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MANAGEMENT AND OUTCOME OF ABDOMINAL WALL CLOSURE IN EMERGENCY LAPAROTOMY AT A TERTIARY CARE CENTRE

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Abstract

Objective: Abdominal wall closure of an emergency laparotomy involves a great deal of consideration. An ideal laparotomy wound closure should be efficient. provide strength and serve as a barrier to infection. The aim of this study is to compare and evaluate the advantages of layered closure in comparison with the mass layered closure, the types of suture materials used in the closure, absorbable/nonabsorbable and its correlation with post operative complications such as wound sepsis, burst abdomen and incisional hernia.

Methods: This prospective study was carried out over a period of 18 months enrolling a total of 90 patients split into two groups with group 1 undergoing mass closure using both interrupted and continuous methods and group 2 undergoing layered closure using both interrupted and continuous methods of suturing.

Results: A higher rate of wound complications was noted in the layered closure group (37.7%) than the mass closure group (17%). Wound complications were also noted to be higher in closures done with prolene suture (37.7%) than PDS (20%). As far as techniques were concerned, interrupted and continuous suturing had a similar rate of complications. Of all the comorbidities, considered in the study, the highest rate of wound related complications were seen in patients with pulmonary complications (13.3%).

Conclusion: Although the ideal way to close an abdomen post laparotomy has not yet been discovered, our study shows that mass closure with PDS suture to close the abdominal wall should be advocated as there is decreased early and late post operative wound complications

Keywords: PDS.

Introduction

Laparotomy or celiotomy is a surgical procedure in which incision is put on abdominal wall in order to approach intra-abdominal wall pathologies.(1) In laparotomy, wisely chosen incisions and correct methods of making and closing such wounds are factors of great importance.(2) Closure of emergency laparotomy wound involves a gamut of technical considerations yet suture material and closure techniques are a common denominator for all and it is performed in a multitude of fashions and therefore there are an abundance of different tailored studies on this subject.(3)

The goal of wound closure is to restore function of abdomen after a surgical procedure.(4) Any mistake, such as badly placed incision, inept methods of suturing, or ill-judged selection of suture materials, may result in serious complications.(3)

The most widely utilized incision to access the intra-abdominal pathologies is midline incision and it is very useful in emergency laparotomy as it is simple, quick and provides excellent exposure to every region of the abdominal cavity and retroperitoneum with minimal damage to neurovascular structures and muscles of the abdominal wall.(5,6)

The closure of the abdominal wall is of great importance because it ultimately impacts the outcome of the surgery.(5) The ideal abdominal closure should be efficient, provide strength and serve as a barrier to infection.(7) Closure of the midline abdominal incision have varied over time with better understanding of the physiology and engineering of closure of the abdominal wall and improvement in the materials of surgical sutures.(8)

Numerous clinical trials have compared layered to mass abdominal closure(3); also meta analyses done for continuous versus interrupted methods of wound closure(9) and also for the optimal suture material for the closure but a consensus has not been reached(10). The present study will evaluate the advantages of layered closure in comparison with the mass layered closure, types of suture materials used in the closure, absorbable/nonabsorbable and its correlation with post operative complications such as wound sepsis, burst abdomen and incisional hernia.

Materials and Method

The study was conducted as prospective study of Management and Outcome of Abdominal Wall Closure in Emergency Laparotomy in emergency unit of a tertiary centre after obtaining approval from Institutional Ethics Committee. All patients >18year old who underwent anterior abdominal midline incisions for emergency laparotomy were included in the study after taking written informed consent. Patients with immunocompromised conditions like diabetes mellitus, patients on cancer chemotherapy, immunotherapy and on long-term steroids were excluded from the study along with patients who died within 10 days of laparotomy and those patients who were re-operated. The study duration was of 18 months which included the follow up period.

History regarding the particular illness was noted followed by clinical examination along with the routine investigations. Special investigations relevant to the disease were done and once the decision for laparotomy was taken, patient was randomly allotted to one of the following two groups. Patients under Group 1 underwent mass closure of abdomen, which was closed by suturing the peritoneum and linea alba together using prolene or Polydioxanone ie PDS (interrupted/continuous) while, patients under Group 2 underwent layered closure of abdomen by suturing of peritoneum and linea alba separately with prolene or Polydioxanone (interrupted/continuous). Post-operative complications of laparotomy wounds like seroma, wound infection, wound gaping, stitch abscess, stitch sinus, burst abdomen and incisional hernia between both groups were compared. A total of 90 Patients were included in the study 45 patients in each group. Statistical analysis was done using Chi-square test.

Observation and Results

The mean age of patients included in this study was 43.53, of which 48 were in the age group 46-60 years. 25 patients were below the age of 30 years. Male to female ratio of the sample size was 2.2:1 ie 62 (68.8%) were male and 28 (31.1%) were female.

Emergency laparotomies were mainly done for non traumatic intestinal perforation(54.4%) followed by intestinal obstruction(36.6%).(Table 1)

Table 1: Indication for emergency Laparotomy

S. N.	Pathology	No of Patients	Percentage (%)
1.	Intestinal obstruction	33	36.6
2.	Non Traumatic Intestinal perforation	49	54.4
3.	Trauma	8	7.7
	Total	90	100

Table 2: Distribution of Patients as per different techniques and suture material.

S. N.	Material Used		Mass Closure (45)		Layered Closure(45)	
1.	PDS 1-0	45	Continuous	12	Continuous	10
			Interrupted	12	Interrupted	11
2.	Prolene 1-0	45	Continuous	11	Continuous	13
			Interrupted	10	Interrupted	11

In our study out of 90 patients, after randomisation 45 patient remained in each group of Mass closure and Layered closure. Amongst these groups also there was equal distribution of continuous and interrupted technique using PDS 1-0 and Prolene 1-0 sutures (Table 2). In order to compare different techniques and sutures we compared incidences of wound complication in all these respective groups. We observed that the wound complication (Seroma, Infection, wound gaping, stitch abscess, sinus, burst abdomen and incisional hernia) rates were 8 (17%) and 17 (37.7%) in mass closure group and layered closure group respectively, which were significant with a p value < 0.05. (Table 3)

Table 3: Incidence of wound complications in Mass closure group and Layered closure group.

S. no.	Complication	Mass Closure		Layered Closure	
		No.	%	No.	%
1	Seroma	2	4.4	2	17.7
2	Wound Infection	2	4.4	5	22.2
3	Wound Gaping	1	2.2	2	17.7
4	Stitch Abscess	1	2.2	1	15.5
5	Stitch Sinus	1	2.2	2	11.1
6	Burst Abdomen	0	0	2	8.8
7	Incisional Hernia	1	2.2	3	15.5
	Total Complication	8	17.7	17	37.7

In our study we also observed that the above mentioned wound complication rates were 9 (20%) and 16 (37.7%) in PDS group(n=45) and Prolene group(n=45) respectively, which were significant with a p value < 0.05.(Table 4)

Table 4: Incidence of wound complications in PD group and Prolene group.

S. no.	Complication	PDS		Prolene	
		No.	%	No.	%
1	Seroma	2	4.4	2	4.4
2	Wound Infection	3	6.6	4	8.8
3	Wound Gaping	1	2.2	2	4.4
4	Stitch Abscess	0	0	2	4.4
5	Stitch Sinus	1	2.2	2	4.4
6	Burst Abdomen	1	2.2	1	2.2
7	Incisional Hernia	1	2.2	3	6.6
	Total	9	20	16	35.5

As far as closure technique of fascia was concerned, we compared interrupted with continuous closure, and in our study both the techniques had similar incidence of wound complication (p value >0.05) (Table 5)

Table 5: Incidence of wound complications in Interrupted group and Continuous group.

S.N.	Complication	Interrupted (n= 44)		Continuous (n=46)	
		No.	%	No.	%
1	Seroma	2	4.5	2	4.3
2	Wound Infection	2	4.5	5	10.8
3	Wound Gaping	0	0	3	6.5
4	Stitch Abscess	2	4.5	0	0
5	Stitch Sinus	3	6.8	0	0
6	Burst Abdomen	1	2.3	1	2.2
7	Incisional Hernia	2	4.5	2	4.3
	Total	12	26.6	13	28.2

Table 6: Distribution of Co morbidities and wound complications in different patients.

S. No.	Co-morbidities	No. of Patients	(%)	No of Patients having wound complications
1	Hypertension	10	11.1	2
2	Pulmonary Disease	12	13.3	9
3	Anaemia	7	7.8	2
4	Heart Disease	8	8.9	2
5	Smoker	11	12.2	3
6	Alcoholic	5	5.6	1
7	Renal Failure	5	5.6	0
8	Thyroid Disease	3	3.3	0
9	Sepsis	12	13.3	5
10	Abdominal Wall inflammation/ Edema	10	11.1	7

In our study, most of the patients belonged to 46-60 year age group so it is expected for these patient to have other co morbidities as well. As Diabetes was excluded in our sample size we took account of hypertension, pulmonary diseases, anaemia, heart disease, smoker, alcoholic, renal failure, thyroid disorder, sepsis and abdominal wall inflammation/ edema. Many patients had multiple co morbidities which contributed in occurrence of wound complications (Table 6). Majority of wound related complications (n=9, 75%) were present in patients with various types of pulmonary complications (n=12, 13.3%) making it obvious that lung collapse, COPD, Asthma, pulmonary infections, pneumonia etc adversely impact the outcome of wound healing.

Discussion

Restoration of structure integrity of abdominal wall following emergency laparotomy incision is an essential aim of every surgeon. The outcome of crucial emergencies is based on a tripod of cardinal determinants of the outcome viz, closure technique, suture material and surgical

experience. The fundamentals like asepsis, haemostasis, tensionless co-option of sutured edges are inherent and integral part of any good surgical procedure. Though different closure techniques exists for the closure of laparotomy wounds with abundant literature evidence emphasising merits and demerits of each of them, yet the jury is still out on a "bench marking dictate" as plenty of variables and their predictability leaves room for improvement and improvisation. Hence the present study was taken by us to compare the single layer closure vs conventional layered closure of laparotomy wounds and diligently accounting for each of multifactorial, multidimensional aspect viz operative time, post op incision healing and associated complications.

Out of 90 patients the distribution of patients according to age varied from 18 years to as old as 60 and the mean age being 43.53. Majority of patients ie 48(53.3%) were in the age group 46-60years, while 25 patients were below the age of 30 years. Male to female ratio of the sample size was 2.2:1 ie 62(68.8%) were male and 28(31.1%) were female. These distributions were comparable to the other studies matching the disease burden in the respective age group and gender (3, 7, 2). In the emergency laparotomy there are plethora of indications and during ours we also observed the same and which can be put in the following way as majority were by non traumatic intestinal perforation in 49, Intestinal obstruction in 33 and Trauma in 8 patients. This is comparable with the study conducted by Gandhi J. A. et al(11) .

The wound complications occurring in our study can be divided in minor and major wound complications. These complications add to the morbidity and mortality of patients. Minor complications include seroma, wound infection, stitch abscess, stitch sinus. Major complications include wound gaping, burst abdomen and incisional hernia. The incidence of almost all types of wound complications were more in patients with layered closure group (n=17, 37.7%) as compared to mass closure group(n=8, 17.7%). There was significant difference between these groups as P value is <0.05 that validates the fact that complication rate was higher in layered method of abdominal closure and so the mass closure comes out to be a better way of closure. Similar results have been observed by Kumar R et al(7). As far as wound complications associated with interrupted vs continuous method of fascia closure is concerned, both the groups had similar incidence ie 12 (26.6%) and 13 (28.8%) with p value > 0.05. In a study by Kumar B et al(12), wound complication rate were similar in both continuous and interrupted method of fascia closure . The difference was not statistically significant (p>0.05). They also concluded continuous suturing was comparable to interrupted suturing although the former being less time consuming.

Apart from technique we also considered the role of suture material in occurrence of wound complication and found that prolene was significantly (p value <0.05) associated with more such occurrences as compared to PDS group. These findings are comparable with the study of Shankar K. H. et al (13) who concluded that Polydioxanone (PDS) for closure of midline laparotomy incision is superior to Polypropylene (PPL) suture material. On the other hand, In a study by Pai D et al(14) they had not found any difference in outcomes with the said sutures.

Co morbidities in the patients affect the healing of the laparotomy wounds in a multi factorial manner. Co morbid states which came across in our study were hypertension, pulmonary disease, anaemia, heart disease, smoker, alcoholic, renal failure, thyroid disease, sepsis and abdominal wall inflammation/edema. There were patients who had multiple co morbidities as well and almost all of them were having some wound complication. The incidence of wound complications is highest in subjects having pulmonary diseases (9 out of 12 patients ie 75%). These findings are comparable with the study of Talukdar M et al (15), in which out of total 213 patients 27 had wound dehiscence and its prevalence in anaemia, hypoalbuminemia, post-operative pulmonary complications, increased intra-abdominal pressure, intra-abdominal sepsis/wound infection, delayed presentation and malignancy. So perioperative management of these co morbidities plays a major role in wound healing and complications.

Conclusion

The ideal method of abdominal wound closure has not been discovered. The ideal method should be technically so simple that the results are as good in the hands of the trainee as in those of the surgical master; it should be free from the post-operative wound complications; it should be comfortable to the patient; and it should leave a reasonable aesthetic scar.

Mass closure with PDS suture technique of abdominal fascial closure should be advocated in decreasing both early and late post-operative wound complications. Various modifiable risk factors have been described to decrease the rate of development of post-operative wound complications. Although this study provides insight on proper surgical technique; however, much remains to be unravelled in the Pandora's Box.

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