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Original Research Article

Mass closure versus layered closure of midline laparotomy incisions: a prospective comparative study

Santoshkumar N. Deshmukh*, Audumbar N. Maske

Department of General Surgery, Dr. Vaishampayan Memorial Govt. Medical College, Solapur, Maharashtra, India

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***Correspondence:**
Dr. Santoshkumar N. Deshmukh,
E-mail: santoshkumardeshmukh@yahoomail.com

ABSTRACT

Background: The ideal method of abdominal wound closure remains to be discovered. It should be technically so simple that the results are as good in the hands of a trainee as in those of the master surgeon. The best abdominal closure technique should be fast, easy, and cost effective while preventing both early and late complications. Present study is undertaken to compare the two methods (Mass closure and Layered closure) of laparotomy wound closure in relation to post-operative complications, time for wound closure and cost effectiveness in both groups and also to decide the most effective method among the two.
Methods: This prospective comparative study was conducted in department of surgery at a tertiary care teaching hospital at Solapur (Maharashtra) from January 2006 to January 2009. On admission, patients suspected of having intraabdominal pathology, a thorough clinical e and general assessment was done. Necessary radiological and biochemical investigations were done to support the diagnosis. After confirmation of diagnosis patients were subjected for exploratory laparotomy. The laparotomy wound was closed with either by Mass closure or Layered closure technique. Patients were followed up for 6 months in post-operative period for detection late complications.
Results: Total 60 patients of were studied. Majority of patients were in 61 to 65 age group. Male outnumbered the females. Incidence of early complications like seroma, wound infection is more in layered closure group as compared to mass closure. Mean wound closure time is more in layered closure group. Mass closure technique is more cost effective than layered closure group.
Conclusions: Mass closure technique is less time consuming, more cost effective and safe for closure of midline laparotomy incisions.

Keywords: Layered closure, Mass closure, Midline laparotomy incision

INTRODUCTION

Despite the advances in surgical technique and materials, abdominal fascial closure had remained a procedure that often reflects a surgeon's personal preference with reliance on traditional and anecdotal experience.[1] In abdominal surgery, wisely chosen incisions and correct methods of making and closing such wounds are factors of great importance. Any mistake, such as badly placed incision, inept methods of suturing, or ill-judged selection of suture materials, may result in serious complications such as hematoma formation, infection, stitch abscess, an ugly scar, an incisional hernia, or, worst of all, complete disruption of the wound.

The ideal method of abdominal wound closure remains to be discovered. It should be technically so simple that the results are as good in the hands of a trainee as in those of

the master surgeon.[2] Many trials carried out for determination of ideal technique for abdominal fascial closure, lacked sufficient power to show significant treatment differences also the results were conflicting and had left many surgeons uncertain about it.[3] The best abdominal closure technique should be fast, easy, and cost effective while preventing both early and late complications. Present study is undertaken to compare the two methods (Mass closure and Layered closure) of laparotomy wound closure in relation to post-operative complications, time for wound closure and cost effectiveness in both groups and also to decide the most effective method among the two.

METHODS

After obtaining the institutional ethics committee approval, present prospective comparative study was carried out in the department of surgery at a tertiary care teaching hospital at Solapur, Maharashtra. There is a rural tertiary care centre surrounded by many villages. Present study was carried out for a period of 3 years (December 2006 to December 2009) on 60 patients. 30 patients were subjected for mass closure and layered closure was carried out in remaining 30 patients. Both the groups were comparable for midline vertical incisions, elective laparotomy cases and PDS suture material.

Inclusion criteria

All the patients above 20 and up to 65 years of age, regardless of sex, undergoing laparotomy by midline incision were included in the study.

Exclusion criteria

- Emergency operated cases were excluded from this study
- All patients below 20 years and above 65 years
- All immune-compromised patients undergoing laparotomy
- Grossly obese patients. (patients having BMI>35 were excluded from this study)

On admission detailed history and thorough clinical examination was performed as per proforma. History regarding age, sex, education, occupation, residence, socioeconomic status, symptoms, and associated diseases were documented after direct interview with patient. Necessary laboratory and radiological investigations were done in each and every patient to confirm the clinical diagnosis. Out of 60 patients undergoing laparotomy, 30 patients were subjected for mass closure and 30 patients for layered closure of laparotomy incision.

Mass closure: In mass closure the parietal peritoneum, posterior rectus sheath, and the anterior rectus sheath all were approximated as a single layer with PDS in a continuous running sutures without interlocking.

Layered closure: Here all the steps were same as mass closure except peritoneum was closed as a separate layer and other layers closed as a separate layer with PDS by taking continuous running sutures without interlocking. The data collected were entered into MS-Excel sheets and analysis was carried out using statistical package for social sciences (SPSS-version 16.) On the basis of analysis and observation, results were drawn and discussed and compared with other relevant literature.

RESULTS

During the study period, consecutive 60 patients having intra-abdominal pathology and undergoing laparotomy by midline incision were included.

Table 1: Age distribution.

Age group (years)	Total cases
20-30	13 (21.66%)
31-40	11 (18.33%)
41-50	11 (18.33%)
51-60	6 (10%)
61-65	19 (31.66%)

The most vulnerable age group in this study was 61 to 65 years (31.66%) followed by 20 to 30 years (21.66%).

Table 2: Sex incidence.

Sex	Total cases	Male:female ratio
Male	38 (63.33%)	1.7:1
Female	22 (36.66%)	
Total	60 (100%)	

Out of 60 patients, 38 were male and 22 were females with F: M ratio of 1.7:1

Table 3: Intra-abdominal pathologies treated with midline laparotomy incisions.

Intra-abdominal pathologies	Total cases	Intra-abdominal pathologies	Total cases
Upper GI malignancy	14%	Bleeding duodenal ulcer	1%
Gastric outlet obstruction	3%	Common bile duct stone	2%
Hydatid cyst of liver	2%	Lower GI malignancy	18%
Splenic abscess	1%	Volvulus	1%
Pseudocyst of pancreas	3%	Mesenteric cysts	3%
Achalasia cardia	2%	Retroperitoneal tumours	3%
GERD	2%	Soft tissue tumours	1%
Splenomegaly	3	Carcinoma of bladder	1

Table 4: Distribution according to abdominal incisions.

Abdominal incision	Total cases
Upper midline	33 (55%)
Mid midline	8 (13%)
Lower midline	19 (32%)
Total	60 (100%)

Upper and lower midline incisions are most commonly used in present study.

Table 5: Postoperative complications.

Postoperative complications	Mass closure	Layered closure	P value
	No. of patients	No. of patients	
Hematoma	0 (0 %)	0 (0%)	>0.05
Seroma	0 (0 %)	1(3.33%)	
Wound infection	3 (10%)	2(6.66%)	
Burst abdomen	1 (3.33%)	1(3.33%)	
Incisional hernia	2 (6.66%)	2(6.66%)	
Button hole hernia	0 (0%)	0 (0%)	
Suture sinus formation	0 (0%)	1(3.33%)	

As compared to mass closure the incidence of early and late complications is slightly more in layered closure group but is statistically not significant.

Table 6: Mean closure time.

Type of closur	Mean closure time (minutes	P value
Mass closure	16.2	<0.01
Layered closure	21.2	

As compared to mass closure mean wound closure time is more in layered closure group which is statistically significant.

Table 7: Cost effectiveness.

Type of closure	Total cases	No. of PDS sutures required	Total cost (Rs)
Mass closure	30	35	35 x 119=4,165/-
Layered closur	30	55	55 x 119=6,545/-

From above table it is clearly evident that mass closure is cost effective as compared to layered closure.

DISCUSSION

In the present prospective study wound infection rate in mass closure group is 10% which is comparable with other studies.[4-6] As compared to studies by Leaper DJ et al and Khan NA et al it is less and this may be because of small sample size in present study.[7,8] In the study conducted by Israelsson et al and Bloemen et al the incidence of wound infection is 9.4% and 7.7% respectively in mass closure group.[9,10] In present study wound infection rate in layered closure group is 6.66%, As compared to studies by Ellis H et al (5%) and Kendal et al study (5%) rate of infection in present study is higher. As compared to mass closure wound infection is higher in layered closure, it may be due to more tissue handling, more exposure of wound to atmosphere air.

Incidence of burst abdomen in mass closure group is 3.33%. It is comparable with studies conducted by Ellis H et al and Khan NA et al and Murtaza B et al.[11] Incidence of burst abdomen for layered closure group is 3.3%, which is comparable with other studies.[2,5] The incidence of incisional hernia for mass closure is 6.6% in present study; it is comparable with other studies.[2,5,8,12] The incidence of incisional hernia in layered closure group is 6.6%, and is higher as compared to other studies this may be due to small sample size in present study.[2,5]

In present study, the incidence of suture sinus formation for mass closure group is 0%. Similar findings were reported in the studies conducted by krukowski et al and Brolin et al whereas incidence of suture sinus formation in layered closure group in present study is 3.33% which is comparable with Wissing et al study.[4,12,13]

Mean wound closure time in mass closure group is 16.2 min in present study. This figure is comparable with Kendal et al study.[5] Mean closure time for layered closure group in present study is 21.2 min and in Kendal et al study it is 18 min. The time required in layered closure group in present study is slightly higher and this may due to personal variation as all the faculty members were involved in the treatment of patient.

In present study mass closure technique is found to be more effective as compared to layered closure technique. Similar findings were noted in the studies carried out by Ausobsky JR et al and Pollock AV et al study.[14,15]

CONCLUSION

In comparison with layered closure mass closure technique is less time consuming, associated with less post- operative complications, less costly, safe and effective method for closure of midline laparotomy incisions.

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