



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

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ABSTRACT

Introduction: The skin act as barrier between internal structures and external environment and is susceptible to injury, either through accidental or planned surgical incision¹. Cutaneous wound healing is a necessary physiological process consisting of the combined action of many cell strains and their regenerations². Wound closure techniques have evolved from early development in suturing materials to advanced resources that include staples, tapes and adhesive compounds³. Suturing, which is a method of wound closure is thousands year old⁴. Various techniques of wound closure are simple interrupted, mattress, continuous, subcuticular and intradermal. A subcuticular stitch in a Pfannenstiel incision runs along the natural skin lines hence improves and hasten wound healing, it allows early ambulation and fasten recovery. Mattress sutures were outdated for years mostly due to its cosmetic appearance but its resurgence for skin closure is for reducing the cost of therapy and time in tertiary referral centre, indirectly in periphery without affecting the quality of treatment. As the disadvantage of mattress suture technique is that it has high propensity to dig into skin and cause prominent stitch marks therefore in order to this the number of sutures applied has been reduced to three mattress suture in our study. In view of prevailing scenario regarding wound closure, techniques and material used no clear preference of suture material is known therefore present study is planned to compare three mattress and subcuticular techniques of closure and to compare the difference in rate of complications among the two suture material and technique. **Aim And Objectives:** The aim of this study was to compare the subcuticular suture (Polyglecaprone 3-0) with three mattress suture (3-0 polypropylene) for skin closure of low transverse incision in obstetrics and gynecological surgeries. **Materials and method:** A prospective randomized trial was conducted in the Department of Obstetrics and Gynecology, Dr. Rajendra Prasad Government Medical College, Kangra at Tanda from December 2019 onward on 112 women undergoing Caesarean section/Laparotomy by low transverse incision after getting approval from the Scientific, Protocol Review Committee and Ethical Committee of the institution. **Group I:** Women in which skin closure was done by subcuticular technique using Polyglecaprone 3-0. Approximation of fat layer was done by using plain catgut 2-0. **Group II:** Women in which skin closure was done by three mattress, that is, one at each corner and one in middle using Polypropylene 3-0 by far-far-near-near technique. In the postoperative period, 48 hours after surgery the patient was assessed for pain by NRS scale and wound condition by looking for erythema, swelling, oozing, infection, haematoma, seroma, pus discharge and fever. On 5th day in Group II (Three mattress suture technique) sutures were removed and in both the groups wound were assessed again for erythema, swelling, oozing, infection, haematoma, seroma, pus discharge and fever. After 6 weeks patient was again assessed for scar condition according to OSAS scale. **Results:** After 6 weeks patient was again assessed for scar condition according to OSAS scale. The two groups were comparable with regards to demographic profile. There was no significant difference in age, residence, socioeconomic status, parity, BMI between the two groups. There was significant difference in time of skin closure as women in group I (Subcuticular group) took longer time for closure of skin as compared to group II. This difference was statistically highly significant (P value <0.001). At 48 hours post operative pain score was calculated using NRS scale in both the groups. Mean pain score was more in group I (5.45 + 0.85) as compared to group II (3.80 + 0.80). Pain was more in women in Group I as compared to Group II. This difference was statistically highly significant (P value <0.001). At 48 hours post surgery skin wound was also assessed for wound complications like erythema, swelling/induration, seroma, haematoma, pus discharge and oozing. Most of the women in both groups i.e. 42 women in Group II (75%) and 46 women in Group II (82%) had no wound complications. It was observed that local wound complications were slightly more in group I (subcuticular group) as compared to group II (mattress group) but the difference was not statistically significant (P value >0.05). The expenditure of skin closure in group I was approximately double as compared to group II as the cost of skin closure in group I included skin incision closure with Polyglecaprone 3-0 along with subcutaneous fat closure with Plain catgut 2-0 and group II included only skin closure with Polypropylene 3-0. **Conclusion:** It was concluded from the present study that skin closure with Subcuticular group versus three mattress suture technique had similar outcomes with respect to wound complications at 48 hours postoperative and 5th day post operative. However skin closure was quick, cost effective with less postoperative pain in three mattress suture technique using Polypropylene 3-0 as compared to subcuticular technique. However wound closure by Subcuticular technique using Polyglecaprone 3-0 yields a cosmetically better scar.

KEYWORDS :

INTRODUCTION

The skin act as barrier between internal structures and external environment and is susceptible to injury, either through accidental or planned surgical incision¹. In understanding repair and regeneration, it is essential to be familiar with the anatomic and physiologic functions of normal skin. Cutaneous wound healing is a necessary physiological process consisting of the combined action of many cell strains and their regenerations². Wound healing in

a non contaminated surgical wound with edges in apposition takes place by migration of new epithelial skin cells from the edges of the incision. Basic skin union can be seen by 48 hours post-surgery, whereas complete union is visible by seventh or eighth postoperative day.

The exudative, proliferative and extracellular matrix remodeling phases are sequential events that occur through the integration of dynamic processes involving soluble

mediators, blood cells, and parenchymal cells⁵. Exudative phenomena that take place after injury contribute to the development of tissue edema. The proliferative stage seeks to reduce the area of tissue injury by contracting myofibroblasts and fibroplasia. At this stage, angiogenesis and reepithelialization processes can still be observed.

The postoperative appearance of a beautifully designed closure or flap can be compromised if an incorrect suture technique is chosen or if the execution is poor⁶. Wound closure techniques have evolved significantly and multiple techniques can be used for wound closure. Wound closure techniques have evolved from early development in suturing materials to advanced resources that include staples, tapes and adhesive compounds³. The earliest reports of suture date back to 3000BC in ancient Egypt. Suturing, which is a method of wound closure is thousands year old⁴. In the present state, as surgery increases in complexity, and heightened public awareness of scar cosmesis, skin healing need to be optimized to ensure overall success of surgery. Although suture materials and technique have changed. The goals of skin suturing remains the same: closing dead space, supporting wounds until healing increases their tensile strength, approximating skin edges for an aesthetically pleasing and functional result and minimizing the risk of bleeding and infection⁷. Suture materials can be: absorbable and non absorbable which can be broadly classified as naturally occurring and synthetic and they can be further classified as monofilament or multifilament (braided), dyed or undyed, coated or uncoated⁸. Synthetic – Polypropylene (Prolene), Polyamide (Nylon), Polyester (Dacron).

A good suture material is known as one which causes least foreign body reaction and inflammation. Generally, the surgeon selects the smallest suture that adequately holds the healing wound edges; the tensile strength of the suture should never exceed the tensile strength of the tissue. Several parameters can be used to describe the physical characteristics of sutures which are known as tensile strength, breaking strength, elasticity, capillarity and memory. Characteristics of ideal suture include good handling characteristics, not induce significant tissue reaction, allow secure knot, have adequate tensile strength, be sterile, be non allergic, be cheap.

Polypropylene (prolene) was first developed in 1970 as a first synthetic non absorbable suture which is made of isotactic crystalline stereoisomer of polypropylene with few unsaturated bonds⁹. It is known to easily pass through tissues and induce minimal host response⁷. It doesn't adhere to tissue and can be used as an intra dermal suture. It has good plasticity and it expands with tissue swelling to accommodate the wound. High memory, poor knot security and lack of elasticity are few disadvantages with prolene. Polyglecaprone is a synthetic absorbable suture. It is generally used for soft tissue approximation and ligation. It has less tendency to exit skin after it breaks down and has low tissue reactivity, maintains high tensile strength however use is inappropriate in malnourished, or debilitated patients or in patients suffering from conditions that may delay wound healing. Recent evidence suggests that polyglecaprone and polypropylene sutures are associated with lower risk of wound complications.

Various techniques of wound closure are simple interrupted, mattress, continuous, subcuticular and intradermal. A subcuticular stitch in a Pfannenstiel incision runs along the natural skin lines hence improves and hasten wound healing, it allows early ambulation and faster recovery. Mattress sutures were outdated for years mostly due to its cosmetic appearance but its resurgence for skin closure is for reducing the cost of therapy and time in tertiary referral centre,

indirectly in periphery without affecting the quality of treatment. Interrupted mattress sutures involves piercing the skin at four points at the same level for a single stitch, which gathers a good amount of subcuticular tissue and fat in a tight stitch and leaves gaps between the stitches to allow drainage of blood and serosanguinous discharge of fat necrosis¹⁰.

As the disadvantage of mattress suture technique is that it has high propensity to dig into skin and cause prominent stitch marks therefore in order to this the number of sutures applied has been reduced to three mattress suture in our study. As postsurgical wound complications often result in unplanned hospital and emergency room visits, as well as readmissions, there is a need to know the adequate suturing technique. But still there is no evidence in regard to best suture technique and material in point of view of wound healing and patient satisfaction. In view of prevailing scenario regarding wound closure, techniques and material used no clear preference of suture material is known therefore present study is planned to compare three mattress and subcuticular techniques of closure and to compare the difference in rate of complications among the two suture material and technique

AIM AND OBJECTIVES

The aim of this study was to compare the subcuticular suture (Polyglecaprone 3-0) with three mattress suture (3-0 polypropylene) for skin closure of low transverse incision in obstetrics and gynecological surgeries. The primary outcome was to compare the wound condition on fifth postoperative day. And secondary outcome were to find the operative time for skin closure including subcutaneous fat closure in subcuticular technique, post operative pain on NRS scale, wound complication at 48hrs postoperatively and the scar condition at 6th week.

MATERIALS AND METHOD

A prospective randomized trial was conducted in the Department of Obstetrics and Gynecology, Dr. Rajendra Prasad Government Medical College, Kangra at Tanda from December 2019 onward on 112 women undergoing Caesarean section/Laparotomy by low transverse incision after getting approval from the Scientific, Protocol Review Committee and Ethical Committee of the institution.

Women who fulfilled the inclusion criteria were explained in detail about the study and those who were willing to participate were enrolled for the study and informed written consent was taken. Then they were randomly allocated according to the computer generated randomized system. Inclusion criteria had pregnant women undergoing emergency/elective lscs and women undergoing laparotomy for gynecological conditions. Exclusion criteria included Previous scar, Body mass index >30kg/m², Uncontrolled diabetes mellitus, Cancer of any type, Deranged coagulation disorders, PROM, Preexisting febrile illness.

Sample size calculated with the rate of better wound condition as assumed 94% in Subcuticular group and 75% in mattress group at 80% power and 5% level of significance with enrollment ratio 1:1.49. Total sample size calculated was 112 (56+56). All eligible women undergoing caesarean section/Laparotomy by transverse incision who were willing to participate were randomized in two groups through computer generated randomization table.

In group I: Women in which skin closure was done by subcuticular technique using Polyglecaprone 3-0.

In group II: Women in which skin closure was done by 3 mattress suture technique using Polypropylene 3-0.

At the time of admission demographic profile of the women was noted. A detailed history was taken and thorough clinical

examination was performed followed by routine and special investigations with reference to points as per proforma. Women were managed as per treatment protocol of the hospital. Indications and details of operative technique were noted in case of caesarean section/ laparotomy as per proforma. Details of skin closure including whether subcuticular suture with Polyglecaprone 3-0 along with approximation of subcutaneous fat layer with Plain catgut 2-0 or three mattress suture using Polypropylene 3-0 was noted. During surgery time interval required for closure of incision in both groups was noted through stopwatch. In case of subcuticular technique time taken included both the time taken for fat approximation plus time taken for subcutaneous stitch application.

In the postoperative period, 48 hours after surgery the patient was assessed for pain by NRS scale and wound condition by looking for erythema, swelling, oozing, infection, haematoma, seroma, pus discharge and fever. On 5th day in Group II (Three mattress suture technique) sutures were removed and in both the groups wound was assessed again for erythema, swelling, oozing, infection, haematoma, seroma, pus discharge and fever. After 6 weeks patient was again assessed for scar condition according to OSAS scale (Observer scar assessment scale).

OBSERVATIONS

In both the groups maximum women i.e. 94 (83.9%) belonged to age group between 21-30 years. The average age in group I was 28 + 7.20 and in group 2 was 27 + 6.34 years. There was no significant difference in age distribution between group I and group II patients (p value > 0.05).

There was no significant difference between the two groups in terms of BMI (Kg/m²). Fifty two patients in group I and fifty four patients in group II had BMI between 18-24.9 kg/m² whereas only four patients in group I and 2 patients in group II had BMI between 25-29.9 kg/m². In our study time of closure was less in group II than group I and none of the patients in both groups required time > 10 minutes. In most of the women in the Group II i.e. 49 women (87.5%) time taken for skin closure was < 5 minutes, however in the Group I all the 56 women (100%) the time taken for closure was between 5-10 minutes. There was a significant difference between both groups in terms of time taken for closure (p value 0.001). It was observed that none of the women in Group I (0%) had time of closure < 5 minutes, rest of 56 women (100%) had time of closure between 5-10 minutes whereas in group II 49 patients had time taken < 5 minutes and only 7 patients had time taken for closure 5-10 minutes. None of the women in both groups had time taken for skin closure as > 10 minutes.

Table 1

TIME TAKEN	Group1 (n=56)	Group2 (=56)	P value	Significance
Time taken(minutes)	No of cases	No of cases		
<5 Minutes	00	49	0.001	Highly significant
5-10 Minutes	56	07		
10-15 Minutes	-	-		

So it was observed that the time taken for skin closure was significantly less in group II (Three mattress suture) as compared to group I (Subcuticular group). There was statistically significant difference on basis of time of closure (p value - 0.001).

In our study women were assessed for pain after 48 hours of surgery by NRS scale. There was a significant difference between the two groups in terms of mean NRS pain score (p < 0.001). The median score pain being highest in the Group I. Table 2 shows the distribution of pain.

Table 2

Pain	Group1 (n=56)	Group2 (n=56)	P value	Significance
Mean +SD	5.45 +0.85	3.80 +0.80	<0.001	Highly significant
Median	5	4	<0.001	Highly significant
Range	3-7	3-6		

It was observed that mean NRS score for pain was significantly lower in group II 3.8 + 0.80 as compared to group I 5.45 + 0.85 (p value < 0.001).

In the present study on examination of the wound at 48 hours post operatively, local wound complications were slightly more in subcuticular group as compared to mattress group but the difference was not statistically significant (P value > 0.05). There were no wound complications in Group I in 42 cases (75%) whereas 46 cases (82%) in Group II had no wound complications; however it was not statistically significant.

In our study stitches were removed of group II on 5th post operative day i.e. non absorbable sutures Polypropylene 3-0 and assessment of skin wound site was done. None of the patients in both group had erythema, swelling/ in duration, pus discharge, seroma, haematoma or oozing. The scar was assessed at 6 weeks post surgery by OSAS. This scale includes 5 points: vascularity, thickness, pigmentation, pliability and relief. This scale ranges from 0-50, 0 being the best scar and 50 being the worst scar. The mean OSAS in the group I was 7.89 + 1.55, and the mean OSAS in the group II was 10.79 + 2.16. The scar was better in group I as compared to group II. Table 3 depicts the OSAS distribution in both groups.

Table 3

OSAS	Group 1 (n=56)	Group 2 (n=56)	P value	Significance
Mean+SD	7.89+1.55	10.79+2.16	<0.001	Highly significant
Range	5 - 11	6 - 16		

OSAS was better in group I as compared to group II and the scar became poorer with increase in OSAS score.

In our study in women in group I (Subcuticular group) the cosmesis of scar was better as compared to group II (mattress group) and the difference was statistically highly significant (P value < 0.001). Table 4 depicts the distribution of women on basis of cosmesis in the two groups.

Table 4

COSMESIS	Group I No of cases	Group I %	Group II No of cases	Group II %	P value	Significance
Excellent	50	89.3%	01	1.8%	<0.001	Highly significant
Good	06	10.7%	50	89.3%		
Poor	00	0%	05	8.9%		

DISCUSSION

Maximum women in both groups belonged between 21-30 years and it was comparable to various studies. In our study study 83.9% belonged to age group between 21-30 years and 14.3% belonged to 31-40 years whereas study conducted by Shwetha B R et al (2016)¹¹ 95% of women belonged between 21-30 years as compared to only 5% in 31-40 years age group. This difference in Shwetha B R et al was due to the fact that in their study only LSCS was performed whereas in our study LSCS along with gynecological surgeries were also performed. In the present study BMI of the women in both the groups was comparable i.e. 92.6% in group I and 96.43% in group II had normal BMI (18.5 kg/m²-24.9 kg/m²), whereas in a study conducted by Dasanayake DLW et al (2020)¹² BMI of the women in both groups were though comparable in their study but only 42% of women in subcuticular group and 44% in

mattress group were having BMI within normal range. In a study conducted by Vasudheva A et al(2016)13, in subcuticular group 66% of women had normal BMI as compared to only 44% in mattress group. Similar to our study Joshi D et al (2016)14 also found that time taken for closure was significantly less in mattress group as compared to subcuticular group. However the time taken in both the groups in their study was more as compared to our study. In their study in 96% of women the time of closure in subcuticular group was between 10-15 minutes whereas all the women (100%) in our study the skin closure was within 10 minutes. In their study in mattress group only 34% had the skin closure within 5 minutes as compared to 87.5% in our study. The difference in the skin closure time range can be explained by the difference in exclusion criteria. In contrast to our study conducted by Ibrahim M et al (2014)15 in their study on subcuticular technique versus interrupted technique in Cesarean section found that the skin closure time was significantly (p value<0.001) more in interrupted group (8.6+2.3 minutes) as compared to subcuticular group (5.7+2.2 minutes). This may be because in our study mattress group consisted of only three interrupted sutures only. Table 5 shows mean time of closure in various studies.

Table 5

	Time taken for closure(minutes)	Group 1 N (%)	Group 2 N (%)
Joshi D et al (2016) (n=100)	0-5	00(0%)	17(34%)
	5-10	02(4%)	33(66%)
	10-15	48(96%)	00(0%)
Present study (n=112)	0-5	00(0.0%)	49(87.5%)
	5-10	56(100%)	7(12.5%)

In contrast to our study Vasudheva A et al (2016) found that the mean score of pain was less i.e. 3.8 in subcuticular group as compared to 6.4 in mattress group with help of VAS score and concluded that postoperative pain was significantly more in mattress group as compared to subcuticular group (p value=0.001). Table 6 shows mean post operative pain score in both studies.

Table 6

	Subcuticular group(Mean + SD)	Mattress group (Mean + SD)	P value
Vasudheva A et al(2016) (n=336)	3.8	6.4	<0.001
Present study[NRS score] (n=112)	5.45 + 0.85	3.8+ 0.80	<0.001

In the present study 75% of women in Group I and 82% in Group II had no wound complication when observed at 48 hours post operatively. At 48 hours post surgery three complications observed were erythema, swelling/induration and seroma whereas none of the women had haematoma, oozing or pus discharge in both the group of women however there was no significant difference in the assessment at 48 hours post surgery (P value>0.05).

In our study though the wound complications at 48 hours were slightly more in subcuticular group as compared to mattress group but the difference was not significant. However in contrast to our study in various studies by Dasanayake DLW et al (2020), Shwetha BR et al (2016), Chaudhary A et al(2017)16 and Vaudheva A et al(2016) the wound complications were more in mattress group as compared to subcuticular group. In Dasanayake DLW et al (2020) wound complications were more in mattress group (8%) in which Polyamides 0 was used and were less in subcuticular group using polyglecaprone 3-0 (3%) and around 90% women had no complications in both groups. Shwetha B R et al (2016) also found that complication

were slightly more in mattress group using Polyamide 2-0 than subcuticular group using Polyglactin 2-0. Around 90% women in group I and 60% women in group II had no complications. Similarly in other studies like Vasudheva A et al, Chaudhary A et al, it was found that complications were more in mattress group using Polyamide sutures.

This difference may be because of the reason that different suture material was used in mattress group i.e. Polyamide was used in these studies and we used Polypropylene. Also different technique was used in our study i.e. only three mattress suture technique in our study. In our study it was found that 2nd postoperative wound assessment was done at 5th day and both groups had no complications i.e. erythema, swelling/induration, pus discharge, haematoma, seroma and oozing. A study was conducted by Joshi D et al (2016) in which subcuticular technique was used in one group using Polyglecaprone 3-0 and 3 mattress technique using polyamide 3-0 in other group and found that wound in duration and discharge was more in mattress group (16%) and less (12%) in subcuticular group, however the difference was not statistically significant to prove which were better. The difference from our study can be explained by the fact that we used Polypropylene 3-0 in mattress technique and the difference in exclusion criteria.

In our study scar was assessed at 6 weeks post surgery with OSAS scale which included five parameters namely vascularization, pigmentation, thickness, relief and pliability with the score 0 being the best scar and score 50 being the worst scar. In our study OSAS was significantly better in subcuticular group than mattress group as it was 7.89+1.55 in subcuticular group and 10.79+ 2.76 in mattress group. This was similar to study conducted by Vasudheva A et al (2016) in which mean score was better in subcuticular group (27.3) as compared to mattress group in which it was 32.7, though difference was not statistically significant for OSAS in the study.

Similar to our study, in the study conducted by Shwetha BR et al cosmetic appearance of scar was better in subcuticular group as compared to mattress group as shown in the table no 8 above. Good to excellent scar was in 80% of women in subcuticular group as compared to 64% in mattress group. Also in the studies by Choudhary A et al and Malika S et al17 the cosmetic appearance was better in subcuticular group (92%) each than mattress group (48%) each. In contrast Joshi D et al in their study found that scar cosmesis was better in in mattress group with Polyamide 3-0 than subcuticular group however the difference was not statistically significant. The reason for difference may be due to difference in suture material applied in mattress group and difference in exclusion criteria's. Table no 7 shows cosmesis at 6 weeks post surgery in various studies.

Table 7

	COSMESIS	Subcuticular group N (%)	Mattress group N (%)
Joshi D et al(2016) (n=100)	Excellent	14(35%)	19(44.1%)
	Good	14(35%)	14(32.5%)
	Fair	12(30%)	10(23.25%)
Shwetha BR et al(2016) (n=100)	Excellent	16(32%)	04(8%)
	Good	24(48%)	28(56%)
	Fair	10(20%)	18(36%)
Present study (n=112)	Excellent	50(89.3%)	01(1.8%)
	Good	06(10.7%)	50(89.3%)
	Poor	00(0%)	05(8.9%)

CONCLUSION

In our study done on 112 women on comparing the two techniques of skin closure i.e. Subcuticular technique using Polyglecaprone 3-0 versus three mattress technique using Polypropylene 3-0, the time taken for skin closure was

significantly more in Subcuticular technique as compared to Three mattress technique. Also the postoperative pain at 48 hours was also more in Subcuticular technique group. However there was no significant difference in local wound complications like erythema, swelling/induration, seroma, haematoma, pus discharge and oozing at 48 hours and 5th day postoperatively between the two groups. However on comparing two groups scar cosmesis was significantly better at 6 weeks in Subcuticular as compared to three mattress group. Therefore it was concluded from the present study that skin closure with Subcuticular group versus three mattress suture technique had similar outcomes with respect to wound complications at 48 hours postoperative and 5th day postoperative. However skin closure was quick, cost effective with less postoperative pain in three mattress suture technique using Polypropylene 3-0 as compared to subcuticular technique. However wound closure by Subcuticular technique using Polyglecaprone 3-0 yields a cosmetically better scar.

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