ORIGINAL RESEARCH PAPER

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COMPARISON OF SUBCUTICULAR POLYGLECAPRONE 3-0 VERSUS THREE MATTRESS POLYPROPYLENE 3-0 SUTURE TECHNIQUE FOR SKIN CLOSURE OF LOW TRANSVERSE INCISION IN OBG SURGERIES

KEY WORDS:

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ABSTRACT

Background: Skin closure technique plays a pivotal role in postoperative outcomes, including wound healing, pain, and scar cosmesis. This study aimed to compare subcuticular sutures with mattress sutures in women undergoing caesarean section or laparotomy through a low transverse abdominal incision. **Methods:** A prospective randomized trial was conducted at Dr. Rajendra Prasad Government Medical College, Kangra at Tanda, A total of 112 women fulfilling the inclusion criteria were randomly allocated into two groups: Group I (subcuticular sutures using Polyglecaprone 3-0 with fat approximation using plain catgut 2-0) and Group II (three mattress sutures using Polypropylene 3-0). Time taken for skin closure, postoperative pain (VAS score), wound complications at 48 hours and day 5, duration of hospital stay, and scar cosmesis at 6 weeks (assessed by the Observer Scar Assessment Scale, OSAS) were compared. Statistical analysis was performed using appropriate tests with a p-value <0.05 considered significant. **Results:** Baseline characteristics were comparable across both groups. Closure time was significantly shorter in Group II, with 87.5% of cases completed in under 5 minutes compared to none in Group I ($p < 0.001$). Group II also reported significantly lower postoperative pain scores (3.80 ± 0.80 vs. 5.45 ± 0.85, $p < 0.001$). No significant differences were observed in wound complications or fever between groups. While Group II had higher OSAS scores (indicating poorer scar cosmesis), Group I demonstrated superior cosmetic outcomes, with 89.3% rated as excellent compared to 1.8% in Group II ($p < 0.001$). **Conclusion:** The mattress suture technique offers faster skin closure and less immediate postoperative pain, whereas the subcuticular method results in significantly better cosmetic outcomes.

INTRODUCTION:

Wound healing in clean surgical incisions typically occurs by primary intention, with epithelial cell migration from the incision edges initiating skin union by 48 hours and complete healing by the seventh or eighth postoperative day. Optimal wound healing, particularly in the absence of infection or hematoma, is critical to surgical success and patient satisfaction, especially with increasing surgical complexity and growing awareness of cosmetic outcomes. Despite advances in suturing techniques and materials, the fundamental goals remain unchanged: to close dead space, approximate wound edges, support the wound until adequate tensile strength develops, and minimize bleeding and infection risks.[1-3]Suture materials play a significant role in determining postoperative outcomes such as pain, infection, healing quality, and cosmetic appearance.[4] These materials may be absorbable or non-absorbable, natural or synthetic, monofilament or multifilament, and vary in characteristics like tensile strength, elasticity, memory, and capillarity.[5,6] An ideal suture should handle well, induce minimal tissue reaction, form secure knots, maintain tensile strength, be sterile, hypoallergenic, and cost-effective. Natural absorbable sutures like catgut are broken down by proteolysis, causing significant inflammation but favoring rapid healing, while synthetic ones like polyglecaprone degrade by hydrolysis, leading to minimal tissue reaction.[7] Polyglactin offers good tensile strength, whereas polyglycolic acid provides smooth handling. Polypropylene and polyamide are durable and inert but may present cosmetic drawbacks.[8]Techniques for skin closure—simple interrupted, continuous, mattress, or subcuticular—each have advantages. Subcuticular sutures, especially in Pfannenstiel incisions, align with natural skin lines, promoting faster healing, less pain, early ambulation, and better cosmetic outcomes. However, they can be time-consuming and technically demanding. Mattress sutures, particularly the far-far-near-near variant, offer strong tissue approximation, wound eversion, and dead space closure but may cause tissue necrosis if overtightened and are associated with visible stitch marks.[9,10] While silk and nylon are traditionally used, their higher tissue reactivity may compromise healing. Despite the variety of techniques and materials, there is no consensus on the ideal method for skin closure. To address this gap, the present study compares subcuticular closure using polyglecaprone with a three-point mattress technique using polypropylene to evaluate wound healing, complication rates, and patient satisfaction.

MATERIAL AND METHODS:

A prospective randomized trial was conducted in the Department of Obstetrics and Gynaecology at Dr. Rajendra Prasad Government Medical College, Kangra at Tanda, beginning in December 2019, after obtaining approval from the Institutional Scientific, Protocol Review Committee and the Institutional Ethics Committee (IEC No: IEC/176/2019). The study included 112 women undergoing caesarean section or laparotomy through a low transverse abdominal incision who fulfilled the inclusion criteria and gave informed written consent. Women with a history of previous scar, body mass index >30 kg/m², uncontrolled diabetes mellitus, malignancy, deranged coagulation profiles, PROM, preexisting febrile illness, immunological disorders, long-term steroid use, or skin infections were excluded. The sample size was calculated assuming a 94% rate of better wound condition in the subcuticular group versus 75% in the mattress suture group, with 80% power and 5% level of significance, resulting in 56 participants per group. Randomization was performed using a computer-generated table with a 1:1 allocation ratio. Group I included women who underwent skin closure using a subcuticular technique with Polyglecaprone 3-0, and approximation of the subcutaneous fat layer using plain catgut 2-0. Group II consisted of women whose skin closure was done using three mattress sutures (far-far-near-near technique) with Polypropylene 3-0. Detailed demographic, obstetric, medical, and surgical data were collected preoperatively. The time taken for skin closure was recorded intraoperatively using a stopwatch, with the duration in the subcuticular group including fat layer approximation. Postoperative assessments were conducted at 48 hours and on the fifth day post-surgery. Parameters recorded included postoperative pain (measured using the Numerical Rating Scale), wound condition (erythema, swelling, oozing, infection, hematoma, seroma, pus discharge, fever, edge approximation, and induration), and complications such as wound gaping, sepsis, or dehiscence. Suture removal was done on the fifth postoperative day. At six

weeks, scar cosmesis and healing were evaluated using the Observer Scar Assessment Scale (OSAS), which assessed vascularity, pigmentation, thickness, pliability, and relief. All data were documented in predesigned proformas, and statistical analysis was carried out using Epi Info software. Student's t-test, Chi-square test, and Fisher's exact test were used as appropriate for comparing continuous and categorical variables, with a p-value <0.05 considered statistically significant. Ethical principles as outlined in the ICMR guidelines (2006) and the Declaration of Helsinki (modified 2000) were strictly adhered to throughout the study.

RESULTS:

The demographic profile of the study population (N=112) was comparable across both groups, with the majority of women aged between 21–30 years (83.9%), and a similar mean age observed in Group I (28 ± 7.20 years) and Group II (27 ± 6.34 years), showing no significant difference (p = 0.465). Most participants were from rural backgrounds (91.1% in Group I and 96.4% in Group II), and the socio-economic status distribution showed a predominance of lower middle-class individuals, though the difference between groups approached statistical significance (p = 0.040). BMI and parity status were similarly distributed, with over 90% of women in both groups having normal BMI and a majority being primigravida. Most participants underwent emergency lower segment caesarean section (LSCS), with a small number undergoing elective procedures or gynecological surgeries. None of these baseline variables showed statistically significant differences between the two groups, indicating good comparability for subsequent outcome assessments. (Table 1)

A comparison of postoperative outcomes between the two groups revealed significant differences across several parameters. Closure time was significantly shorter in Group II, with 87.5% of cases completed in under 5 minutes, compared to none in Group I (p < 0.001). Group II also experienced significantly less postoperative pain, both in terms of mean VAS score (3.80 ± 0.80 vs. 5.45 ± 0.85) and pain intensity distribution, with a higher proportion reporting mild pain (p < 0.001). Assessment at 48 hours and day 5 post-surgery showed comparable wound complications and fever rates between the groups, with no statistically significant differences. Although a higher proportion in Group II stayed beyond 5 days, this was not statistically significant (p = 0.088). The Overall Surgical Assessment Score (OSAS) was significantly better in Group II (mean 10.79 ± 2.16 vs. 7.89 ± 1.55, p < 0.001), and cosmetic outcomes were markedly superior in Group I, where 89.3% of women had an excellent rating compared to only 1.8% in Group II (p < 0.001). These findings highlight faster closure, less pain, and better perceived surgical outcomes in Group II, while cosmetic results favored Group I. (Table 2)

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population (N = 112)

Parameter	Group I (n = 56)	Group II (n = 56)	P Value	Significance
Age Group (years)				
<20	0 (0.0%)	0 (0.0%)	0.465	NS
21–30	47 (83.9%)	47 (83.9%)		
31–40	8 (14.3%)	8 (14.3%)		
>40	1 (1.79%)	1 (1.79%)		
Mean Age ± SD (years)	28 ± 7.20	27 ± 6.34		
Residence				
Rural	51 (91.1%)	54 (96.4%)	0.438	NS
Urban	5 (8.9%)	2 (3.6%)		
Socio-economic Status				
Upper class	0 (0%)	0 (0%)	0.040	NS
Upper middle class	7 (12.5%)	14 (25%)		
Lower middle class	45 (80.4%)	42 (75%)		
Lower class	4 (7.1%)	0 (0%)		
BMI (kg/m²)				
18.0–24.9	52 (92.86%)	54 (96.43%)	0.675	NS
25.0–29.9	4 (7.14%)	2 (3.57%)		
≥30	0 (0%)	0 (0%)		
Parity Status				
Primigravida	39 (69.6%)	35 (62.5%)	0.574	NS
Multigravida	16 (28.6%)	18 (32.1%)		
Para 1–4	1 (1.8%)	3 (5.4%)		
Surgical Procedure				
Emergency LSCS	55 (98.2%)	50 (89.3%)	0.129	NS
Elective LSCS	1 (1.8%)	4 (7.1%)		
Abdominal hysterectomy	0 (0%)	1 (1.8%)		
Exploratory laparotomy	0 (0%)	1 (1.8%)		

Table 2. Postoperative Outcomes Between Group I and Group II (N = 112)

Parameter	Group I (n = 56)	Group II (n = 56)	P Value	Significance
Time Taken for Closure (minutes)				
<5 Minutes	0 (0%)	49 (87.5%)	<0.001	Highly significant
5–10 Minutes	56 (100%)	7 (12.5%)		
Postoperative Pain (VAS Score)				
Mean ± SD	5.45 ± 0.85	3.80 ± 0.80	<0.001	Highly significant
Median	5	4		
Range	3 – 7	3 – 6		
Pain Intensity				
Mild	1 (1.79%)	22 (39.2%)	<0.001	Highly significant
Moderate	50 (89.2%)	34 (60.7%)		
Severe	5 (8.9%)	0 (0%)		
Assessment at 48 Hours Post-Surgery				
Fever	12 (21.4%)	16 (28.6%)	0.429	NS
Erythema only	6 (10.7%)	4 (7.14%)	0.740	NS
Swelling/Induration	8 (14.2%)	6 (10.7%)	0.082	NS
Seroma	4 (7.14%)	3 (5.3%)	1.000	NS
No wound complication	42 (75%)	46 (82%)		
Assessment at 5th Day Post-Surgery				
Fever	10 (17.8%)	9 (16.7%)	1.000	NS
Wound complications	None reported	None reported		
Hospital Stay Duration				
5 Days	45 (80.4%)	37 (66.1%)	0.088	NS
>5 Days	11 (19.6%)	19 (33.9%)		
Overall Surgical Assessment Score (OSAS)				
Mean ± SD	7.89 ± 1.55	10.79 ± 2.16	<0.001	Highly significant
Range	5 – 11	6 – 16		
Cosmetic Outcome				
Excellent	50 (89.3%)	1 (1.8%)	<0.001	Highly significant
Good	6 (10.7%)	50 (89.3%)		
Poor	0 (0%)	5 (8.9%)		

DISCUSSION:

In the present study, the majority of women in both groups belonged to the 21–30 years age group. Specifically, 83.9% were in this age group, while 14.3% were between 31–40 years. These findings are consistent with the study by Shwetha et al[11] (2016), where 95% of women were aged 21–30 years and only 5% were aged 31–40 years. The slight variation can be attributed to differences in the study population: while Shwetha B.R. et al. included only women undergoing lower

segment cesarean section (LSCS), our study included both LSCS and gynecological laparotomy cases, thereby capturing a broader age distribution.The mean age in our study was comparable between groups—28 ± 7.20 years in Group I and 27 ± 6.34 years in Group II. Similar age distribution was reported by Ibrahim et al[12] (2014), with mean ages of 29.2 ± 3.6 years in the subcuticular group and 30.2 ± 6.0 years in the mattress group. Likewise, Dasanayake et al[13] (2020) reported that the majority of women in both subcuticular and mattress groups were aged between 26–35 years (69% and 67.5%, respectively), with fewer women <25 or >35 years of age.This difference with our study may again be attributed to their exclusive inclusion of LSCS cases, while we included both obstetric and gynecological surgeries.Regarding BMI, most participants in our study had a normal BMI (18.5–24.9 kg/m²), with 92.6% in Group I and 96.43% in Group II. In contrast, Dasanayake et al[13]reported normal BMI in only 42% of subcuticular and 44% of mattress group patients, with a higher proportion having BMI >30 kg/m², which was an exclusion criterion in our study. Vasudheva et al[14] (2016) reported normal BMI in 66% of subcuticular and only 44% in mattress group participants, with 40% of the mattress group being obese. These differences highlight the impact of differing inclusion/exclusion criteria across studies.In our study, the time taken for skin closure was significantly longer in the subcuticular group (Group I), with 100% of closures taking 5–10 minutes, whereas 87.5% in the mattress group (Group II) were completed within 5 minutes ($p < 0.001$). This finding aligns with Joshi et al[18] (2016), who reported longer closure times for subcuticular techniques. However, their reported closure times were longer overall, with 96% of subcuticular closures taking 10–15 minutes. Conversely, Ibrahim et al[12] reported faster closure with subcuticular sutures than with interrupted sutures, possibly due to differences in suture techniques—in our study, the mattress group used only three interrupted sutures.Pain assessment using the NRS score revealed significantly higher postoperative pain in the subcuticular group (mean NRS 5.45 ± 0.85) compared to the mattress group (3.8 ± 0.80; $p = 0.001$). Joshi et al[18]similarly reported higher pain scores in the subcuticular group. In our study, 89.2% of women in Group I had moderate pain and 8.9% had severe pain, while in Group II, only 60.7% had moderate pain and none reported severe pain. However, Vasudheva et al[14](2016) and Dasanayake et al[13]found the opposite, with higher pain scores in the mattress group. The discrepancy could stem from differences in the number and technique of interrupted sutures and type of suture materials used.Wound complications at 48 hours postoperatively were not significantly different between groups. In Group I, 75% had no complications, while 82% in Group II were complication-free. Minor complications (erythema, swelling, seroma) were observed, but there were no cases of hematoma, oozing, or pus discharge. Other studies, such as by Dasanayake et al[13]and Shwetha et al[11]reported higher wound complication rates in the mattress group. A key factor could be the suture material used—our study used Polypropylene for mattress sutures, while others used Polyamide, which may be associated with a higher incidence of complications.By the fifth postoperative day, no complications were observed in either group. In contrast, Joshi et al[18]reported more wound induration and discharge in the mattress group, though the difference was statistically insignificant. Some studies assessed wound outcomes on the seventh postoperative day and noted more complications in the mattress group, which again could be attributed to different suture materials and surgical techniques.Scar cosmesis was assessed at 6 weeks using the OSAS scale. Group I (subcuticular) had significantly better outcomes (mean OSAS 7.89 ± 1.55) compared to Group II (mattress group; mean 10.79 ± 2.76), with $p < 0.001$. 90% of women in Group I had excellent scars, and none had poor scars, while in Group II, only 1% had excellent scars and 8.9% had poor scars. This finding is consistent with Shwetha et al,[11] Choudhary et al[16] (2017), and Mallika et al[17] (2019), all of whom reported superior cosmetic outcomes with subcuticular closure.However, Joshi et al[18]reported better cosmesis with mattress sutures using Polyamide, which contrasts with our findings. Again, such differences can be attributed to varying techniques, suture materials, and assessment scales.The major strength of this study lies in its prospective design and standardized assessment at multiple postoperative intervals, ensuring consistent and reliable data collection. The inclusion of both obstetric and gynecological surgeries enhances the generalizability of findings. Additionally, the use of the OSAS scale for objective scar assessment and exclusion of confounding factors like BMI >30 kg/m² and diabetes strengthens internal validity. However, limitations include a relatively small sample size and short follow-up duration for scar evaluation. The study also did not assess long-term cosmetic outcomes beyond six weeks or patient satisfaction scores, which could further validate the aesthetic results.

CONCLUSION:

This study demonstrated that while the subcuticular technique required more time for skin closure and was associated with slightly more postoperative pain, it resulted in significantly better scar cosmesis compared to the mattress technique. Wound complication rates were comparable between both groups, with no significant differences noted at 48 hours or on the 5th postoperative day.The findings suggest that the subcuticular technique, despite its longer closure time, offers superior aesthetic outcomes, making it a preferred method in patients where scar appearance is a priority.

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