

Comparison of continuous versus interrupted abdominal fascia closure in patients of perforation peritonitis using Polydioxanone (PDS) suture: A prospective study of 50 cases

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ABSTRACT

OBJECTIVE: Comparison of closure of midline laparotomy fascia using interrupted PDS v/s continuous PDS in emergency settings in terms of wound infection, wound dehiscence, incisional hernia and suture sinus.

METHODS: The present prospective study was conducted in Department of General Surgery, Pt. B. D. Sharma Institute of Medical Sciences, Rohtak. A total of 50 patients were enrolled who were operated in emergency operation theatre. These patients were grouped in two groups of 25 each. Alternate patient was allocated to Group I and Group II. Group I (study group) patients underwent interrupted closure of abdominal wall using polydioxanone No 1 suture. Group II (control group) underwent continuous closure of abdominal wall using polydioxanone No 1 suture.

RESULTS: The mean age in Group I was 39.16 and 41.4 in Group II. Majority of the patients were male (88%). Mean length of incision in both the groups were comparable i.e. 20.64 in group I and 20.56 in group II. The mean time taken for closure of rectus sheath in Group I was 39.56 mins and 19.8 mins in Group II. Mean duration of hospital stay in Group I was 12.84 days and 12.2 days in Group II. Also, 6 patients (28%) in Group I underwent wound infection as compared to 4 patients (16%) in Group II. Two patients (8%) belonged to Group I both of which had localised fascial burst and 1 patient (4%) was from Group II who had complete fascial burst. All 3 patients of fascial wound dehiscence were patients of peptic perforation. Further management of this complication in interrupted group only required regular aseptic dressing and secondary suturing while continuous group patient had to undergo a Bagota Bag application under general anaesthesia. One case (4%) of incisional hernia was observed in both the groups at the 3rd month of follow up. Three (12%) patients in interrupted group and one (4%) in continuous developed suture sinus.

CONCLUSION: In a patient with peritonitis, midline abdominal fascial closure should preferably be done with interrupted PDS as wound dehiscence is localised and easier to manage.

INTRODUCTION

Laparotomy is a major surgical procedure, whether elective or emergency always remains the bread and butter of a general surgeon.¹ Midline laparotomy is the most common technique of opening the abdomen in both emergency and elective settings because it is simple, provides adequate exposure to all four quadrants, affords quick exposure with minimal blood loss.² Laparotomy wounds have been closed in a variety of ways in terms of continuous versus interrupted closure, single layer versus mass closure and absorbable versus non absorbable sutures. The continuous suture has an advantage of an 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 has the disadvantage of being time consuming to perform and of isolating the tension to each individual stitch.

PDS is the first absorbable synthetic monofilament suture that has been marketed for clinical use and is suitable for closure of an abdominal wound.³ PDS is a reabsorbable polymer material that persists in the mid/long term (for around 180-230 days).⁴ Complications which may arise following fascial closure include wound dehiscence, wound infection, incisional hernia, and suture sinus formation.

Wound dehiscence is acute wound failure. It ranges from superficial breakdown of skin with intact deeper musculo-aponeurotic layers to a complete failure of wound and an exposure of viscera i.e. burst abdomen.⁵ Suture sinus is defined as abnormal protrusion of underlying suture threads through an intact skin, may or may not requiring removal. Incisional hernia is one of the most common long term complication of open abdominal surgery. In prospective studies, its incidence after midline laparotomy varies from 11-20 per cent.⁶ Incisional hernia can cause pain and may lead to serious conditions such as incarceration (6-15%) or strangulation of bowel (2%).⁷

MATERIAL AND METHODS

The present prospective study was conducted in Department of General Surgery, Pt. B. D. Sharma Institute of Medical Sciences, Rohtak. A total of 50 patients were enrolled who were operated in emergency operation theatre. These patients were grouped in two groups of 25 each. Alternate patient was allocated to Group I and Group II. Group I (study group) patients underwent interrupted closure of abdominal wall using PDS No 1 suture. Group II (control group) underwent continuous closure of abdominal wall using PDS No 1 suture.

Patient selection

All patients between 18-70 years of age with secondary peritonitis were included in the study who were operated through midline incision. Exclusion criteria were cases of primary peritonitis, ileostomy and colostomy, Pre-existing severe co-morbid conditions: severe renal and liver disease, anaemia (Hb<10 mg/dl), uncontrolled diabetes, malignancy and patients on anticancer chemotherapy or steroids and patients who had previous laparotomies through midline incision.

PREOPERATIVE EVALUATION

All the patients entering the study underwent pre-operative investigations including complete haemogram, bleeding time, clotting time, urine complete examination, serum electrolytes, blood sugar, blood urea, X-ray abdomen (erect and supine), chest x-ray PA view, ECG and USG abdomen.

PROCEDURE

Patients were first seen in emergency department wherein detailed history was taken from the patient if possible or the relative accompanying the patient. Patients were then subjected to preliminary and essential general physical and detailed systemic examinations. Patients were then investigated further to confirm the diagnosis. All patients were given a preoperative dose of antibiotics. Patients were then shifted to emergency operation theatre. Exploratory laparotomy was done and abdomen was opened by midline incision. Incision was made in skin using blade no. 23 mounted on bard-parker handle. The deeper layers were separated using electrocautery. The peritoneum was opened up between two haemostats with the help of metzenbaum scissors. The peritoneum along with the rectus sheath were opened up using electrocautery over the surgeon fingers. Findings were noted, desired procedure was performed. Variable number of abdominal drains were inserted accordingly and taken out at the level of umbilicus lateral to rectus muscle. Peritoneal cavity was washed thoroughly with warm normal saline till the effluent was clear.

The required closure was performed accordingly with suture bites taken 1 cm apart and 1 cm from fascial edges. The time taken for closure was noted. The skin was closed using silk 2-0 cutting in interrupted manner. The wound was cleaned first with saline and then povidone-iodine solution. The wound was primarily dressed with sterile surgical gauzes and covered with occlusive adherent bandage. Broad spectrum antibiotics was given to all patients with adequate i/v fluids. The primary dressing was removed after 3 days if there was no soakage and once daily dressing was done with saline and povidone-iodine solution. The wound was inspected for signs of infection and dehiscence before each dressing. Swab cultures from the wound were sent for microbiological culture and antibiotic sensitivity on evidence of any signs of infection. Patients were then put on antibiotics according to the culture and sensitivity report if they showed any systemic signs of inflammation (e.g. Fever, sinus tachycardia, raised TLC>11000 mm³)

METHOD OF CLOSURE

Group I (Interrupted PDS): PDS no. 1 was used taking interrupted sutures at a distance of 1 cm from the divided edge with a distance of 1 cm between the two consecutive suture taking 5-6 squared knots in a single suture tie.

Group II (Continuous PDS): PDS no. 1 was used in a simple running technique starting just proximal to the incision. The bites were taken 1 cm from the divided edge with a distance of 1 cm between the two consecutive bites in a non-interlocking manner and was closed using Aberdeen knot at the other end of the incision.

Evaluation

Postoperatively wound was examined on 3rd day for any infection. If there was any discharge dressing was done as required. A note was made of any evidence of burst abdomen. In subsequent days, number of dressings required in

patients developing wound discharge or dehiscence were noted. Number of days patient stayed in the hospital was recorded. Burst abdomen was defined as post-operative missing continuity of the abdominal fascia with bursting open or splitting along sutured lines. Wound infection was defined as redness, wound dehiscence with secretion of putrid smelly fluid or requiring antibiotic or surgical intervention.

Follow up

Patients were followed up at 3 weeks, 2 months and 3 months after surgery in outpatient department for any suture sinus formation or incisional hernia. Suture sinus was defined as abnormal protrusion of underlying suture threads through an intact skin, may or may not requiring removal. Incisional hernia was defined as post-operative evidence of a fascia dehiscence after completed superficial wound healing with or without prolapse of abdominal organs.

RESULTS

A total of 50 patients were enrolled who were operated in emergency operation theatre. These patients were grouped in two groups of 25 each. Group I consisted of 25 patients who underwent interrupted closure of abdominal wall using PDS No 1 suture. Group II consisted of 25 patients who underwent continuous closure of abdominal wall using PDS No 1 suture. The data was tabulated and statistical analysis was done using SPSS software.

TABLE I

	GROUP I (n=25)	GROUP II (n=25)
Mean age (years)	39.16	41.4
% of male	92	84
Mean length of incision (cms)	20.64	20.56
Mean time taken for closure of rectus sheath (mins)	39.56	19.8
Duration of hospital stay (days)	12.84	12.2

In our study, the mean age in Group I was 39.16 and 41.4 in Group II. Majority of the patients were male i.e. 44 out of 50 (88%). Out of which Group I had 23 (92%) male while Group II had 21 (84%) male. The mean length of incision in both the groups were comparable i.e. 20.64 in group I and 20.56 in group II. The mean time taken for closure of rectus sheath in Group I was 39.56 mins and 19.8 mins in Group II. The difference was found to be extremely statistically significant. Mean duration of hospital stay in Group I was 12.84 days and 12.2 days in Group II.

TABLE II: Diagnosis

DIAGNOSIS	No. OF PATIENTS (GROUP I)	No. OF PATIENTS (GROUP II)
Peptic perforation	10 (40%)	15 (60%)
Traumatic jejunal perforation	5 (20%)	4 (16%)
Traumatic ileal perforation	5 (20%)	2 (8%)
Traumatic gastric perforation	2 (8%)	3 (12%)
Traumatic duodenal perforation	2 (8%)	0
Traumatic colonic perforation	1 (4%)	3 (12%)
TOTAL	25	25

TABLE III: Complication

			GROUP I (n=25)	GROUP II (n=25)
EARLY	Wound infection		6 (24%)	4 (16%)
	Wound dehiscence/Burst abdomen	Localised	2 (8%)	0
		Complete	0	1 (4%)
LATE	Incisional hernia		1 (4%)	1 (4%)
	Suture sinus		3 (12%)	1 (4%)

In our study, 6 patients (28%) in Group I underwent wound infection as compared to 4 patients (16%) in Group II. Burst abdomen occurred in 3 patients (6%) out of 50 patients. Two patients (8%) belonged to Group I both of which had incomplete fascial burst and 1 patient (4%) was from Group II who had complete fascial burst. The patient in group II who had complete fascial burst was managed by application of Bagota bag under general anaesthesia and was followed by secondary wound healing. On the other hand, both the patients in group I who had incomplete fascial wound burst were managed by daily aseptic dressings followed by secondary suturing. In our study, no evidence of incisional hernia was present till 2 months in both the groups. One case (4%) of incisional hernia was observed in both the groups at the 3rd month of follow up. In total 2 patients (8%) out of 50 had incisional hernia as complication of surgery. There was no difference in incidence of incisional hernia in both the groups. No suture sinus was present till 2 months. First evidence of suture sinus was detected in 3rd month in both the groups. Three (12%) patients in interrupted group and one (4%) in continuous developed suture sinus. In all 4 patients out of 50 i.e. 8% had suture sinus as the complication of laparotomy. The difference was found to be statistically not significant ($p=0.6022$) using chi square test.

DISCUSSION

Mean age in both the group was found out to be similar to another recent study done in India.⁸ Male predominance similar to our study has been observed in majority of the studies in past.^{9,10} Closure time for fascial closure was grossly different in the two groups (Interrupted group 39.56 mins and Continuous group 19.8 mins) and when compared to earlier studies almost similar results were observed by Richard et al (Interrupted 40 mins and Continuous 20 mins).¹⁰ Higher rate of wound infection was found in both the groups in comparison to the studies in past probably because our study was done exclusively in patients operated in emergency operation theatres leading to already contaminated wounds.^{8,11}

Our study found high rate of burst abdomen in interrupted group (8%) in comparison to continuous group (4%) though the cases in interrupted had incomplete dehiscence and thereby decreased post-operative morbidity. Further management of this complication in interrupted group only required regular aseptic dressing and secondary suturing while continuous group patient had to undergo a Bagota Bag application under general anaesthesia. All 3 patients of wound dehiscence were peptic perforations with peritonitis. No patient of traumatic perforation had this complication. Traumatic perforations generally present early and are operated before full blown peritonitis sets in. This signifies that patient with peritonitis have higher changes of burst abdomen and interrupted suturing is a better option in these patients.

In our study, there was no difference in incidence of incisional hernia in both the groups (4%). Similarly, no statistical difference was found in earlier studies too.^{10,11,12} Another late complication, three (12%) patients in interrupted group and one (4%) in interrupted developed suture sinus. In a study by Iwase et al, suture sinus was found in 7.1% patients in interrupted group and 1.3% in continuous.¹²

CONCLUSION

From the above finding, we found out that there is no statistical difference in either technique in terms of wound infection, wound dehiscence, incisional hernia, suture sinus formation and length of hospital stay. Wound dehiscence is a dreaded complication of midline laparotomy which increases hospital stay and post-operative morbidity. In a patient of peritonitis, closure of midline fascial wound should preferably be done with interrupted PDS as wound dehiscence with this technique is localised and further management is easier, cheaper and doesn't require general anaesthesia.

REFERENCES

- ¹ Murtaza B, Saeed S, Sharif MA. Postoperative complications in emergency versus elective laparotomies at a peripheral hospital. *J Ayub Med Coll Abbottabad* 2010;22:42-7.
- ² Ellis H. Midline abdominal incision. *Br J Obstet Gynecol* 1984;91:1-2.
- ³ Ray JA, Doddi N, Regula D. Polydioxanone (PDS), a novel monofilament synthetic absorbable suture. *Surg Gynecol Obstet* 1981;153:497-507.
- ⁴ Bellon JM, Lopez PP, Allue RS, Sotomayor S, Kohler BP, Pena E, et al. New suture materials for midline laparotomy closure: an experimental study. *BMC Surgery* 2014;14:70-80.
- ⁵ Wong SY, Kingsnorth AN. Abdominal wound dehiscence and incisional hernia. *Surg Int* 2002;57:100-3.
- ⁶ Mudge M, Hughes LE. Incisional hernia: a 10 year prospective study of incidence and attitudes. *Br J Surg* 1985;72:70-1.
- ⁷ Read RC, Yoder G. Recent trends in the management of incisional herniation. *Arch Surg* 1989;124:485-8.

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- ⁸ Shukla RN. Surgical Wound Infection and Suture Material - A Study of 60 Cases. Indian Journal of Applied Research 2015;5:63-9.
- ⁹ McNeill PM, Sugerman HJ. Continuous absorbable vs interrupted non-absorbable fascial closure. A prospective, randomized comparison. Arch Surg 1986;121:821-3.
- ¹⁰ Richards PC, Balch CM, Aldrete JS. Abdominal wound closure. A randomized prospective study of 571 patients comparing continuous versus interrupted suture techniques. Ann Surg 1983;197:238-43.
- ¹¹ Sahlin S, Ahlberg J, Granström L. Monofilament versus multifilament absorbable sutures for abdominal closure. Br J Surg 1993;80:322-4.
- ¹² Iwase K, Higaki J, Tanaka Y, Kondoh H, Yoshikawa M, Kamike W. Running closure of clean and contaminated abdominal wounds using a synthetic monofilament absorbable looped suture. Surg Today 1999;29:874-9.