

## Prevention of Burst Abdomen by Interrupted Midline Fascial Closure in Emergency Laparotomy

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### Abstract:

**Background:** Burst abdomen represents one of the most frustrating and difficult postoperative complication that concerns every abdominal surgeon. It occurs because of various predisposing factors which can be prevented to some extent by having knowledge regarding them. Despite many years of experience, the optimal technique of emergency laparotomy closure remains more or less controversial. The varieties of surgical excess as well as the varieties of abdominal closure techniques are the main difficulties in the proper standardization of this procedure.

**Aims and Objectives:** The aim of the study was to find out the technique of rectus sheath closure in patients undergoing emergency laparotomy that can reduce the burden of complications in post-operative period.

**Materials and methods:** A total of 260 patients of acute abdominal condition who underwent laparotomy were randomized into two groups of 130 patients in each group. **Results:** Total 19(7.30%) of 260 patients developed burst abdomen in the post-operative period. Twelve 12(9.23%) in continuous arms and seven 7(5.34%) patients in interrupted arms developed burst abdomen. Burst abdomen occurring mostly 40-60 years of age group with a male to female ratio 1.48:1. Predictor Variables: Cough, anemia, malnutrition, DM, intraperitoneal Sepsis, wound infection, uremia and abdominal distension were the important predisposing factors for the incidence of burst abdomen. **Conclusion:** Interrupted suturing was associated with significantly reduced the burst abdomen when comparing with continuous closure.

**Keywords:** Interrupted suturing; Continuous suturing; Rectus sheath closure; Emergency laparotomy; Wound dehiscence; Burst abdomen;

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### I. Introduction

Exploratory laparotomy is a major surgical procedure. Midline laparotomy is the most common technique of opening the abdomen as it is simple, provides adequate exposure to four quadrants, and affords quick exposure with minimal blood loss. A midline laparotomy requires opening of linea alba which is a weak and tendinous zone. The weakness of the linea alba is enhanced when its fibers are vertically sectioned to access the peritoneal cavity. Thus, when closing the linea alba using sutures, these fibers are subjected to the tension induced by the mechanical forces that act on it.

Laparotomy wounds have been closed in various ways in terms of continuous versus interrupted closure, single layer versus mass closure, and absorbable versus non-absorbable sutures. The continuous have the advantage of evenly distributed tension across the suture line and being more expedient. It has the disadvantage of being a single suture holding the fascia together. The multiple interrupted suture method has been used

successfully for many years, but it has the disadvantage of being time consuming to perform and of isolating the tension of each individual stitch

Burst abdomen is considered when intestine, omentum or other viscera are seen in the abdominal wound following midline laparotomy due to separation of the abdominal musculo-aponeurotic layer. It is a serious post-operative complication. The incidence of this complication as reported from two hospitals from India, VIZ from Delhi and Surat was 5% and 7% respectively. The burst abdomen is associated with high morbidity up to 40% and mortality up to 18%, particularly in elderly and malnourished patient. Burst abdomen can occur for a variety of reasons. Factors relating to the incidence of burst abdomen are suture closure, incision, post-operative repeated vomiting. Post-operative abdominal distension, obesity, jaundice, malignancy, diabetes mellitus, hypoproteinaemia, anemia, immunocompromised patient and post-operative wound infection. A surgeon can perform a technically perfect operation in a patient but still have a complication. Similarly, surgical technical errors may account for this operative complication.

There is no ideal wound closure technique that would be appropriate for all situations. Therefore, the correct choice of suturing technique is vital. A marked reduction in the incidence of burst abdomen can be achieved by utilizing employing a correct technique of abdominal closure. The present study assesses the efficacy of the fascial closure of emergency laparotomy incisions with interrupted suture in the prevention of burst abdomen.

### **Aims and objectives**

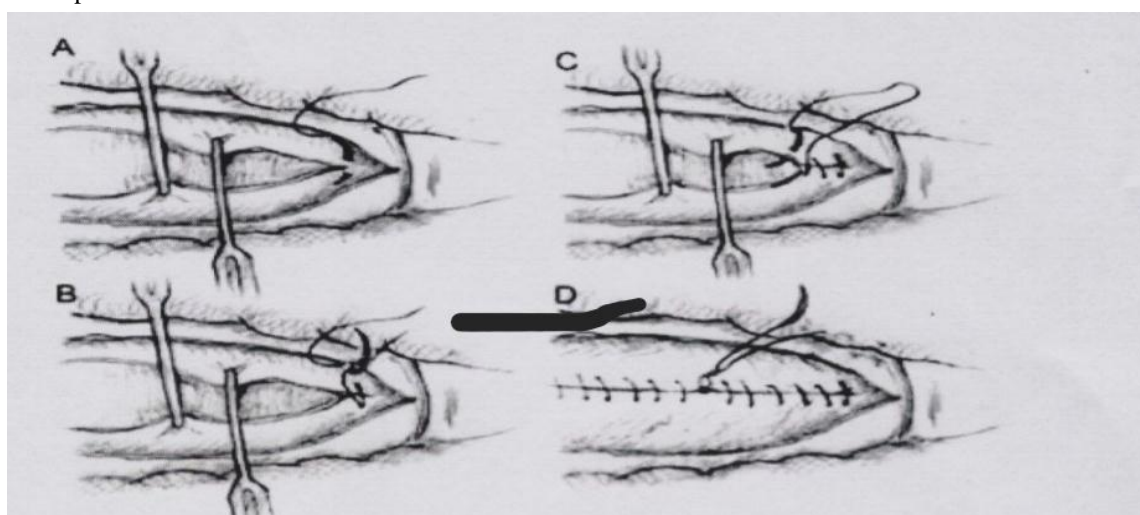
General objective: The aim of the study was to compare the outcome of continuous and interrupted suturing for rectus sheath closure in emergency laparotomy. Specific objectives: The objective of this study was to find out the superior technique of midline closure in patients undergoing emergency laparotomy that can reduce the burden of post-operative complications.

## **II. Methodology**

The present study was a hospital based prospective randomized observational study which was conducted in with a time frame of about 2 years from ethical approval. A total number of 260 patients of age group 21-70 years in general surgery ward of DAMCH from January 2015 to December 2017 were studied. Patients were randomized in to two groups of 130 patients in each that is interrupted (case) and continuous (control).

### **Suturing technique**

Interrupted closure: It was performed using no 1 prolene suture. A large bite was taken on the edge of linea alba from outside in about 01-1.5 cm from from edge and then needle emerged on the other side from inside-outside 01-1.5 cm from the edge. The two ends were tied just tight enough to approximate the edges of linea alba taking care not to include bowel or greater omentum between the edges. The next suture will be placed 01-1.5 cm from the previous one.



Continuous Suture

Fig-1

Interrupted Suture

Continuous closure: It was performed using no I prolene, care being taken to place each bite 01-1.5cm from the cut edge of linea alba and successive bites being taken 01 cm from each other. The edges of linea alba were gently

approximated without strangulation with an attempt to keep a suture to wound length ratio of 4:1. The closure was performed by a senior resident or consultant.

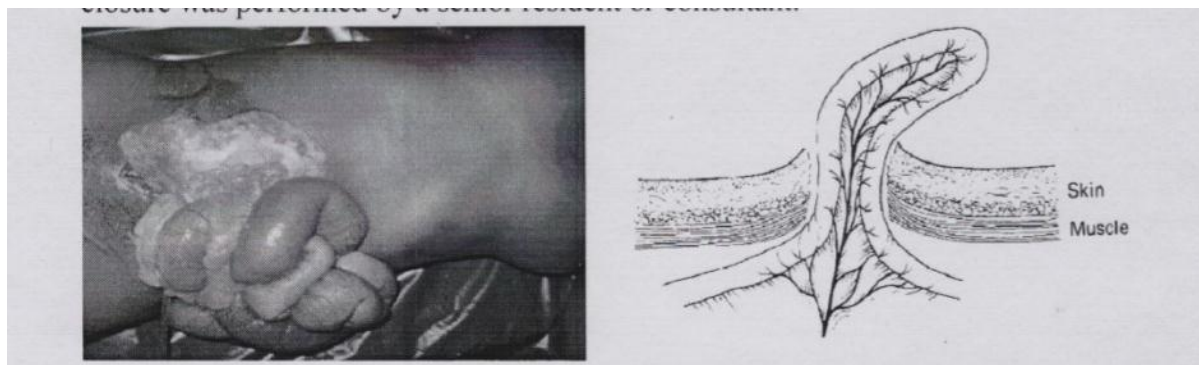


Fig-2: Burst Abdomen

The patient was followed up to 10 POD to determine the risk of dehiscence. All clinical information including history, physical findings, per and post-operative findings were recorded a pre-designed data sheet. Data were processed and analyzed using SPSS in version 24.

Inclusion criteria were All patients 20 to 70 years old presenting in emergency surgical ward who sunder gone explanatory laparotomy through midline incision were included in this study. Exclusion criteria were patients younger than 20 years of old, patients older than 70 years of old, patients with previous abdominal surgery with midline incision scar, patients who had undergone a previous laparotomy for any condition and patient with comorbid conditions such as renal failure, malignancy, undergoing radio or chemotherapy, and collagen vascular disease.

All patients were given explanation of the study and signed a written consent form. All the odd number of patients were taken as case (interrupted group) and even number of patient as control (continuous group). Patients undergoing emergency laparotomy for acute abdominal condition likely intestinal obstruction, perforation of gas containing hollow viscus, various peritonitis and abdominal trauma were included.

### III. Result

In our study, number of patients were 260. Patients were divided into two groups- Group A (n=130)- Patient in this group used interrupted (case) suturing. Group B (n=130) - Patient in this group used continuous (control) suturing.

**Table 1: Sociodemographic distribution of patients**

Age group	Interrupted suturing (case)		Continuous suturing (control)		P Value
	n	%	n	%	
20-29 yrs	26	20.0	23	17.69	0.051
30-39 yrs	26	20.0	26	20.0	
40-49 yrs	30	23.07	32	24.61	
50-59 yrs	31	23.84	33	25.38	
60-69yrs	17	10.07	16	12.30	
<b>Gender distribution</b>					
Male	75	57.69%	80	61.53%	0.399
Female	55	42.30%	50	38.46%	

In this study most of the patients were aged between 40-60 years in both the groups. p-value=0.051. In this study majority of the patients were male in both the groups (57.69% in group A and 66.7% in group B) with male to female ratio 1.48:1.

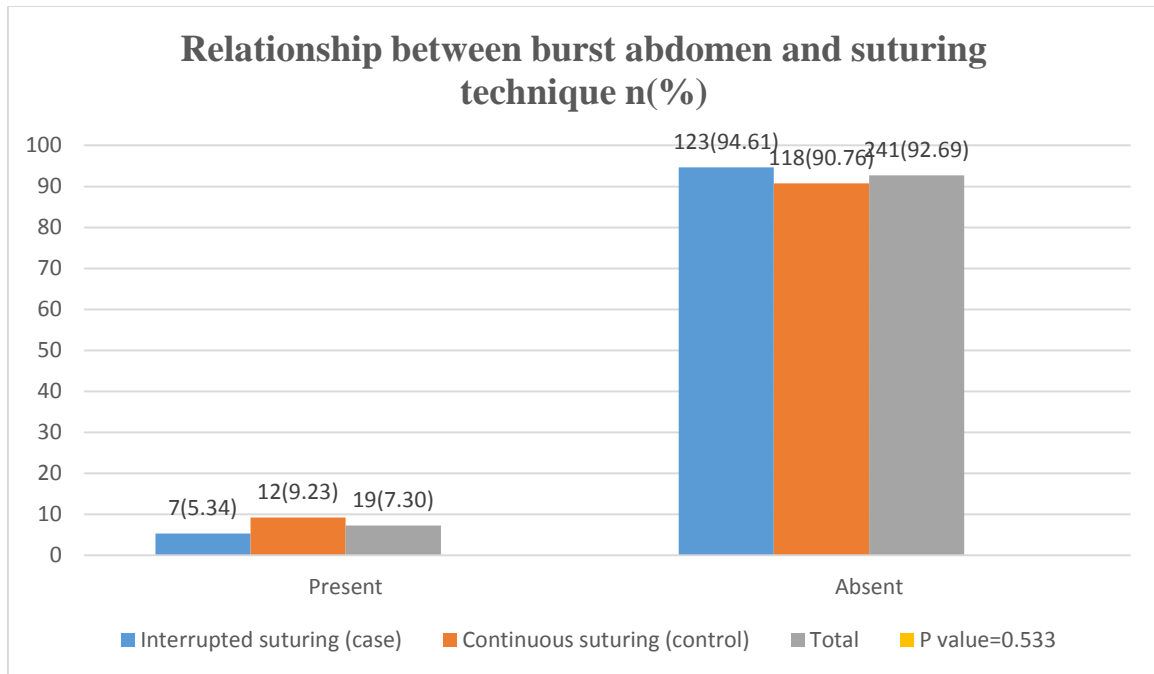


Figure 1: Relationship between burst abdomen and suturing technique

Table-3: Age group and Gender with burst abdomen

Burst Abdomen				
		Present	Absent	Total
<b>Age Group</b>				
	20-29 yrs			
	Count	2	47	49
	% within age group	4.08%	95.91%	100%
	30-39 yrs			
	Count	2	50	52
	% within age group	3.84%	96.15%	100%
	40-49 yrs			
	Count	6	56	62
	% within age group	9.67%	90.32%	100%
	50-59 yrs			
	Count	7	57	64
	% within age group	10.93%	89.07%	100%
	60-69 yrs			
	Count	3	30	33
	% within age group	9.09%	90.90%	100%
<b>Total</b>	Count	19	241	260
	% within age group	7.30%	92.69%	100%
<b>Gender</b>				
Male	Count	75	80	155
	% within Gender	38.70	61.29	100%
	% within Status	57.69%	61.53%	59.61
Female	Count	55	50	105
	% within Gender	26.19	73.80	100%
	% within Status	42.30%	38.46%	40.38
<b>Total</b>	Count	130	130	260
	% within Gender	50%	100%	100%
	% within Status	100%	100%	100%

In this study most of the patients were aged between 40-60 years in both the groups. In this study majority of the patients were males in both the groups (57.69% in group A and 61.53% in group BJ with male to female ratio 1.48:1

**Table -5: Predisposing Factors for burst abdomen.**

Factors	Burst Abdomen				Total		P-value
	Present		Absent		Number	Percent	
	Number	Percent	Number	Percent			
<b>DM</b>	10	52.63	50	20.74	60	23.07	0.017
<b>Anaemia</b>	16	94.73	44	18.25	60	23.07	0.001
<b>Cough</b>	10	52.63	40	16.59	50	19.23	0.007
<b>Uremia</b>	16	94.73	42	17.42	58	22.30	0.001
<b>Intraperitoneal</b>	14	73.68	38	15.76	52	20	0.001
<b>Post-operative</b>	14	73.68	32	13.27	56	21.53	0.001

In this study, variables are highly significant with the development of burst abdomen as p-value=0,017 and p-value 0.001.

**Table-7: Burst abdomen and malnutrition**

BMI	Burst Abdomen				Total		P-value
	Present		Absent		Number	Percent	
	Number	Percent	Number	Percent			
<b>&lt;18 (Malnutrition)</b>	15	78.94	45	18.67	60	23.07	0.001
<b>&gt;18 (Average)</b>	4	21.05	196	81.32	200	76.92	
<b>Total</b>	19	100	241	100	260	100	

In the table shows 60 (23,07%) patients were malnourished and in 15 cases (78.94%) burst abdomen occurred. p-value 0.001

#### IV. Discussion

The best method of abdominal closure is one that maintains tensile strength throughout the healing process with good tissue approximation, does not promote wound infection or inflammation, is well tolerated by patients, and is technically simple and expedient. The specific technique used in closure of abdominal fascia for the individual is frequently based on non-scientific factors. Because of difficulties arising from differently tailored study designs, the surgical literature has not clearly demonstrated an optimal technique to close abdominal fascia, especially in emergency settings.

Burst abdomen remains a major cause of morbidity and mortality followings laparotomy especially in the emergency setting. Trails from western countries have shown no significant difference in the risk of burst in the interrupted versus continuous methods of suturing. In a study from Department of Surgery, University of Alabama Hospitals, Birmingham, Alabama" the 2.0% (5/244) dehiscence rate for the continuous method is similar to other reports of continuous closure in which the incidence of disruption ranged from 0 to 2.8% 1.12 The 0.9%(2/229) of dehiscence for the interrupted method is also comparable with other series of interrupted closure in which the incidence ranged from 0 to 4.0% 13.14.

But in our trial, a statically significant difference in the risk of burst was obtained between the continuous and interrupted arms.

In our hospital study, 12(9.23%) in the continuous and 7(5.34%) in the interrupted arm developed burst abdomen. Among them, most of the patients were aged between 40-60 years and male to, female ratio 1.48:1. In continuous suturing cutting out of even a single bite of tissue leads to opening of the entire wound. This is the probable explanation for a high prevalence of burst in our emergency surgery.

A study Srivasta a reported 8 burst in the continuous arm of suturing whereas only 01 (dehiscence risk 2.17%) with interrupted technique indicating a much lower risk of burst with interrupted method of closure". Other Author also reporter protection from burst abdomen by interrupted suturing". The continuous suture is associated with a hacksaw effect due to varying tension on different parts of the suture due to abdominal wall movements. This results in cutting out of the suture. In case of interrupted suture there is no hacksaw effect hence cut out force is minimal. Our hospital study data in emergency surgery supports this theoretical explanation.

From our study, it is shown that interrupted suturing was associated with significant reduction in the risk of burst abdomen when compared with continuous in case of midline fascial closure.

## V. Conclusion

Intraabdominal sepsis, anaemia, DM, post-operative cough, wound infection, uremia and malnutrition are significant predictors of the burst abdomen. In presence of these symptoms, the risk of abdominal dehiscence can be reduced significantly by using interrupted sutures. Interrupted suture technique should be used in all emergency laparotomy cases and in elective laparotomy cases presenting with one or more risk factors for burst abdomen.

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