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Comparison Between Delayed-Absorbable Polydioxanone (PDS) And Non-Absorbable (POLYPROPELENE) Suture Material In Abdominal Wound Closure

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Abstract: *The objective of this study is to compare Polydioxanone (PDS) and Polypropylene (PPL) suture material for fascial closure,in midline abdominal incisions using interrupted X sutures in terms of post-operative wound complications. Patients for clinical study were selected from the surgical wards of Mc-Gann Teaching and District Hospital, SIMS from Jan 2012 to Dec 2013 with the following inclusion and exclusion criteria: A minimum of 50 cases of randomized midline laparotomy incisions were studied, after informed consent to either a Polydiaxanone (PDS) or Polypropylene (PPL) suture material. Equal number of cases (25) were studied for closure with these two suture materials. The patients were followed-up 01, 02 weeks and then one month after surgery. People around 36-45 years age group formed the maximum numbers in this study. Male to Female ratio was 1.94:1. There was one burst abdomen (out of 25 cases, 4%) in Polypropylene group and none (out of 25 cases) in Polydiaxanone group. Incidence of wound infection was 12%(6 out of 25 cases) in Polypropylene group compared to 6% (3 out of 25 cases) in Polydiaxanone group. The relative risk of wound infection was 0.50. The complications like burst abdomen, wound infection and suture sinus. incidence of suture sinus was 12% (3 out of 25 cases) in Polypropylene group as compared to 4% (1 out of 25 cases) in Polydiaxanone group. Infection rate was 12% (6 cases) in Polypropylene group and 6% (3 cases) in Polydiaxanone group. Hence interrupted X suture technique using No.l Polydiaxanone (PDS) for closure of midline laparotomy incision, is superior to no. 1 Polypropylene (PPL) suture material. Also PDS is superior in preventing major post-operative wound.*

Keywords: *Abdominal wound dehiscence, Burst abdomen, X Suture technique, Suture sinus, Wound infection.*

I. Introduction

Whether inflicted by chance or sustained during a surgical procedure, every wound is simply a disruption of the normal continuity of tissue. When tissue has been disrupted so severely that it cannot heal naturally (without complications or possible disfiguration) it must be held in opposition until the healing process provides the wound with sufficient strength to withstand stress without mechanical support.

Although the skill and technique of the surgeon is important, so is the choice of wound closure material [1,2]. Every surgeon's dream is to close the abdominal incisions securely, so as to prevent complications, such as wound infection, dehiscence, incisional hernia, suture sinuses[3] Abdominal wound dehiscence is a common complication of emergency laparotomy in Indian setup. Wound dehiscence carries with it a substantial morbidity and mortality in addition to increase in cost of care. Its prevention is important to reduce postoperative morbidity and mortality. Many patients have a poor nutritional status and the presentation of patients is often delayed. This makes the problem of wound dehiscence more common and graver. Wound dehiscence is related to the technique of closure of abdomen and the suture used [4]. Numerous studies have been conducted evaluating a bewildering variety of suture materials and closure technique's[5-7]. A new interrupted X technique was introduced to circumvent the problem of cutting out effect of continuous sutures which showed reduced incidence of wound dehiscence[8] While the choice may not be so important in elective patients who are nutritionally adequate, do not have any risk factor for dehiscence and are well prepared for surgery, however it may prove crucial in emergency patients who often have multiple risk factors for developing dehiscence[9] and strangulation of sheath is the proverbial last straw in precipitating wound failure.

A new suture material Polydiaxanone (PDS) was introduced to reduce the morbidity and mortality rate of laparotomies by its newer properties. Polydiaxanone (PDS) is monofilament. It absorbs slowly, approximately 70% remains at 2 weeks, approximately 50% remains at 4 weeks, approximately 14% remains at 8 weeks and there is minimal absorption until about 90 days[10]. Tensile strength of Polypropylene is Infinite (lasts>1 year)[10]. So it is interned to study the closure of abdomen with Polypropylene (PPL) versus Polydiaxanone (PDS) in cases operated at Mc-Gann Teaching and District Hospital, Shimoga with respect to the effectiveness of two different suture material in our setup.

II. Materials And Methods

The present clinical study was carried out at the surgical wards of Mc-Gann Teaching and District Hospital , SIMS from Jan 2012 to Dec 2013. Patients underwent both elective and emergency laparotomies through midline vertical incisions. Equal number of cases (25 each for PDS and PPL group) were studied for closure with these two suture materials; Polydiaxanone (PDS) and Polypropylene (PPL) suture material. The patients were followed–up 01, 02 weeks and then one month after surgery. A predesigned proforma was used to collect the information for individual cases. Data was collected, based on post-operative wound complications including post-operative wound pain, wound infection, wound dehiscence, suture sinus formation, stitch granuloma and incisional hernia.

Inclusion criteria:

- Both male and female patients.
- Patients older than 14years.
- Consent to participate in study.
- Study included both emergency and elective laparotomies.
- Only continuous suture technique was used.
- Only vertical midline abdominal incision closures were included.

Exclusion criteria:

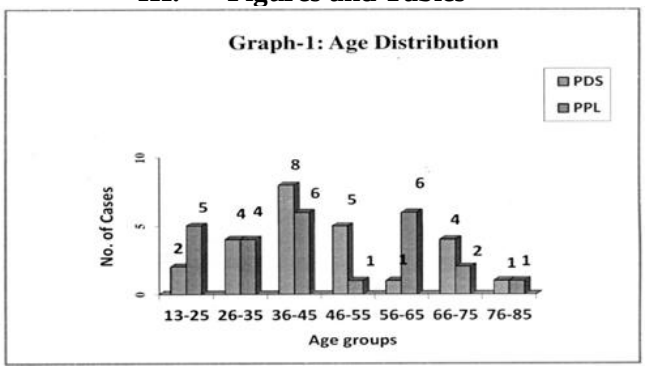
- Frank purulent peritonitis.
- Any perforation of gut which was more than 12 hours old.
- Patients with raised intra-abdominal pressure, which required tension suture closure.
- Patients with Pre- or Post-operative diagnosis of malignant involvement of peritoneum.
- Patients in whom there was a pre-existing cause of raised intra-abdominal pressure.
- Ascites

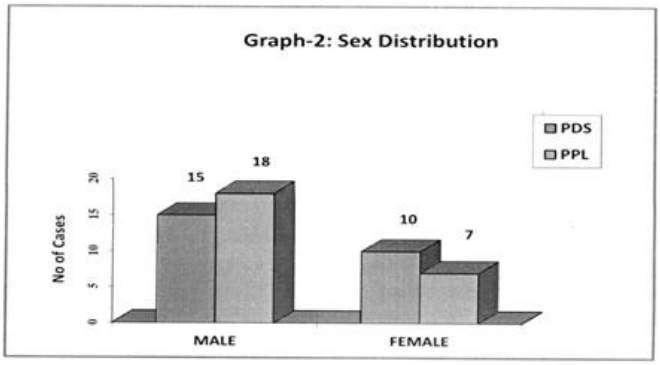
Suture Technique used: Interrupted X suture mass closure technique was used for fascial closure in both the groups. In both the groups, skin was sutured with subcuticular sutures with no.3-0 Ethilon. Sterile dressings were placed after completion of closure. Post operatively all patients received IV fluids and antibiotics as required. Blood transfusions were done wherever indicated. Postoperatively, the laparotomy suture line were checked after 48 hours and assessed for any early wound complications. There after the wound was examined on 5th, 7th and 9th post-operative days .

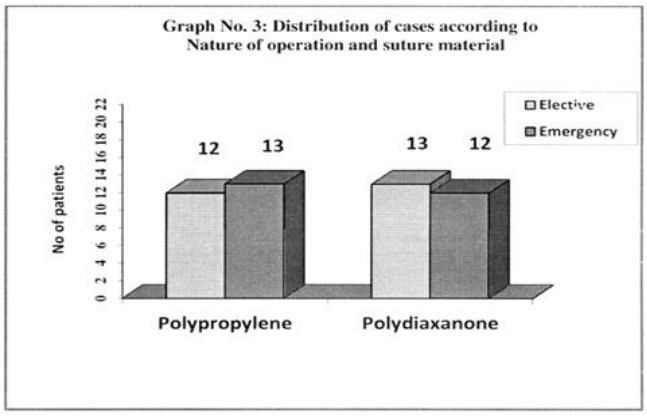
Closure using Polydiaxanone (PDS): An Interrupted X sutures were Performed using No.1 Polydiaxanone (PDS II) suture. All layers of abdominal wall except skin and subcutaneous tissue were included in single layer . A bite was taken outside in 2cm from cut edge of linea alba. The needle emerged on other side from inside out diagonally 2cm from edge and 4cm above or below first bite. This strand was crossed or looped around free end of suture and continued outside-in diagonally at 90° to first diagonal. A bite is taken inside out and the end is tied with free end of suture just tight enough to approximate linea alba. This creates two 'X' like crosses one on surface and another deep to linea alba. Next X suture is placed 1 cm away from previous one [11-12].

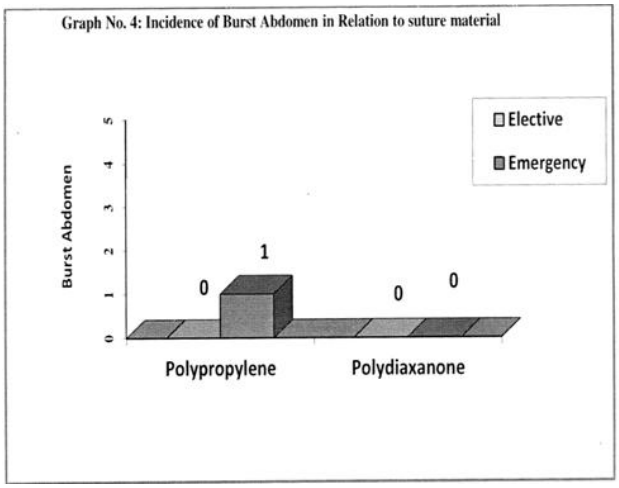
Closure using Polypropylene (Prolene): Similar interrupted X sutures were performed using No.1 Polypropylene (prolene) suture.

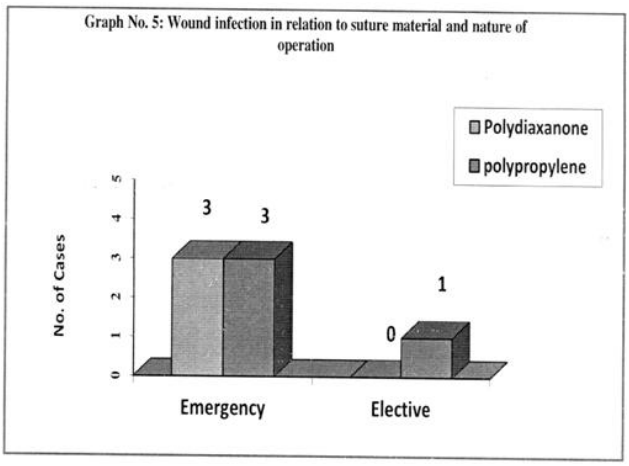
III. Figures and Tables

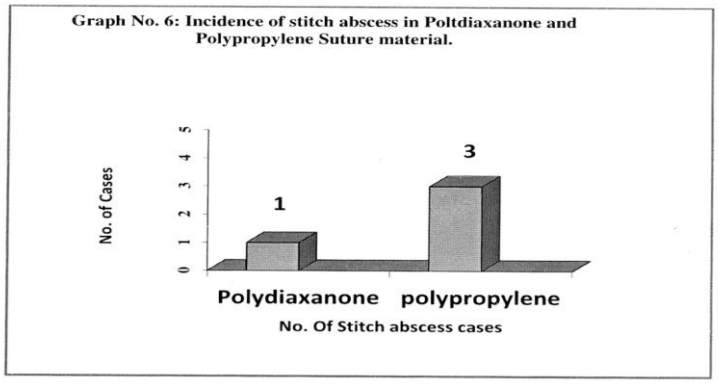



Graph-2: Sex Distribution
PDS
PPL
No of Cases
0
5
10
15
20
15
18
10
7
MALE
FEMALE


Graph No. 3: Distribution of cases according to Nature of operation and suture material
Elective
Emergency
No of patients
0 2 4 6 8 10 12 14 16 18 20 22
12
13
13
12
Polypropylene
Polydiaxanone


Graph No. 4: Incidence of Burst Abdomen in Relation to suture material
Elective
Emergency
Burst Abdomen
0
1
2
3
4
5
0
1
0
0
Polypropylene
Polydiaxanone


Graph No. 5: Wound infection in relation to suture material and nature of operation
Polydiaxanone
polypropylene
No. of Cases
0
1
2
3
4
5
3
3
1
0
Emergency
Elective



IV. Inferences From The Study

50 cases of laparotomy closure of midline incisions were studied to compare the results of Polydiaxanone (PDS II) and Polypropylene (Prolene) suture material. Equal number of cases (25 each) were randomly selected and divided in both the Polydiaxanone (PDS II) and Polypropylene (Prolene) suture materials. Both elective and emergency cases were included in the study, out of which elective cases were 25 and emergency cases were 25.

The male to female ratio was 1.94: 1 (graph 2). Patients aged 36-45 years formed the maximum number of this study (graph 1). The early and late wound complications encountered in both the suture materials used were as follows. There were 1 cases of burst abdomen in the present study (graph 4) which was done on an emergency basis in the Polypropylene (Prolene) and it was associated with wound infection. There was no case of burst abdomen in Polydiaxanone (PDS II) group and p-value was 1.0.

The use of Polydiaxanone (PDS II) was better in emergency cases with no case of burst abdomen as compared to Polypropylene (Prolene) suture material technique with incidence of burst abdomen of 4.0%.

The incidence of wound infection was higher in Polypropylene (Prolene) (12.0%) compared to Polydiaxanone (PDS II) (06%). The use of Polydiaxanone (PDS II) was better in emergency cases with low infection rate of 8% as compared to Polypropylene (Prolene) suture material with infection rate of 12% (graph 5). The incidence of suture sinus (graph 6) was 1 in 25 cases (4%) in Polydiaxanone (PDS II) and 3 in Polypropylene (Prolene) sutures (12)

V. Conclusion

Based on the observations made in this study, it has been concluded that interrupted x suture technique using no.1 Polydiaxanone (PDS) for closure of midline laparotomy incision is superior to no.1 Polypropylene (PPL) suture material and PDS is , superior in preventing major post-operative wound complications like burst abdomen, wound infection and suture sinus.

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