Original Article JCMCTA 2024 ; 35 (1) : 38-43

Post Operative Outcomes of Large Bite Versus Small Bite Technique following Upper Midline Incision Closure

Avijit Dewanjee[1*] Sreekanta Chandra Banik[2] Faisal Mostafa[3]
Mohammad Ahsanul Abedin[2] Liton Kumar Palit[4] Sadia Akter[5]

Abstract

Background: Incisional hernia is a common complication that arises after midline laparotomy, and it is associated with high morbidity, decreased quality of life and high healthcare costs. A reliable technique for closing the abdominal wall should provide strength and act as a barrier against infection. The method used to close the wound and the type of suture material utilized are critical factors in ensuring an effective abdominal wall closure after midline laparotomy. Abdominal wound dehiscence following closure is a severe complication, particularly in emergency laparotomy. To observe the postoperative outcome of small bite technique and large bite technique in midline incision closure.

Materials and methods: This quasi-experimental study was conducted in the Surgery Department of Chittagong Medical College Hospital, Chattogram, over a period of one year from February 2020 to February 2021.A total of 88 patients who underwent emergency midline laparotomy were included in this study. Patients over 18 years old who had laparotomy using an upper midline incision were included. The patients were divided equally into two groups by consecutive technique. Group A consisted of 44 patients using the conventional large bite technique, while Group B consisted of 44 patients using the small bite technique. Window-based computer software using SPSS-22 performed statistical analyses.

Results: Almost half (43.3%) of patients belonged to age 21-30 years in group A and 21(47.7%) in group B. The male-to-female ratio was 6.3:1 and 10:1 in groups A and B, respectively. There was no significant difference between the two groups ($p>0.05$).Group A had a wound infection rate of 38.6%, compared to 22.7% in Group B. The mean level of pain (0-10) was 1.95±1.46 in group A and 1.07±1.32 in group B. Group A had Southampton score 01 in 45.5% of patients, compared to 31.8% in group B.The mean characteristics were 1.95±1.46 in group A and 1.07±1.32 in group B. More than one-fourth (27.3%) of patients had wound dehiscence in group A and 5(11.4%) in group B. Three (6.8%) patients had burst abdomen in group A and 2(4.5%) in group B. The difference in level of pain (0-10) and characteristics were statistically significant ($p<0.05$) between the two groups. Five (11.3%) patients had superficial Incisional surgical site infection in group A and 5(11.3%) in group B. Ten (22.8%) patients had deep Incisional Surgical site infection in Group A and 3(6.8%) in Group B. No patient had organ or space infection in Group A or Group B.The difference in deep incisional surgical site infectionwas statistically significant ($p<0.05$) between the two groups. 43.3% of patients in group A had a hospital stay lasting 5-10 days, compared to 68.2% in group B. The mean duration of hospital stay was 11.11±3.72 days in group A and 9.18±2.66 days in group B. The difference was statistically significant ($p<0.05$) between the two groups. No patient had an incisional hernia in group A and group B at one month. The difference was statistically not significant ($p>0.05$) between the two groups. Five (11.4%) patients had incisional hernia after six months in group A and 2(4.6%) in group B. The difference was statistically not significant ($p>0.05$) between the two groups.

Conclusion: The small bites suture technique is more effective than the traditional largebites technique.

Key words: Burst abdomen; Incisional hernia; Midline incision; Short bite technique; Surgical site infection large bite technique.

1. Registrar of Burn & Plastic Surgery
Chittagong Medical College Hospital, Chattogram.
2. Assistant Professor of Surgery
Chittagong Medical College, Chattogram.
3. Assistant Registrar of Surgical Oncology
Chittagong Medical College Hospital, Chattogram.
4. Assistant Registrar of Burn & Plastic Surgery
Chittagong Medical College Hospital, Chattogram.
5. Medical Officer (OSD)
DGHS

***Correspondence: Dr. Avijit Dewanjee**
Cell : 01534 94 47 07
E-mail: avijitcmc@gmail.com

Submitted on : 25.11.2023
Accepted on : 03.03.2024

Introduction

Abdominal surgery frequently uses a midline incision because it causes minimal damage to muscle, nerve, and blood supply and can be made quickly. The incision is vertical and goes through the skin, subcutaneous fat, line alba and retroperitoneum. Surgical site infection, incisional hernia and wound dehiscence are potential complications after laparotomy, depending on patient and surgical factors. The only factor that

surgeons can control is surgical technique. However Incisional hernia remains the most common complication after midline laparotomy with reported incidence varying between 2-20%.[1] Over the past few decades, various suturing techniques have been studied for the closure of abdominal incisions made along the midline. Nowadays, surgeons prefer using the running closure technique, which involves taking large tissue bites to ensure a secure closure. Large tissue bites are usually placed at least 1 cm away from the wound edge and spaced 1 cm apart from each other. On the other hand, small tissue bites are placed closer to the wound edge, at a distance of 0.5 cm, and spaced 0.5 cm apart from each other. Large stitches may be associated with a high rate of wound complications as they include not only the aponeurosis but also soft tissues such as subcuticular fat and muscle, with low suture holding capacity.[2] In 2009 a study from Sweden showed that a running suture technique with small tissue bites developed by Israelsson, decreased the the incidence of incisional hernia compared with a running suture technique with large tissue bites.[3] According to Jenkins, it is recommended that incisions should be closed with a Suture Length (SL) to Wound Length (WL) of at least 4.[4] When the SL to WL ratio is less than 4, the risk of wound complication is higher.[4] The ratio depends on the size of each stitch and the stitch interval. Thus,a ratio of at least 4 can be achieved with many small stitches placed at close interval.[4] So small bite technique provides more wound strength postoperatively and has less chance of surgical site infection, wound dehiscence, or Incisional hernia. The aim of the study is to the rationality of the small bite technique in the closure of midline laparotomy in a tertiary hospital in terms of SSI, wound dehiscence, postoperative pain and Incisional hernia.

Materials and methods

Before starting the study, the ethical committee approved the research protocol and written consent were obtained from the participants. The investigator collected the data. This quasi-experimental study was conducted in the Surgery Department of Chittagong Medical College Hospital, Chattogram for a year, from February 2020 to February 2021. A total of 88 patients who underwent emergency midline laparotomy were included in this study. Only patients of age 18 or above and laparotomy through an upper midline incision were included. The patients were divided into two groups equally, with 44 patients in group A who underwent conventional large bite technique and 44 patients in group B who underwent small bite technique. Statistical analyses of the results were done using window-based computer software devised with Statistical Packages for Social Sciences (SPSS-22). The wound was checked on the third postoperative day, or earlier if the dressing became soaked or the patient developed signs of wound infection. All cases were selected according to the inclusion criteria. The patient's particulars, other parameters, and variables were recorded in a pre-designed SPSS data sheet. This study did not cause additional risk to the patient and no experimental drugs were used. Informed written consent was obtained after explaining the details of the procedures with their advantages and disadvantages and it was ensured to them that there was no potential risk of this study. Every individual questionnaire was preserved with proper identification of the patient maintaining confidentiality.

Results

Table I Distributions of the study subject by post-operative events (n=88)

Post-operative events	Group A (n=44)		Group B (n=44)		p-value
	n	%	n	%	
Postoperative pain					
Yes	44	100	44	100	-
Wound infection					
Yes	17	38.6	10	22.7	[b]0.106[ns]
No	27	61.4	34	77.3	
Level of pain (0-10)					
Mean±SD	5.64±1.5	4.8±1.65	[a]0.014[s]		
Range (Min-max)	2-8	2-8			
Characteristics					
Southampton score 0	5	11.4	20	45.5	
Southampton score 01	20	45.5	14	31.8	
Southampton score 02	1	2.3	0	0	
Southampton score 03	10	22.7	7	15.9	
Southampton score 04	6	13.6	3	6.8	
Southampton score 05	2	4.5	0	0	
Mean±SD	1.95±1.46	1.07±1.32	[a]0.003[s]		
Range (Min-max)	0-5	0-4			

Post-operative events	Group A (n=44)		Group B (n=44)		p-value
	n	%	n	%	
Wound dehiscence					
Yes	12	27.3	5	11.4	[b]0.059[ns]
No	32	72.7	39	88.6	
Burst abdomen					
Yes	3	6.8	2	4.5	[b]0.646[ns]
No	41	93.2	42	95.5	

s= significant
ns= not significant
[b]p value reached from the Chi-square test
[a]p value reached from the Unpaired-t-test.

Table I shows the distribution of the study of the patients by post-operative events. It was observed that all patients had post-operative pain in both groups. More than one-third (38.6%) of patients had wound infection in group A and 10(22.7%) in group B. The mean level of pain (0-10) was 1.95±1.46 in group A and 1.07±1.32 in group B. Almost half (45.5%) of patients had Southampton score 01 in group A and 14(31.8) in group B. The mean characteristics were 1.95±1.46 in group A and 1.07±1.32 in group B. More than one-fourth (27.3%) of patients had wound dehiscence in group A and 5(11.4%) in group B. Three (6.8%) patients had burst abdomen in group A and 2(4.5%) in group B. The difference in level of pain (0-10) and characteristics were statistically significant (p<0.05) between the two groups.

Table II Distributions of the study subject by surgical site infection (n=88)

Surgical site infection	Group A (n=44)		Group B (n=44)		p-value
	n	%	n	%	
Superficial Incisional					
Yes	5	11.4	5	11.4	1.000[ns]
No	39	88.6	39	88.6	
Deep Incisional					
Yes	10	22.7	3	6.8	0.035[s]
No	34	77.3	41	93.2	
Organ or space					
Yes	0	0.0	0	0.0	-
No	44	100	44	100	

s= significant
ns= not significant
p-value reached from the Chi-square test.

Table II shows the distributions of the study subjects by surgical site infection. It was observed that 5(11.3%) patients had superficial Incisional surgical site infection in group A and 5(11.3%) in group B. Ten (22.8%) patients had deep incisional surgical site infection in group A and 3(6.8%) in group B. No patients had organs or space in Group A or Group B. The difference of deep Incisional was statistically significant (p<0.05) between the two groups.

Table III Distributions of the study subject by duration of hospital stay (Days) (n=88)

Duration of hospital stay (Days)	Group A (n=44)		Group B (n=44)		p-value
	n	%	n	%	
5-10	19	43.3	30	68.2	
11-15	19	43.3	13	29.5	
16-20	6	13.4	1	2.3	
Mean±SD	11.11±3.72		9.18±2.66		0.007[s]
Range (Min-max)	6-20		5-16		

s= significant
p-value reached from the Unpaired-t-test.

Table III shows the distributions of the study subjects by duration of hospital stay (Days). It was observed that almost half (43.3%) of patients' duration of hospital stay was 5-10 daysin group A and 30(68.2%) in group B. The mean duration of hospital stay was 11.11±3.72 days in group A and 9.18±2.66 days in group B. The difference was statistically significant (p<0.05) between the two groups.

Discussion

In this present study, it was observed that all patients had post-operative pain in both groups. Deerenberg et al. study reported thatpain did not differ between the two groups.[3] Clay et al. study found a significantly lower Visual Analogue Scale (VAS) score for pain on the fifth postoperative day and no adverse effect on postoperative lung function.[5]

Henriksen et al. obtained in their study that the incidences of SSI reported that wound infection remains a frequent complication after laparotomy and should be monitored carefully.[6] In this current study, it was observed that 38.6% of patients had wound infection in group A and 22.7% in group B. The wound infection was higher in group A but the difference was not statistically significant (p>0.05) between the two groups. Israelsson and Millbourn, study found that 10.2% and 5.2% hadwound infection in group A and group B

respectively.[7] Similar findings were also observed by Millbourn et al. and Israelsson and Jonsson, studies[8,9].

In this present study, it was observed that the mean level of pain (0-10) was 1.95±1.46 in group A and 1.07±1.32 in group B. The mean level of pain was significantly ($p<0.05$) higher in group A. Sharma et al. study observed in both groups, the mean difference in VAS scores at 48 hours, 5, 7 and 9 days postoperatively was statistically insignificant ($p>0.05$). Deerenberg et al. randomized controlled trial comparing small to large bite suture techniques identified that the use of small bite sutures is not associated with an increase in adverse events or postoperative pain.[3] In this current study, it was observed that 45.5% of patients had a Southampton score of 01 in group A and 31.8 in group B. The mean characteristics were 1.95±1.46 in group A and 1.07±1.32 in group B. The mean Southampton score was significantly ($p<0.05$) higher in group A. The Southampton Guidelines highlight the difference in difficulty and outcomes between laparoscopic left and right hemi-hepatectomies. Hence, it was advised that their uptake occurs at different points in the learning curve. Regarding inflow control and parenchymal transection, the guidelines state that the choice of technique is dependent on the characteristics of the disease and the surgeon's preference.[10]

Wound dehiscence and burst abdomen were poorly defined by most of the studies. Wound dehiscence seemed to include both skin dehiscence with intact fascia and fascial disruption.[6] Different mechanical reasons for wound dehiscence were encountered as the suture breaks, the knot slips, or the suture cuts through the tissues.[11] Generally, wound dehiscence occurs when the suture material tears through the fascia with little effect forthe first two reasons. The strength of particular suture material increases as its cross-sectional diameter increases and smaller diameter sutures are associated with a greater likelihood of tearing through the tissue.[12] In this present study, it was observed that 27.3% of patients had wound dehiscence in group A and 11.4% in group B. Wound dehiscence was more in group A but the difference was not significant ($p>0.05$) between the two groups. Hassan et al. study found that 16.0% of patients in the large tissue bites group and 8.0% of patients in small tissue bites developed wound dehiscence.[4] The difference was found to be statistically insignificant ($p>0.05$) which is comparable with the current study. A study done by Milbourn et al. found 0.3% of patients inthe long stitch length group and none of the patients in the short stitch length group had wound dehiscence.[8] This difference was also statistically insignificant ($p>0.05$). Shahid et al. study observed that 7.2% and 1.2% of patients developed wound dehiscence in group A and group B respectively.[11] Wound dehiscence is a complete disruption of the sutured wound with evisceration, demanding emergency reoperation. Dehiscence usually happens within the first 10 days after wound closure, as the integrity of the wound is then entirely dependent on the suture and the suture-holding capacity of the tissues.[13,14] Wound dehiscence is associated with a mortality rate as high as 35.0% and with considerable morbidity, including a high rate of subsequent incisional hernia by Carlson.[15,16] A necrotizing infection may disintegrate the suture-holding tissues reduce suture-holding capacity and greatly increase the risk of wound dehiscence occurring. Dehiscence caused by a necrotizing infection may often occur relatively late, 7 to 10 days after wound closure, as a major infection takes some time to develop. However, this type of wound dehiscence does not seem to happen very often by Millbourn et al. and Israelsson et al.[8,9]

In this current study, it was observed that 22.7% of patients had deep incisional surgical site infection in group A and 6.8% in group B. Deep incisional surgical site infection was significantly ($p<0.05$) higher in group A. On the other hand, Deerenberg et al. found that 4.0% of patients had deep incisional in the large bites group and 3.0% in the small bites group, which differsfrom the present study.[3]

Regarding the duration of hospital stay it was observed in this study that 43.3% of patient's hospital stayed 5-10 days in group A and 68.2% in group B. The mean duration of hospital stay was 11.11±3.72 days in group A and 9.18±2.66 days in group B. The mean duration of hospital stay was significantly ($p<0.05$) prolonged in group A. Deerenberg et al. study showed the length of hospital stay was similar between the groups,

where they found the mean length of hospital stay was 14±24 days in the large bites group and 15±35 days in the small bites group, which differed from the present study may be due to most of their patients had the malignant disease, which is associated with a reduced their quality of life that may be prolonged length of hospital stay.[3]

Limitation

The study population was selected from one selected hospital in Chattogram City, so the results of the study may not reflect the exact picture of the country.

Conclusion

This study aimed to compare the postoperative outcomes of the small bite and large bite techniques in midline incision closure. Most patients were male in their fourth decade of life. The mean level of pain and Southampton score were significantly higher ($p<0.05$) in the large bite technique. Although wound dehiscence, burst abdomen and deep incisional surgical site infection were higher in the large bite technique, they were not statistically significant ($p>0.05$). The mean duration of hospital stay was significantly longer in the large bite technique. The study concluded that the small bites suture technique is more effective than the traditional large bites suture closure technique for preventing incisional hernia in midline incisions, without causing more pain or adverse events. Therefore, the small bites suture technique should be considered the standard closure technique for midline incisions.

Recommendations

Further studies can be undertaken by including a large number of patients.

Acknowledgement

The authors would like to acknowledge the co-operation of the respondents who participated in the study.

Contribution of authors

AV-Conception, design, acquisition of data, data interpretation, manuscript writing & final approval.

SCB-Analysis, critical revision & Final approval.

FM-Design, analysis, data interpretation, drafting & Final approval.

MAA-Data interpretation, analysis, critical revision & Final approval.

LKP-Analysis, data interpretation, critical revision & Final approval.

SA-Data analysis, critical revision & Final approval.

Disclosure

All the authors declared no competing interest.

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