Original Article

Comparison of Absorbable and Non-Absorbable Subcuticular Suture Materials for Caesarean Skin Closure

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Abstract

Background: The objective is to compare the results of polyglactin 910 and polypropylene suture material used for subcuticular skin closure after cesarean delivery. Study Design- This is a randomized clinical trial. Population- The study was conducted at the Department of Obstetrics and Gynecology, a tertiary care Hospital. Women undergoing elective and emergency caesarean section were studied. **Material and Methods:** 264 women who underwent emergency caesarean section were divided into two groups. In group 1, polyglactin 910 no. 1 is used as subcutaneous sutures; In group 2, polypropylene no. 1 skin sutures were used. **Results:** The mean time of skin closure with polyglactin was 4.23 minutes and 5 minutes for polypropylene. The percentage of surgical site infection was 8% in group 1 and 1% in group 2. The percentage of seroma was 12% in group 1 and 3.7% in group 2. 4.5% wound dehiscence was found in group 1, and 0.7% in group 2 experienced wound dehiscence. Group 1 had 2.2% of hypertrophic scar, and group 2 had none. **Conclusion:** In the current comparative study between polyglactin and polypropylene sutures, it was concluded that there is a statistical difference in wound complications, such as surgical site infection (p 0.01), seroma ($p < 0.01$), and postoperative pain on day 3 (p.001) in group 1 compared to group 2. There was no statistical difference in pelvic dehiscence (p.0.05), hypertrophic scar (p.0.088), and postoperative pain on day 5 (0.15). However, polypropylene requires a longer time for suture application, and there is a need for suture removal.

Keywords: Polyglactin, polypropylene, wound complications, cosmetic results.

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Introduction

Although caesarean sections are a commonly performed procedure, there is no universally accepted suture material for skin closure.[1,2] Ideal suture material shall have adequate strength, good knot security, less pain, reduced infection rates, even tension distribution along the suture line, with no or minimal tissue reaction, and provide a good cosmetic scar which is acceptable for the patient.[1] Various methods of skin closures have been described, including absorbable suture materials (such as polyglactin 910, poliglecaprone 25), nonabsorbable suture (such as polypropylene, nylon, black silk), and staples.[1,2] Good tissue approximation, asepsis, and haemostasis are all essential to improve tissue healing, along with the type of suture material used for a good-looking scar. Subcuticular suturing, as described by Halsted, has simplified suturing and provides a cosmetically acceptable scar that is superior to that of mattress sutures and staples.[3,4] Caesarean survey A study in the United Kingdom revealed that the Pfannenstiel incision is the most common (over 99%), and approximately 41% used Polypropylene for skin closure, 17.5% used Polyglactin, and 5.2% used poliglecaprone 25. About 10% used staples as a skin closure technique.[5]

In India, too, there is no uniformity for skin closure technique for caesarean delivery. Availability, cost, surgeon expertise with specific suture material, patient risk factors such as sepsis, and institutional practices guide skin closure techniques; subcuticular Vs mattress Vs staples, and absorbable vs. nonabsorbable suture and Monofilament Vs braided suture material. Indian data regarding outcomes in terms of surgical site infection, healing of scar, and cosmesis for caesarean skin closure are scarce.[6,7] Hence, this study was conducted at a Government medical college with a high case load to know the infection rates and cosmetic outcome based on commonly used suture material in this institute for subcuticular suturing, Polyglactin 910 and Polypropylene for Pfannenstiel incision during caesarean deliveries.

Materials and Methods

This is a Prospective Randomised clinical trial, conducted at a

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tertiary care government medical college from February 2021 to August 2022 (18 months) after obtaining institutional ethical committee approval. Patients undergoing uncomplicated emergency or elective caesarean delivery by Pfannenstein skin incision, willing to follow up for 6 weeks, were included in the study after obtaining informed consent. Pregnant women with medical or obstetric risk factors which may cause increased risk of wound disruption (severe anaemia, hyperglycaemia in pregnancy, obesity, steroid use, foetal demise/ stillbirth, seropositive cases, maternal pyrexia, 2nd stage arrest, chorioamnionitis, premature rupture of membranes for more than 24hours by delivery) were excluded. Women with previous scars with a known tendency for hypertrophic scar and keloid were also excluded from the study. Pregnant women who required emergent caesarean delivery (Category 1 caesarean sections requiring extraction within 30 min) where consent for the study could not be obtained were not included. Intraoperative complications requiring blood transfusions, intensive care unit stay, and caesarean hysterectomy were excluded as they may increase the risk of wound disruption, to reduce confounding factors.

Women undergoing caesarean delivery fulfilling inclusion and exclusion criteria were counselled regarding the study while taking informed consent for caesarean delivery, and a separate consent form was taken for including them in the trial. All women had a haemoglobin level of more than 10 gm/dL, received the same preoperative antibiotic (3rd-generation cephalosporin) at least 30 minutes before the incision, and Povidone iodine was used for skin preparation before the Pfannenstiel skin incision. A separate fat closure was done whenever the thickness exceeded 2cm, as per the standard practice in the institution. After uncomplicated uterine closure in caesarean section, patients were randomised into two groups based on the type of suture material used for subcuticular closure for Pfannenstein incision. Randomisation was done after matching, and the Floor nurse was asked to pick up the chit to choose suture material.

Group 1 received a delayed absorbable suture, polyglactin 910, braided suture (Ethicon, manufactured by Johnson and Johnson Private Limited) for subcuticular skin closure. Wound closure included burying the knot on either side inside the skin, with no visible suture material from outside. These women did not require the removal of the suture. Group 2 received non.

Absorbable suture material, Polypropylene (Ethicon, manufactured by Johnson and Johnson Private Limited) for subcuticular skin closure. Knots were placed on either side of the skin incision beyond the angle, with visible knots on either side. Suture was removed on the 7th day, by cutting the knot on one side and pulling out the suture from the other side.

Case details, including demographic features, body mass index, and indications, were collected using a standard case pro forma. Details regarding the amount and intensity of pain on the 5th day were assessed using a standard visual analog scale as described in Figure 1 and recorded in the case proforma. Pain scores were recorded using a visual analog scale from 1-10, where scores 1-3 were described as mild, 4-6 were moderate, and 7-10 were recorded as severe pain. The dressing was removed after 48 hours of surgery, and the condition of the wound regarding union, discharge, bleeding, seroma, and hematoma was noted. The wound is reassessed on the 5th day and after six weeks to assess the nature of the scar.

Outcome indicators were defined as follows: Wound infection is defined as discharge from the wound with signs of inflammation (redness, induration). Wound dehiscence is the separation of skin edges by more than 1cm. Haematoma is a swelling of more than 1cm in the surgical wound, accompanied by skin discoloration. Seroma is swelling in the wound without skin discolouration or clear serous discharge from the wound without signs of inflammation. A hypertrophic scar is a coloured scar, elevated from the skin level, and may be associated with occasional itching, confined to the scar. A keloid is thicker, extending beyond the normal scar length, and has an intense thickness.

Sample size calculation: Sample size calculated using the probability of post operative wound complications as per the study by Shankar B Burute et al.[7] Considering a 10% attrition rate for follow-up, 132 cases were required in each group to achieve 80% power in the study with a 95% confidence interval. The formula used is;

$n = (z\alpha + z1-\beta)2\ [p1(100-p1)+p2(100-p2)]$

$d2$

$z\alpha = standard\ table\ value\ for$ 95% CI Z1-β=standard table value with 80% power P1=proportion in group 1

P2=proportion in group 2

d=expected differences between two groups

$n = (1.94+0.84)2\ [90(100-90)+94(100-94)]$

102

n = 112

Considering the dropout (attrition) rate of 10% the final sample size is calculated as 132 subjects in each group.

Statistical analysis: The data collected with MS Excel and analysed using SPSS version 20.0. Sociodemographic data are presented using descriptive statistics, namely mean, median, standard deviation, and percentage, wherever applicable. Chi-square test or Fisher's exact tests are used to compare the quantitative data, and qualitative data is coded by thematic analysis, and the Transcripts will be analysed using the ATLAS—ti software as appropriate. A p-value of <0.05 is considered significant.

Results

A total of 264 women undergoing caesarean delivery were included in the study. Group 1 included 132 women who received absorbable suture material (Polyglactin 910) for subcuticular skin closure, and Group 2 included 132 women who received nonabsorbable suture material (Polypropylene) for subcuticular skin closure. All patients were available for follow-up on the 7th day and at 6 weeks without drop-out rates (No attrition). Hence, outcome indicators were analysed for all women included in the study.

Table 1 presents the baseline features of the sample groups. Both groups were comparable in terms of age, gestational age, weight, and parity. Mean weight in group is 59.8±5.1, and group 2 is 60.3±4.6. Groups were matched for indication and category of

caesarean section. Most LSCS (lower segment caesarean section) were category 2 and 3 in both groups.

Outcome indicators are described in Table 2. Duration of skin closure time was significantly less in Group 1 (Polyglactin) compared to Group 2 (Polypropylene), 4.18 ± 0.467 vs 5 ± 0.593 minutes. Pain scores were recorded using a visual analog scale from 1 to 10, where scores 1-3 were described as mild, 4-6 as moderate, and 7-10 as severe pain. Pain scores were comparable on the 5th day between the two groups, with a p-value of 0.15, which was not statistically significant. There were 16 cases of seroma in group 1 vs 5 cases in group 2, and 11 cases of surgical site infections among group 1 vs 2 cases in group 2, which was significant. However, wound disruptions requiring secondary suturing were not significant between the groups (6 cases in group 1 vs 2 cases in group 2). Hypertrophic scar at 6 weeks was seen in 3 cases of group 1; however, this was not significant. There were no cases of wound haematoma and keloid formation in the sampled groups when followed up to 6 weeks.

Table 1: Baseline characteristics of the study population. (* LSCS – lower segment caesarean section)

		Group 1 (Polyglactin 910) N=132	Group 2 (Polypropylene) N=132
Age in Years (Mean±2 standard deviation)		26.8±7.6	25.9±6.9
Weight in Kilograms (Mean±2 standard deviation)		59.8±5.1	60.3±4.6
Gestational age in weeks (Mean±2 standard deviation)		38.2±2.4	38.6±3.1
Type of LSCS*	Primary	62	61
	Repeat	70	71
Indication category-wise	Category 2	53	54
	Category 3	57	54
	Category 4	22	24
Total, N = 264		132	132

Table 2: Outcome indicators in Group 1 Vs Group 2 and statistical significance

Outcome		GROUP 1 (Polyglactin 910) N=132	GROUP 2 (Polypropylene) N=132	P value
Duration of skin closure (in minutes)		4.18 ± 0.467	5 ± 0.593	< 0.001
Pain scores on 5th day	Mild	60 (45.5%)	46 (34.8%)	0.15
	Moderate	71 (53.7%)	81 (61.4%)	
	Severe	1 (0.75%)	5 (3.7%)	
Seroma		16 (12%)	5 (3.7%)	0.012
Surgical site infection		11 (8.3%)	2 (1.5%)	0.01
Wound dehiscence requiring secondary suturing		6 (4.5%)	2 (1.5%)	0.15
Scar outcome	Hypertrophic scar	3(2.2%)	0	0.088
	Keloid	0	0	

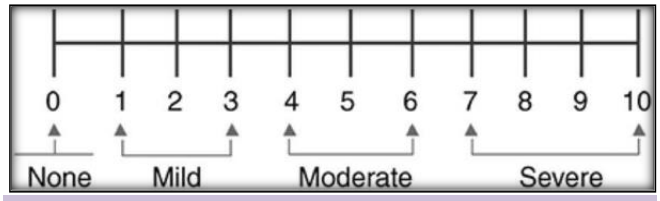

Figure 1: Visual analog pain scale for assessing pain scores

Discussion

Various types of skin closure techniques have been used for caesarean skin incisions. Each skin closure techniques have merits and a few disadvantages. Many private sectors have switched to monofilament absorbable suture material (Poliglecaprone), which has lower wound infection rates and cosmetically better scar compared to polyglactin and polyamide.[6]

However, many public care hospitals continue to use Polyglactin and polypropylene suture materials, which are easily available. Staples are preferred for skin incisions in surgical specialties, as they have no risk of needle stick injuries. Staples are less commonly used for caesarean skin closure. Staples, though faster in application, have higher pain scores, wound disruption, and cosmetically unacceptable scar.[2]

In the current clinical study, 264 patients underwent caesarean section. Of these 264, 132 underwent skin closure with polyglactin, and the remaining 132 underwent skin closure with polypropylene sutures. The mean time to wound closure with polypropylene was 5 min versus 4.23 min with polyglactin, with a p-value of 0.001. Knot tying on either side with an increased number of knots has contributed to increased time with Polypropylene. A similar result was reported by Hasdemir et al.[10] There was a longer time for skin closure with non-absorbable skin sutures than with absorbable ones (p = 0.016). Postoperative pain was assessed with a visual analog scale for patients in our study. Postoperative pain on day 5 was 0.15, not statistically significant. In a survey conducted by Uikey et al,[9] more pain was experienced in the absorbable group than in the non-absorbable group (p < 0.001).

In the current study, 11 patients (8%) in the polyglactin group and two patients (1%) in the polypropylene group developed surgical site infections, which was statistically significant. Polypropylene has been shown to reduce surgical site infections, which is expected due to its monofilament nature, compared to braided suture materials like polyglactin. Similar results were found in a randomized controlled trial by Osther et al,[8] which compared polyglycolic acid and monofilament polyglyconate sutures for abdominal fascial closure after laparotomy in patients with suspected wound healing issues. Wound infection requiring surgical intervention was found in 7% of patients with polyglyconate sutures and 16% with polyglycolic acid sutures (P

< 0.04).

Urvashi Vats et al,[6] compared the effects of polyglactin 25, polyglactin 910, and polyamide as subcuticular skin sutures in post-cesarean women. The number of patients with wound dehiscence and induration was significantly higher in group 2 when polyglactin suture was used compared to polyglycolic and polyamide (P < 0.05). Uikey PA,[9] and Hasdemir PS,[10] also reported similar results in their research. In Urvashi Vats' study, wound dehiscence was found in 3.3% of the absorbable group and 6.6% of the non-absorbable group, which was not statistically significant.[6]

In this study, three patients [3.7%] in the polyglactin group experienced hypertrophic scars, and no hypertrophic scars were found among patients in the polypropylene group. The P value found to be 0.088 [> 0.05] is not statistically significant. As hypertrophic scars are relatively rare, this sample may not be sufficient to detect the effect of suture material on scar outcomes, such as hypertrophic scars and keloids. In a study conducted by Hasdemir et al,[10] wound cosmesis were almost similar in both groups (p value 0.8). A survey conducted by Uikey et al,[9] found that cosmetic outcomes with absorbable suture material were better than those with non-absorbable suture material (p < 0.001).

Conclusion

Both Polyglactin and Polypropylene are suitable options for Caesarean skin closure, with no significant impact on pain scores or cosmetic outcome. Reduced surgical site infections made Polypropylene a good choice; however, the requirement for suture removal and an additional patient visit makes it a less attractive option. The decreased time required for closure and the absence of suture removal make Polyglactin a winner. Individualisation of cases for suture materials based on risk factors for surgical site infections, time utilisation during emergency caesarean deliveries, and reduced patient visits should be considered as part of clinical judgment.

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Conflicts of interest

There are no conflicts of interest.

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