

Research Article

Study of Role of Suture Material in Development of Wound Dehiscence and Burst Abdomen

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Abstract: In this study we evaluated the role of different suture material in development of wound dehiscence and burst abdomen with different technique of closure like continuous/interrupted type. In our study which was carried out at KEM hospital, Pune of duration of 1 year, we have evaluated 60 cases operated in emergency and elective setting at our hospital selected randomly. All cases opened through midline incision and closed with absorbable/nonabsorbable suture material with interrupted and continuous type of suture. This study is a prospective randomized trial comparing the interrupted and continuous method of closure of abdominal wall fascia using both absorbable and non-absorbable suture materials. Wound dehiscence rates are 10% for continuous and 6.6% for interrupted group. Wound dehiscence rates are same for PP/PD at 5% and in PG is high of 15% as PG rapidly absorbable so incidence of dehiscence is higher as compared with two other group. So PG group of suture material should be supplemented with other suture material like PP/PD for closure of abdomen incision. Most of other studies concluded non absorbable continuous like PP is preferred suture material for abdominal wound closure after that partially absorbable PD are preferred in continuous form. But in our study interrupted PP and PD are better as compared continuous type. One thing is common in both study group is PG group of sutures alone should not be used as it will lead to rapid absorption of suture material due to short half life so suture tend to lose the strength early leading to development of dehiscence and burst abdomen. So PG group of sutures alone should not be used for abdominal closure primarily, but whenever PG group material is used it should be supplemented with other suture material like PP or PD.

Keywords: Wound dehiscence, abdominal wound, sutures

INTRODUCTION

The objective of this study is to compare the incidence of wound dehiscence and burst abdomen and development of incisional hernia in the wound for abdominal wall closure with using absorbable/non absorbable suture material.

The Technique—i.e. continuous versus interrupted method of abdominal wall closure using both absorbable and non-absorbable suture in patients of underwent laprotomy in emergency and elective setting. There are different ways of suturing for closure of abdomen fascia and development of burst abdomen and incisional hernia in immediate post operative period and after long interval period.

In this study we are planning to evaluate the, type of suturing material, technique of suturing—continuous/interrupted which is essential for prevention of development of wound dehiscence and burst abdomen and incisional hernia by comparing the

incidence of the same by using the different suturing material.

METHODS AND MATERIALS

Study design:

This study is a hospital based prospective study undertaken to evaluate continuous and interrupted methods of abdominal fascia closure in patients with laprotomy so that an ideal suture material and technique of abdominal closure can be identified and also study of wound infection and related complication incisional hernia with various suture material.

Study population:

Total of 60 patients with admitted in who underwent in elective or emergency setting laprotomy through a midline vertical incision at KEM General Hospital, PUNE City were enrolled in the study. These 60 patients were divided into six groups:

Group A: 10 patients who underwent continuous closure of abdominal wall using non-absorbable monofilament (polypropylene) suture.

Group B: 10 patients who underwent continuous closure of abdominal wall using slowly absorbable monofilament (polydioxanone) suture.

Group C: 10 patients who underwent continuous closure of abdominal wall using slowly absorbable polyfilament (polyglycolic acid) suture.

Group D: 10 patients who underwent interrupted suturing of abdominal wall using non-absorbable monofilament (polypropylene) suture.

Group E: 10 patients who underwent interrupted suturing of abdominal wall using slowly absorbable monofilament (polydioxanone) suture.

Group F: 10 patients who underwent interrupted suturing of abdominal wall using slowly absorbable polyfilament (polyglycolic acid) suture.

Inclusion criteria.

For inclusion in this study patients must underwent laprotomy with midline incision, age greater than or equal to 18 and less than 70 years and an informed consent must be taken.

Exclusion criteria

Cases of laprotomy and patients with severe co-morbidities such as hepatic disease, renal disease, hemoglobin less than 8 mg%, uncontrolled diabetes, malignancy patients on chemotherapy and patients who have had laparotomy previously were excluded.

Preoperative Workup:

All patients underwent the investigations of Complete blood hemogram, blood urea, serum creatinine, serum electrolytes, blood sugar, liver function test including total protein and serum albumin, chest X-ray, electrocardiogram, grouping and cross-matching.

Procedure:

Laprotomy done through midline incision, after dealing the cause the peritoneal wash given and wound closed in layers by employing different techniques as divided in 6 group.

Methods of Closure:

Written informed consent was taken from all patients. Patients were subsequently divided into the following 6 groups for closure:

Group A (Continuous non-absorbable monofilament suture): Non-absorbable No.1 polypropylene was used

in a simple running technique in a non-interlocking manner starting just proximal to the incision. The bites were taken 1-2 cm from the divided edge with a distance of 1 cm between two bites.

Group B (Continuous slowly absorbable monofilament suture): Slowly-absorbable No.1 polydioxanone was used in a simple running technique in a non-interlocking manner starting just proximal to the incision.

Group C (Continuous slowly absorbable polyfilament suture): Slowly-absorbable No.1 polyglycolic acid was used in a simple running technique in a non-interlocking manner starting just proximal to the incision.

Group D (Interrupted non-absorbable monofilament suture): Non-absorbable No.1 polypropylene was used taking interrupted sutures starting at a distance of 1-2 cm proximal to the divided edge with a distance of 1 cm between two consecutive sutures taking 5-6 knots in a single suture tie.

Group E (Interrupted slowly absorbable monofilament suture): Slowly-absorbable No.1 polydioxanone was used taking interrupted sutures starting at a distance of 1-2 cm proximal to the divided edge .

Group F (Interrupted non-absorbable polyfilament suture): Slowly-absorbable No.1 polyglycolic acid was used taking interrupted sutures starting at a distance of 1-2 cm proximal to the divided edge.

Evaluation Parameters:

1. **Wound dehiscence:** Defined as postoperative missing continuity of the abdominal fascia with bursting open or splitting along suture lines.
2. **Burst abdomen/incisional hernia:** Defined as postoperative evidence of a fascial dehiscence after completed superficial wound healing with or without prolapse of abdominal organs.

Follow Up:

Patients were followed up and re-evaluated at 2, 4, 6 and 12 weeks after surgery in out patient department and examined for following complications: Burst abdomen/incisional hernia: defined as postoperative evidence of a fascial dehiscence after completed superficial wound healing with or without prolapse of abdominal organs.

Statistical analysis

For qualitative data, significant difference between means was computed by using t-test. To see significant difference for proportions of qualitative data; chi-square and fisher's exact test was applied. Data will be expressed as mean, median.

RESULTS

This study was conducted in Surgical Department of KEM General Hospital, PUNE City, over a period of one years ,a total of 60 patients were included in the study and were divide into 6 groups as describe above--

1.AGE: Patients between age group 18-70 years were included in this study. The mean age in the six groups were 38.4 yrs, 40.4 yrs, 35.5 yrs, 38.7 yrs, 42.1 yrs, 44.3 yrs (Table-1).

2. SEX: Around 43 patients (71.6%) out of 60 included in this study were males.(Table-2)

3.DIAGNOSIS: in emergency-- Duodenal ulcer perforation peritonitis was the most common diagnosis12 followed by enteric perforation peritonitis at 4 cases,intestinal obstruction-10 cases others-4. Non emergency cases—open cholecystectomy (6),colectomy—10 others--14

4. WOUND DEHIENCE:

a) INDIVIDUAL GROUPS:

Percentage of wound dehiscence in the six groups were 0%, 10%, 20%, 10%, 0% and 10% respectively. Wound dehiscence occurred in 8.3% of the patients. (Table 3)

b) CONTINUOUS AND INTERRUPTED GROUP:

Wound dehiscence rate was found to be 10 % in the continuous and interrupted 6.6%. (Table 4)

c) POLYPROPYLENE, POLYDIOXANONE AND POLYGLYCOLIC ACID:

Wound dehiscence rates in the polypropylene group was 5% as same in polydioxanone group and 15 % in the polyglycolic acid group. (Table5)

FOLLOW-UP EVALUATION

1. Burst Abdomen/Incisional Hernia

a) Individual Groups:

Burst abdomen rate was evaluated till six weeks. Incisional hernia rates in the six groups at the end of 12 weeks was 20%,10%,20%,10%, 0% and 20% respectively. (Table 6)

b) Continuous and Interrupted Groups:

Significant difference in the rates of burst abdomen/incisional hernia was seen in the continuous and interrupted arms more in continuous group as compare to interrupted group. (Table 7)

c) Polypropylene, Polydioxanone and Polyglycolic Acid Groups:

Polyglycolic acid group have very high incidence of burst abdomen and incisional hernia rates as compared to two other group (Table 8)

Table 1: mean, median and standard deviation of ages (years) in the six groups

Age (yrs)	Group A (n=10)	Group B (n=10)	Group C (n=10)	Group D (n=10)	Group E (n=10)	Group F (n=10)
MEAN	38.40	40.4	35.5	38.7	42.1	44.3
MEDIAN	40.30	38.6	30.1	39.2	29	48
STD. DEVIATION	18.4	18.67	15.79	20.64	18.50	10.7
MINIMUM	19	20	18	18	19	28
MAXIMUM	60	66	69	58	64	58

Table 2: Sex distribution in the six groups

Sex	Group A (n=10)	Group B (n=10)	Group C (n=10)	Group D (n=10)	Group E (n=10)	Group F (n=10)
MALES	6 (60%)	7 (70%)	9 (90%)	8 (80%)	6 (60%)	7 (70%)
FEMALES	4 (40%)	3 (30%)	1 (110%)	2 (10%)	4 (40%)	3 (30%)

Table 3: Wound dehiscence rates in six groups

Wound dehiscence	Group A	Group B	Group C	Group D	Group E	Group F	Total
Absent	10 (100%)	9 (90%)	8 (80%)	9 (90%)	10 (100%)	9 (90%)	55
Present	0 (00%)	1 (10%)	2 (20%)	1 (10%)	0 (00%)	1 (10%)	5

Table 4: Wound dehiscence rates in continuous and interrupted groups.

Wound dehiscence	Continuous (n=30)	Interrupted (n=30)	Total
Absent	27 (90%)	28 (93.4%)	55(91.7%)
Present	3 (10%)	2 (6.6%)	5(8.3%)

Table 5: Wound dehiscence rates in polypropylene, polydioxanone and polyglycolic acid groups.

Wound dehiscence	Polypropylene	Polydioxanone	Polyglycolic acid	Total
Absent	19 (80%)	19 (90%)	17 (90%)	55
Present	1 (5%)	1 (5%)	3 (15%)	5

Table 6: Burst abdomen/incisional hernia rates in six groups during follow-up

Burst abdomen/incisional hernia	Group A (n=10)	Group B (n=10)	Group C (n=10)	Group D (n=10)	Group E (n=10)	Group F (n=10)
2 weeks	0	1 (10%)	1 (10%)	1 (10%)	0	1 (10%)
4 weeks	1	0	0	0	0	0
6 weeks	1 (10%)	0	0	0	0	0
12 weeks	0	0	1 (10%)	0	0	1 (10%)

Table 7: Burst abdomen/incisional hernia rates in continuous and interrupted groups in follow-up.

Burst abdomen/incisional hernia	Continuous (n=30)	Interrupted (n=30)
2 weeks	2 (6.6%)	2 (6.6%)
4 weeks	1(3.3%)	0
6 weeks	1 (3.3%)	0
12 weeks	1 (3.3%)	1 (3.3%)

Table 8: Occurrence of burst abdomen/incisional hernia in the three suture groups during follow-up

Burst abdomen/incisional hernia	Polypropylene (n=20)	Polydioxanone (n=20)	Polyglycolic acid (n=20)
2 weeks	1 (5%)	2(10%)	2(10%)
4 weeks	1(5%)	0	0
6 weeks	1(5%)	0	0
12 weeks	0	0	2(10%)

DISCUSSION

The results have been discussed under two subheadings, between continuous and interrupted method of abdominal closure and between polypropylene, polydioxanone and polyglycolic acid sutures. For the study, the patients were divided into 6 groups namely continuous non-absorbable, interrupted non-absorbable, continuous monofilament slowly absorbable, interrupted monofilament slowly absorbable, continuous multifilament slowly absorbable and interrupted multifilament slowly absorbable.

1. AGE

The mean age of patients was 41.30±18.52, 46.30±19.77, 34.5±14.79, 43.7±21.64, 32±16.53 and 47.3±9.86 years respectively. More than 50% of total patients were in 18-40 yrs age group. The average age in all the six groups was 49 years. All the six groups were comparable in terms of age as there was no statistical difference between the mean ages of the six groups. Also the age profile did not show any significant difference when compared to other studies. Cameron *et al* in their randomized trial had a mean age of 60.2±17 years[1].

2. SEX

Around 70% of the patients included in the study were males. However, the sex distribution was comparable in the six groups.

Richards *et al* [2] in their study found a similar sex distribution with around 76% of their patients being males.

3. DIAGNOSIS:

In emergency-- Duodenal ulcer perforation peritonitis was the most common diagnosis 12 followed by enteric perforation peritonitis at 4 cases, intestinal obstruction - 10 cases others-4. Non emergency cases—open cholecystectomy (6),colectomy—10 others—14.

4. WOUND DEHIENCE:-

In individual group—

- The incidence of wound dehiscence is 0%,10%,20%,10%,0%,10%
- Overall it is -8.3% present and absent in 91.6%.
- Wound dehiscence rate is 10% in continuous group and 6.6% in interrupted group
- Wound dehiscence incidence PP-5%,PD-5%,PG-15%
- Polyglycolic acid group have high incidence of wound dehiscence of 15% as compared to two

other group of Polypropylene and Polydioxanone group which 5%.

Comparison with other Trial

- Wound dehiscence rates is 2% in Cleveland *et al* [4] clinic study –PD and PP group comparisons no significance difference was found dehiscence rates.
- In study Sahlin *et al* [3] no difference in continuous and interrupted group in PP/PG group in operation done in elective and emergency setting.
- Wound dehiscence rate in continuous polyglycolic acid group is more as compared with rest other group(20%).
- In most of other studies wound dehiscence rates are same in both continuous and interrupted group but in our study dehiscence rate is more with continuous group than interrupted group.

5. INCISIONAL HERNIA /BURST ABDOMEN---

- At end of 2nd week—incidence of incisional hernia
- In PP-10%, PD -10%, PG –20% group
- At end of 2nd week—incidence of incisional hernia in interrupted and continuous group—6.6% each
- At end of 4th and 6th week—3.3% in continuous group
- At end of 12th week 3.3% in each continuous and interrupted group.
- PP group—15% ,PD has 10% and PG has 20% at end of 12th week is incidence of incisional hernia.

Comparison with other trial—

- Richard *et al* [2] continuous and interrupted group irrespective of type of suture material the incidence of incisional hernia is 1.3% and in our series is 6.6%
- Cameron *et al* no significant difference in incidence of incisional hernia between PP (11/90) and PD 10/90 [1], in our study PP(3/20) PD(2/20), PG(4/20).
- Higher in PG group.

SUMMARY

This study is a prospective randomized trial comparing the interrupted and continuous method of closure of abdominal wall fascia using both absorbable and non-absorbable suture materials .

- But wound dehiscence rates are 10% for continuous and 6.6% for interrupted group.
- Wound dehiscence rates are same for PP/PD at 5% and in PG is high of 15% as PG rapidly

absorbable so incidence of dehiscence is higher as compared with two other group.

- So PG group of suture material should be supplemented with other suture material like PP/PD for closure of abdomen incision .
- Rates of burst abdomen and incisional hernia is more as compared to other studies, it may be related to other factors which contribute to wound dehiscence and we have not include in our studies.
- Most of other studies concluded non absorbable continuous like PP is preferred suture material for abdominal wound closure after that partially absorbable PD are preferred in continuous form.
- But in our study interrupted PP and PD are better as compared continuous type .
- One thing is common in both study group is PG group of sutures alone should not be used as it will lead to rapid absorption of suture material due to short half life so suture tend to lose the strength early leading to development of dehiscence and burst abdomen.
- So PG group of sutures alone should not be used for abdominal closure primarily ,but whenever PG group material is used it should be supplemented with other suture material like PP or PD.

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