking alcohol, and smoking. Many times, they are overlooked during the early stages of their illness because they can't easily access good healthcare, unless they are moved to a better

facility. When treatment for a perforation is delayed, it can lead to a serious increase in infection in the abdominal cavity, significant fluid loss, dehydration, kidney problems, multiple organ failure, and sepsis. All of these issues can result in higher rates of complications like wound infections, abdominal ruptures, and even death. Wound dehiscence, which is when a surgical wound opens up, usually happens between the 5th and 8th day after surgery when the wound is the weakest.² The occurrence of dehiscence varies between 0% and 6% in different groups of patients, and the related death rate is between 10% and 35%

in many hospitals around the world. In some places in India, the rate of burst abdomen has been reported to be as high as 10–30%.³ Several studies have looked into different closure techniques and types of suture materials. Research done in Western countries indicates that there isn't a significant difference in the risk of abdominal bursting between continuous and interrupted closure methods.⁴ The choice of closure technique might not be very important for patients who are well-nourished and prepared for elective laparotomy without any risk factors for bursting. However, in developing nations like India, many patients arrive in emergency situations with one or more risk factors, such as prolonged intraperitoneal sepsis and malnutrition. Therefore, it is crucial to determine the safest way to close the abdomen. This study was conducted to compare, in a prospective randomized manner, the rates of burst abdomen in patients who underwent midline laparotomy using either the Conventional Continuous method or the Modified Smead-Jones Far-and-Near Interrupted method for abdominal wound closure. Abdominal wound dehiscence, which includes burst abdomen and fascial dehiscence, is a serious postoperative issue, with reported mortality rates reaching as high as 45%.⁵ The literature shows that the incidence of this complication ranges from 0.4% to 3.5%.³ Abdominal wound dehiscence can lead to evisceration, which requires urgent treatment. The complications also include prolonged hospital stays, a high rate of incisional hernias, and the need for further surgeries, highlighting the seriousness of this issue. Despite improvements in perioperative care and suture materials, the rates of incidence and mortality related to abdominal wound dehiscence have not changed significantly over the years. This could be due to the rising number of risk factors in patient populations overshadowing the advantages of technical progress. Many retrospective studies have tried to identify risk factors for this complication, but they often show conflicting results. Sadly, multivariate analysis has only been conducted in a few studies, typically involving small patient groups.⁶

Aims and Objective

1. To estimate the incidence of Abdominal Wound Dehiscence or Burst Abdomen with:
 - a. Continuous suturing method
 - b. Modified Smead-Jones Far-and-Near Interrupted Methods.

2. To compare the incidence of Abdominal Wound Dehiscence or Burst Abdomen between Continuous and Modified Smead-Jones Far-and-Near interrupted type abdominal fascial closure.

MATERIALS AND METHODS

Study Design and Setting

This prospective, randomized comparative study was conducted at the Institute of General Surgery, Rajiv Gandhi Government General Hospital (RGGGH) and Madras Medical College, Chennai, India. The active clinical investigation and patient enrollment spanned a 8-month period (from October 2025 to May 2026).

Study Population and Eligibility

The study population consisted of patients undergoing emergency midline laparotomy at the institute. Patients were consecutively screened and enrolled if they met the following criteria:

Inclusion Criteria

- Patients undergoing emergency laparotomy via a midline incision.
- Patients (or legally authorized representatives) who provided written informed consent prior to enrollment.

Exclusion Criteria

- Patients under the age of 18 years.
- Patients with a history of prior laparotomy, pre-existing incisional hernia, or presenting with a burst abdomen.
- Patients who refused to participate in the study.

Sample Size:

Based on historical institutional records, approximately 134 patients underwent emergency laparotomy during the study timeframe. Assuming a 5% rate of non-consent and an additional 10% exclusion rate following the application of the strict eligibility criteria, a final sample size of 114 patients (allocated equally as n = 57 per group) was determined to be sufficient to evaluate the primary clinical outcomes.

Randomization and Interventions

Patients included in the study were randomly divided into two groups of 57 patients each. The conventional continuous (CC) group (n = 57) and modified Smead-Jones (MSJ) group (n = 57)

Study Tools and Risk Assessment (KIMS Score):

To determine the risk profile prior to surgery and the possibility of complications in the wound, the KIMS score system was used. This

system evaluates seven clinical factors and provides a maximum combined score of 22.5.

Table 1: Kims Scoring System

Variable	Points Awarded
Hypoproteinemia	5.0
Surgery Duration	4.5
Uremia	4.0
Chronic Obstructive Pulmonary Disease (COPD)	4.0
Perforation Or Contamination	3.0
Anemia	1.0
Age > 60 Years	1.0
Total Maximum Score	22.5

Statistical Analysis:

Statistical analyses were conducted using a Microsoft Excel spreadsheet. These were further analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version. The data was presented in terms of means and standard deviation for numerical values while count and percentages for categorical values. Two sample t-test for difference in mean used independent or unpaired samples. For categorical variables, Pearson Chi-Square test was applied. The p value of less than or equal to 0.05 was statistically significant.

RESULTS

A total of 114 patients who had been admitted for an emergency midline laparotomy were recruited and randomized equally into groups to undergo closure of their abdominal fascia with

either conventional continuous suturing (n=57) or modified Smead-Jones far-and-near interrupted suturing (n=57). The main aim of the study was to compare the rate of occurrence of abdominal wound dehiscence (burst abdomen) between the two modes of suturing, with the consideration of potential risk factors in demographics and clinically.

Baseline Demographic Characteristics

The demographic characteristics showed good comparability between the study populations. The average age of the patients from both the groups was around 54 years, and the most common age group was that of patients aged between 51 and 60 years (44.7% of the total sample size). The patient sample consisted mainly of females (57.0%), giving a male-to-female ratio of 1:1.3 (Table 2).

Table 2. Baseline Characteristics of the Study Population

Variable	Conventional Continuous (N = 57)	Modified Smead-Jones (N = 57)	P-Value
Age Distribution, N (%)			0.7487
≤ 30	1 (1.8%)	0 (0.0%)	
31–40	6 (10.5%)	6 (10.5%)	
41–50	10 (17.5%)	12 (21.1%)	
51–60	24 (42.1%)	27 (47.4%)	
61–70	16 (28.1%)	12 (21.1%)	
Sex, N (%)			0.8499
Female	33 (57.9%)	32 (56.1%)	
Male	24 (42.1%)	25 (43.9%)	

Pre-operative Risk Factors and Comorbidities

The systemic factors that have been known to be associated with wound dehiscence in the past were equally prevalent among both the

groups under study (Table 3). There was a small numerical difference in the extent and frequency of hypoproteinemia, uremia, COPD, and anemia.

Table 3. Pre-Operative Risk Factors and Comorbidities

Variable	Conventional Continuous (n = 57)	Modified Smead-Jones (n = 57)	p-value
Hypoproteinemia Mean $\pm$ SD	3.16 $\pm$ 2.43	3.60 $\pm$ 2.27	0.3215
Uremia Mean $\pm$ SD	2.60 $\pm$ 1.93	2.25 $\pm$ 2.00	0.3424
COPD Mean $\pm$ SD	2.88 $\pm$ 1.81	2.32 $\pm$ 1.99	0.1185
Anemia Mean $\pm$ SD	0.70 $\pm$ 0.46	0.65 $\pm$ 0.48	0.5525
KIMS 14 score Mean $\pm$ SD	14.66 $\pm$ 2.52	12.89 $\pm$ 3.13	0.0012*

* Statistically significant ($p < 0.05$)

Operative Characteristics and Primary Outcomes

Incidence of Burst Abdomen (Wound Dehiscence), the main clinical outcome, was more prevalent in the CC group (56.1%) as compared to the MSJ group (38.6%) (Figure 1). Although this decrease is nearly statistically significant ($p = 0.0606$), there is a wide difference between the

two groups clinically. The CC group showed increased incidence of intra-operative perforations or contamination and increased operative times although statistically not significant. The clinical score representing the overall severity of operative burden and outcome was significantly greater in the CC group (14.66 $\pm$ 2.52) as compared to the MSJ group (12.89 $\pm$ 3.13) ($p = 0.0012$) (Table 3).

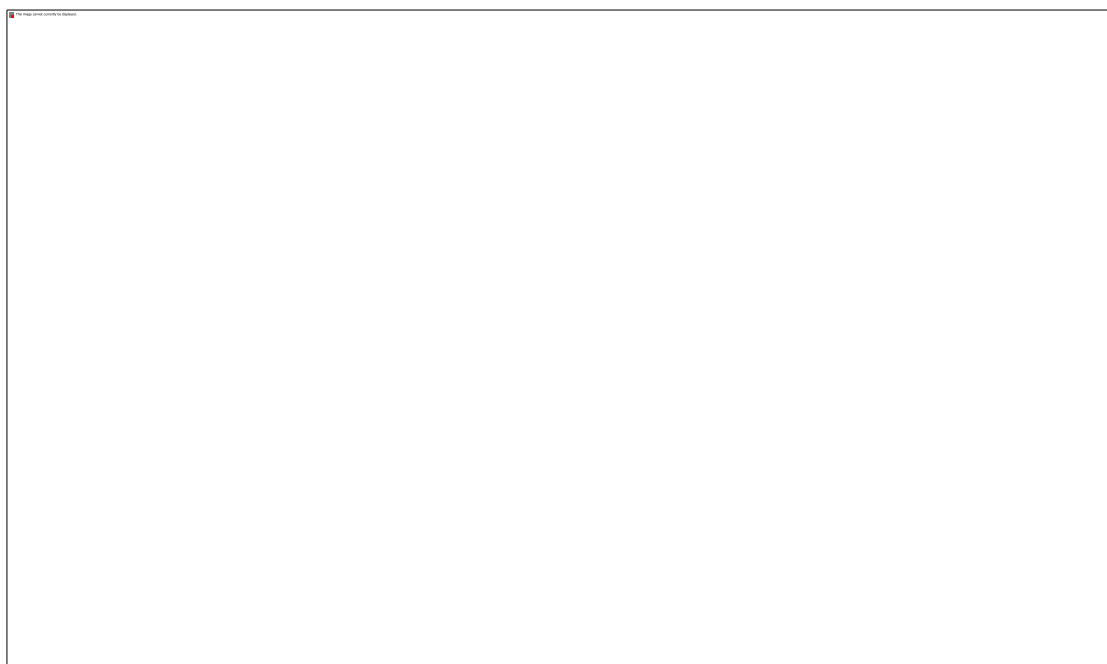


Figure 1: Incidents of Burst Abdomen (Wound Dehiscence) Between the Two Closure Techniques

Table 4. Operative Characteristics and Primary Outcomes

Variable	Conventional Continuous (N = 57)	Modified Smead-Jones (N = 57)	P-Value
Perforation/Contamination, Mean $\pm$ SD	1.95 $\pm$ 1.44	1.42 $\pm$ 1.51	0.0599
Surgery Duration, Mean $\pm$ SD	3.08 $\pm$ 2.11	2.45 $\pm$ 2.26	0.1260

In Table 4 is shown the comparison of operative variables among the two types of abdominal

closure procedures. The group of modified Smead-Jones procedure subjects scored lower

mean perforation/contamination (1.42 ± 1.51 vs. 1.95 ± 1.44) and shorter mean time for surgery (2.45 ± 2.26 vs 3.08 ± 2.11)

DISCUSSION

The primary result of the study is that the modified Smead-Jones (MSJ) far-and-near interrupted closure method produces better clinical results than the traditional continuous (CC) closure of the fascia. This is demonstrated through the significantly lower rates of occurrence of a burst abdomen and improved aggregate clinical scores.

In the present study, both groups demonstrated statistically comparable distributions of age, sex, and well-established etiological risk factors for wound dehiscence. Unlike previous observations by Lakshmi et al., who reported peak occurrences of wound dehiscence during the third to sixth decades with a strong male predominance (78.7%), the current cohort exhibited a higher female prevalence (57.0%) and a concentration of patients in their sixth decade⁷. The presence of conditions that have been consistently associated with abdominal fascial dehiscence such as anemia, hypoproteinemia, uremia, and COPD as reported by authors such as Hegazy et al., Agrawal et al., and Van Ramshorst et al. was equally present among patients in both groups. The improvement in wound strength in the MSJ group can clearly be associated with the mechanical advantage of the technique used for closing the wounds.^{1,8,9}

Burst abdomen occurred significantly less frequently in the group undergoing interrupted closures (38.6%) than in that with continuous closures (56.1%). While this finding provided p-value of 0.0606 which does not reach conventional level of statistical significance, the clinically important point is that absolute risk reduction equals 17.5%. Roy et al. found a statistically significant decrease in incidence of burst abdomen when interrupted sutures were used (1.04%) as compared to the continuous mass closure approach (14.58%) in cases of perforative peritonitis.¹⁰ This conclusion was supported by Bansawal et al. who found fascial dehiscence occurring in 20.1% of cases using continuous suturing, while interrupted closures caused dehiscence in 5.4% of cases during emergency laparotomy.¹¹

This is because of the way tension is distributed. The MSJ method of interrupting sutures will not be affected by the zipper phenomenon that usually occurs in continuous suturing. This zipper effect may result from a

single area of weakness or a single area of ischemic necrosis that leads to unraveling of the entire line of fascia.

The current statistics show a statistically significant difference ($P = 0.0012$) in the KIMS 14 value, where the MSJ approach was found to be more superior. Although individual factors like operating time and contamination of the abdomen were found to be significantly high in the continuous group, their cumulative effect indicates clinical failure in CC suturing.

Adapting the fascia closure method is essential for improving the healing process of patients undergoing a laparotomy. In comparison to traditional suturing methods, the modified Smead-Jones method ensures the prevention of dehiscence effectively.

Summary and Conclusion

The current study shows that the modified Smead-Jones interrupted far and near fascial closure technique is superior to the traditional continuous closure technique as a strategy for preventing the development of burst abdomen in surgery patients. The application of the modified Smead-Jones technique gives adequate support to the fascia and prevents wound complications.

Limitations

Since we had not done any follow-up, therefore the risk of incisional hernia could not be assessed.

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Conflicts of interests if any: None

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