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Comparative study of efficacy of modified Smead-Jones technique versus conventional closure of midline laparotomy wound

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Abstract

Introduction: One of the most commonly used access route for laparotomy is midline incision. But midline laparotomy incision also has major drawback such as increased incidence of postoperative wound dehiscence and incisional hernia.

Methodology: In our study we compared two different types of mass abdominal closure technique and measured the primary outcome by measuring the incidence of wound dehiscence.

Result: Out of 90 patients included in the study, the most common cause for midline laparotomy were duodenal perforation and ileal perforation, followed by pre-pyloric perforation. Out of 45 cases in control group, 6 cases (13.3%) and in study group 1 case (2.2%) had incidence of wound dehiscence.

Conclusion: Modified Smead-Jones technique decreases the incidence of wound dehiscence and thus concludes that this technique has low incidence of wound dehiscence as compared to conventional technique and might also decrease the incidence of incisional hernia.

Keywords: modified Smead-Jones, far-near-near-far, wound dehiscence

Introduction

One of the most commonly used access route for laparotomy is midline incision as it is quick and relatively bloodless and has good exposure.¹ But midline laparotomy incision also has major drawback as compared to other laparotomy incision such as increased incidence of postoperative wound dehiscence and incisional hernia.² Acute wound failure is defined as “postoperative separation of abdominal musculoaponeurotic layers, within 30 days after operation and requires some form of intervention, usually during same hospital stay”^[3]. Between 6th to 9th postoperative days the chances of wound dehiscence is highest.⁴ There should be a balance between “tissue holding capacity of suture and suture holding capacity of tissue” to maintain integrity of the sutured abdominal wound^[5, 6]. In our study we compared two different types of mass abdominal closure technique, one is conventional technique where mass fascial closure, subcutaneous closure followed by skin closure and another is modified Smead-jones closure where “far-near-near far” bites are taken in the same line. We divided patients undergoing midline laparotomy for different emergency indications into 2 groups, Group A patients underwent conventional closure and Group B patients underwent “modified Smead-jones” closure so as to include 45 patients in each group. The incidence of wound dehiscence in post-operative midline laparotomy wound in both groups was compared.

Material and Methods

This is the comparative study conducted in JSS Hospital, Mysuru for a period of one and half year starting from 1/10/2017. 90 patients of age group 18 to 70 years who got admitted to JSS hospital and underwent midline laparotomy were included in the study after considering exclusion criteria. Primary outcome measures the efficacy of modified continuous Smead-Jones technique on midline. laparotomy wound closure by measuring the incidence of abdominal wall dehiscence clinically at the end of 15 days by evaluating surgeon.

Inclusion criteria: All the patients undergoing midline laparotomy between the age group of 18 to 70 years.

Exclusion criteria: Patient undergoing re-laparotomy

Method of collection of data: All eligible patients were allocated to either study or control group alternatively till 45 patients in each group. In group A, 45 patients will undergo closure of mid line laparotomy wound using modified continuous Smead-Jones technique and are taken as study group. In group B, 45 patients will undergo closure of midline laparotomy wound by conventional method and are taken as control group. In both group no.1 synthetic, monofilament, non-absorbable polypropylene suture was used to suture the fascia. The incidence of wound dehiscence was observed in both group.

Results

In our study which was conducted in the department of surgery, JSS hospital, Mysuru who underwent emergency midline laparotomy during the study period, and met the above mentioned inclusion criteria were considered for the study. As per previously decided sample size, 45 cases were included both in study and control group.

Table 1: The analysis of study is as follows: 3.1: Age distribution in the study

Group	N	Mean	Std. Deviation	Std. Error Mean
Control group	45	47.7556	16.17259	2.41087
Study group	45	49.5333	17.75285	2.64644

The mean age in control group was 47 and in study group was 49.

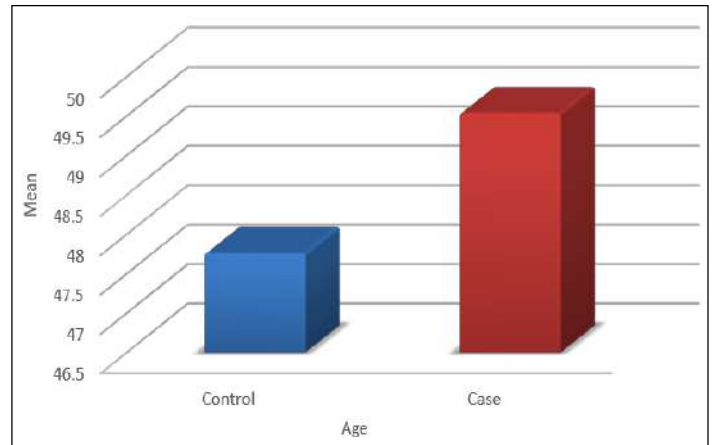


Fig 1: Age distribution in the study

Sex distribution in the study

Table 2: Sex distribution in the study

		Group		Total	
		Control	Case		
Sex	Male	Count	38	37	75
		% within Group	84.4%	82.2%	83.3%
	Female	Count	7	8	15
		% within Group	15.6%	17.8%	16.7%
Total	% within Group	100.0%	100.0%	100.0%	

In the control group, 38(84.4%) were male and 7(15.6%) were female whereas in study group 37(82.2%) were male and 8(17.8%) female.

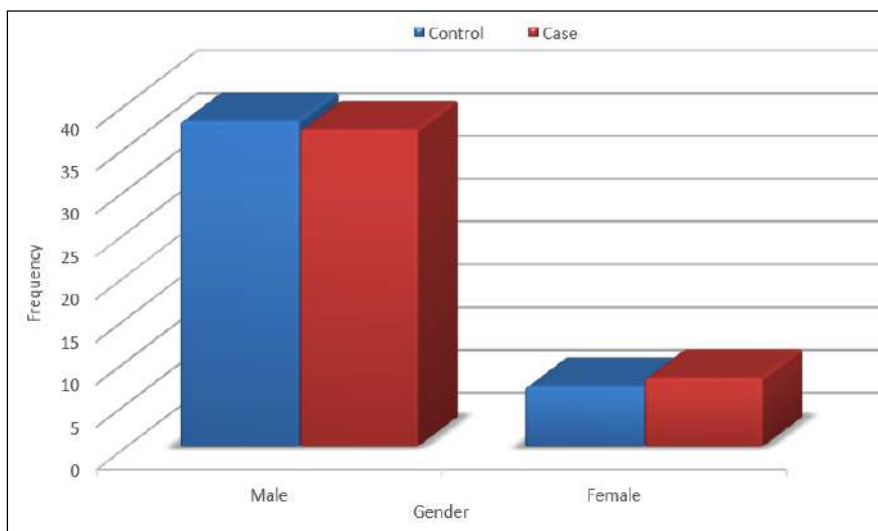


Fig 2: Sex distribution in the study

Wound dehiscence distribution

Table 3: Distribution of wound dehiscence in the study

Technique	Number of wound dehiscence (n)	Percentage (%)
Control group (conventional closure)	6	13.3
Study group (modified Smead- Jones technique)	1	2.2

p-value < 0.05 (statistically significant)

Out of 45 cases in control group, 6 cases (13.3%) had incidence of wound dehiscence. Among the study group 1 case (2.2%) had incidence of wound dehiscence.

The p value is <0.05 and is statistically significant. Thus the statistical analysis concludes that midline laparotomy wound closure with modified Smead Jones technique is better in preventing the incidence of wound dehiscence. Distribution of patients with abdominal wound dehiscence according to underlying intra-abdominal pathology.

Table 4: Distribution of wound dehiscence according to underlying pathology

Diagnosis	No. of cases
Hollow viscus perforation	06
Duodenal ulcer perforation	03
Ileal perforation	02
Pre-pyloric perforation	01
Ileal stricture	01
Blunt trauma abdomen	01

Out of 8 cases 90 patients who had wound dehiscence of midline laparotomy wound, most of them were for duodenal ulcer perforation (37.5%), second most common was ileal perforation (25%), followed by ileal stricture and blunt trauma abdomen.

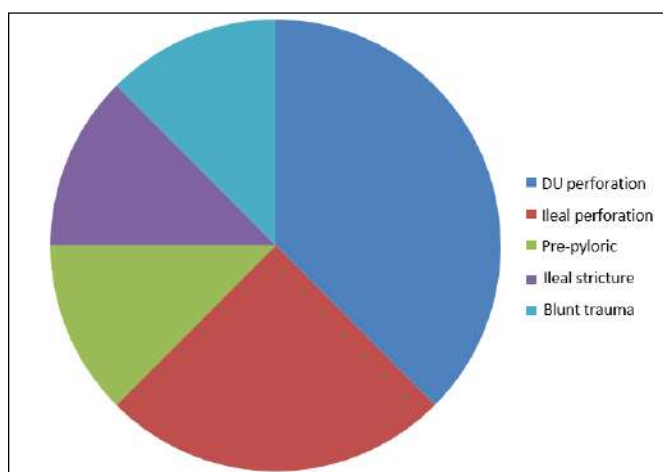


Fig 4: Distribution of wound dehiscence according to underlying pathology

Discussion

There are 3 phases of wound healing, phase of inflammation, phase of proliferation and phase of maturation/remodeling. In inflammatory phase which ranges from day 1-4, does not give any holding strength. Next is proliferative phase (days 5-20) where 15-30% of its tensile strength. Last is remodeling phase (days 21 onwards) where 80% of tensile strength is regained. More than 90% tensile strength is never attained [9-11]. Providing enough support to the healing wound till at least half of its tensile strength is attained is the main purpose of any suturing technique and it should be easy and fast to perform. It should be tension free, should not cause compromise in blood supply, should not predispose to infection and should cause minimal discomfort in post-operative period. Wound infection and wound dehiscence are two important local complications after midline laparotomy. The mechanism of burst abdomen is either due to slippage of knot or breaking of suture material or when suture material tears through the fascia. Due to the fact that continuous suturing is faster and has even distribution of tension load over entire wound it is considered superior to interrupted suturing because of its see-saw and hacksaw effect [12]. In post-operative period when abdomen distends, the continuous sutures readjust themselves because of its inherent elasticity in such a

way that there is uniform distribution of tension along the suture line by to and fro movements of loops of suture [13]. According to Jenkin, "in post-operative period midline laparotomy wound length can increase up to 3 times due to abdominal distention and factors such as violent coughing, retching, bowel edema, third space fluid entrapment." So Jenkin recommended that for continuous repairs the suture length: wound length should be [4, 1, 5-7]. If the bite distance and suture length are not adequate to accommodate the increase in wound length, there are chances of suture cutting through the fascia and resulting in wound dehiscence.

Because of lack of facilities in rural area the surgeries are often delayed for 1 day or two resulting in more marked SIRS, which adversely affect the process of wound healing [6, 7]. Some studies have shown that diameter of the suture strand also decide the strength of sutured wound. In 1900, Smead proposed interrupted double loop fascial closure, which was later popularized by Jones in 1941. In this technique there is no much loss in elasticity or compliance of suture material and it causes more secure approximation of fascial edges. Wound edges remain well approximated due to distribution of the tension between two loops and the suture does not cut through the fascia. [14, 15]. We modified original interrupted Smead-Jones to continuous Smead Jones as continuous suturing is faster and simultaneously preserving advantages of original Smead-Jones technique of distributing tension load uniformly along the suture line and thereby effective in preventing abdominal wound dehiscence. Burst abdomen is "complete wound dehiscence which typically occurs in early post-operative period between 6th to 8th days, where there is evisceration of contents of peritoneal sac." In our study we found that wound dehiscence rate in conventional closure was about 13.3% and in modified continuous Smead Jones technique was 2.2% (table 3) and the difference is statistically significant ($p < 0.05$), thus inferring that modified continuous Smead Jones technique is better than the conventional closure. We did not study the late complications (i.e. development of incisional hernia) in both groups as it requires longer follow up period, but some studies show that the rate of development of incisional hernia is proportional to rate of incidence of wound dehiscence. According to us, modified Smead Jones technique of fascial closure can be used for midline laparotomy wound closure even in patients who are more prone to have wound dehiscence due to various factors.

Conclusion

The present study showed that among the patients who underwent midline laparotomy, the mean age group was 47 to 49. Male patients were more common as compared to female. Out of the various causes of acute abdomen, duodenal and ileal perforation was the two major causes, followed by pre-pyloric perforation. Closure of perforation carried higher incidence of wound dehiscence as compared to other procedures. In emergency setting, patients with generalized peritonitis need special attention to wound closure. Our new technique of closure of midline laparotomy wound, especially in Indian setup, decreases the incidence of wound dehiscence. Thus our study concludes that modified continuous Smead Jones technique of midline laparotomy wound closure has low incidence of wound dehiscence and might also decrease the incidence of incisional hernia on long term.

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