

## Subcuticular versus mattress skin closure techniques following OBGYN laparotomies by low transverse incision.

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**Abstract: Objective:** To compare two widely used skin closure techniques – intermittent mattress and continuous subcuticular suturing, for low transverse laparotomy incisions among obstetrics/gynaecological surgeries including caesarean section, myomectomy, hysterectomy etc. **Methodology:** Prospective observational study of 336 such incisions; 247 mattress and 87 subcuticular. Mattress group had a higher incidence of obesity and previous abdominal surgeries. Scars were assessed between three to seven postoperative days as well as during their postoperative visit between 4-6 weeks. **Results:** Incidence of wound site induration/ erythema /discharge /surgical site infection were similar in both the groups. Wound dehiscence and postoperative pain Mean score in Visual analogue score were more in mattress than in subcuticular group. At 4-6 weeks, overall patient satisfaction was higher among subcuticular than among mattress group, however objective scoring by patient observer scar assessment scale was similar between the two groups. **Conclusion:** Mattress suturing leads to poorer immediate skin approximation, more pain, and poorer patient satisfaction compared to subcuticular suturing. However objective scar assessment at 6 weeks yielded similar results for two groups, despite higher prevalence of obesity and previous abdominal surgeries in the former group.

**Keywords:** laparotomy, low transverse incision, skin closure techniques, subcuticular, intermittent mattress.

### I. INTRODUCTION

Basic needs of skin closure are good tissue union; avoid poor wound healing and cosmetically acceptable scars. It is also necessary that the skin closure technique should be technically easy, acceptable, less time consuming and economical. There are many ways to close the surgical incision, for example, using sutures, staples, tissue adhesives or tapes. Skin sutures can be continuous or interrupted. Mattress sutures obliterate dead space and provide increased wound strength but disadvantages include difficulty in approximating wound edges and prominent suture marks leading to thick scars. Subcuticular skin closure is believed to give better results with wound healing and cosmetic appearance. This study was aimed to compare the two widely used skin closure techniques –mattress sutures and subcuticular sutures in low transverse laparotomy incisions for obstetrics/gynaecological surgeries.

### II. MATERIALS AND METHODS

We conducted a prospective observational study in the Department of Obstetrics and Gynaecology, Kasturba Medical College, Manipal for a period of 8 months. Women who underwent low transverse laparotomy incisions for obstetric or gynaecological indication with either mattress or subcuticular skin closure techniques were included in our study. Women with risk factors for poor wound healing like coagulopathies, chronic steroid usage were excluded from the study. Total of 336 women participated, out of which 249 had mattress skin sutures while 87 had subcuticular sutures (Fig 1). Informed consent was obtained from all the participants. The study was approved by institutional ethics committee. Wound was assessed at two stages, first stage between postoperative day 3 and 7 for variables like induration, erythema, discharge (serosanguinous/purulent), pain and surgical site infection. Pain was assessed using visual analogue scale (Fig 2). Wound was reassessed at second stage during postoperative visits between 4 and 6 postoperative weeks for cosmetic appearance of scar and patient's overall scar satisfaction. Scar was assessed using Patient Observer Scar Assessment Score [1] (Fig 3) and overall patient's scar satisfaction using scoring chart as in Fig 4. Lower scoring was better in both these assessments. Risk factors associated with poor wound healing like diabetes, obesity, anaemia, previous abdominal surgeries were individually compared between the two groups. Statistical Analysis was done using SPSS16 and applying Pearson's chi-square test for testing the correlation.

### III. RESULTS

We recruited a total of 347 women, 11 were excluded as they had history of using steroid or coagulopathies. Of the remaining 336 women, 24 were lost for follow up and 312 had complete follow up till 4-6 postoperative weeks as shown in the consort statement (Fig 1). Hence wound was assessed between postoperative day 3-7 among 336 participants and between 4-6 postoperative weeks among 312 participants as 24 women lost for follow up. Distribution of perioperative risk factors among women who had mattress sutures and subcuticular sutures is shown in Table 1. We observed higher incidence of obesity and previous abdominal surgeries among women with mattress sutures than with subcuticular sutures (31% Vs 3% and 23% Vs 7% respectively; both p value = 0.001), but incidence of anaemia and diabetes were equally distributed. Total of 249 had mattress sutures and 87 had subcuticular sutures. Between postoperative day 3 and 7 there was no significant difference between the groups with respect to variables like induration, erythema, discharge, surgical site infection. However, poor wound edge approximation (23% Vs 3.4%, p value 0.002), and postoperative pain (Mean score in Visual analogue score of 6.4 Vs 3.8, p value 0.001) were more in mattress than in subcuticular group as shown in Table 2 and Table 3. Further analysing poor wound edge approximation, we observed significant higher incidence of superficial wound dehiscence of <3 cm length, with mattress sutures (13.6% vs 4.5%, p value- 0.04). However, incidence of superficial wound dehiscence of >3cm length, was similar among the groups (5.6% vs 1.1%, p value 0.6). In mattress sutures group, 10 patients had deep wound dehiscence and 3 had burst abdomen while none in subcuticular sutures group had these complications. When wound was assessed between 4-6 postoperative weeks, overall patient satisfaction was higher among subcuticular than among mattress group as showed in Table 4 (P value-0.001), however objective scoring by Patient Observer Scar Assessment Scale was similar between the groups (mean score 32.7 among mattress and 27.3 in subcuticular group).

### IV. DISCUSSION

In our study we assessed operative wounds at two stages, first between 3-7 postoperative days and second between 4-6 postoperative weeks. Although subcuticular suture is thought to be associated with much better wound healing, objectively when we assessed the wound with variables like induration, erythema, discharge, incidence of surgical site infections, they were equally distributed among the two groups. Wound edge approximation alone was clearly poor with mattress sutures as evidenced by increased superficial wound dehiscence of <3cm length. However, this was not a significant clinical problem. It is understood that wound edge approximation during mattress suturing is highly operator dependent and can be achieved perfectly with good surgical technique. Also probably due to multiple skin and subcutaneous tissue pricks and more number of suture knots during mattress skin closure, patients experienced more pain in postoperative period. In our institution, mattress sutures were removed 7 to 8 days postoperatively while subcuticular sutures were not removed, being absorbable. Hence subcuticular sutures provide wound support for longer duration and thus contribute to better wound approximation. Those with subcuticular sutures were discharged early and some patients under mattress group remained in the hospital for suture removal, as such facilities are not available in remote areas. Mattress sutures being interrupted skin closure technique, provides better route for drainage of subcutaneous collection which is beneficial in obese women. Subcuticular sutures have better approximation of skin edges and thus contribute for scar satisfaction. Mattress sutures have difficulty in approximating wound edges and prominent suture marks leading to thick scars leading to poorer patient satisfaction comparatively. It was observed that surgeons opted mattress sutures for obese women and for those with previous abdominal surgeries which showed a selection bias, however objective scar assessment at 6 weeks yielded similar results for two groups, despite the selection bias. Across studies, subcuticular sutures were observed to have decreased wound morbidity like dehiscence, discharge and better cosmetic outcome when compared to interrupted sutures [2, 3, 4, 5, 6]. Macdeen et al observed no difference in terms of wound morbidity, pain, cosmesis and scar satisfaction [7]. Ibrahim MI et al observed that obese women with subcuticular sutures showed significantly better short-term cosmetic outcome, yet, with slightly higher risk of superficial incisional surgical site infection and significantly more postoperative pain [8]. Kobayashi et al observed that patients in the subcuticular suture group were significantly more satisfied with their wound though objective wound assessment was similar [9]. Tanaka A et al observed that patients preferred subcuticular closure technique, citing better cosmetic results, and less pain [6]. Wang H et al showed that there was no difference in postoperative pain [3]. Subcuticular suture requires more technical expertise, more training, more time, finer surgical skills, finer instruments and costlier suture material but have superior long term cosmetic outcome, better patient compliance and less hospital stay. While mattress suture is easier, needs less training, less time, less surgical skills and cheaper suture material. However, mattress suturing still remains a good choice

especially in obese women, as it allows space for drainage of subcutaneous collection, and ultimate wound healing is comparable to subcuticular technique.

**5.Figures and tables**

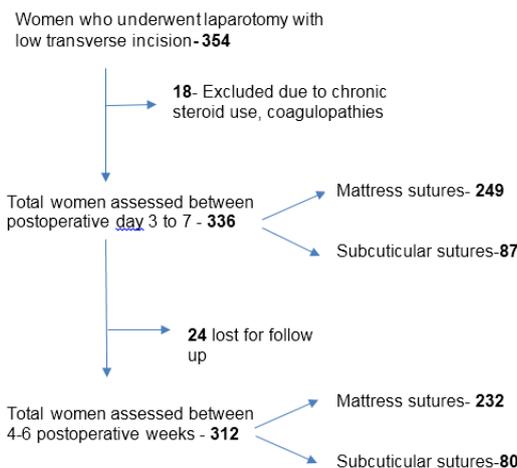


Figure 1: Consort statement

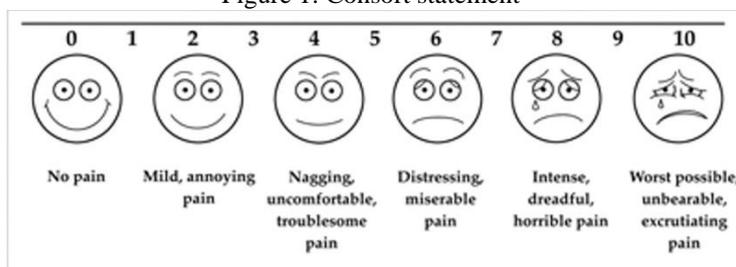


Figure 2. Visual analogue scale for pain used between postoperative day 3-7

Observer Scar Assessment Scale (OSAS)												
	Normal skin	1	2	3	4	5	6	7	8	9	10	Worst scar imaginable
Vascularization		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Pigmentation		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Thickness		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Relief		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Pliability		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Observer scar rating		-----+										
OSAS summary score:		_____ (minimum, 5; maximum, 50)										
Patient Scar Assessment Scale (PSAS)												
	No, no complaints	1	2	3	4	5	6	7	8	9	10	Yes, worst imaginable
Is the scar painful?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Is the scar itching?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	No, as normal skin	1	2	3	4	5	6	7	8	9	10	Yes, very different
Is the color of the scar different?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Is the scar more stiff?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Is the thickness of the scar different?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Is the scar irregular?		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Overall patient scar satisfaction		-----+										
PSAS total score:		_____ (minimum, 6; maximum, 60)										

Figure 3. Scoring chart- Patient Observer Scar Assessment Scale for wound assessment between 4-6 postoperative weeks [1]

Satisfaction level	Score
Very satisfied	1
Satisfied	2
Somewhat satisfied	3
Dissatisfied	4
Very dissatisfied	5

Figure 4: Scar satisfaction level at postoperative visit between 4-6 weeks

Table 1: Comparison of risk factors for poor wound healing between the groups, (N=336)

Risk factors	Mattress sutures		Subcuticular sutures		P value
	N1=249	%	N2=87	%	
Diabetes	21	8	6	7	0.9
Anaemia	36	14	11	13	0.2
Obesity					
Obese	78	31	2	3	<b>0.001</b>
Overweight	23	9	11	13	0.8
BMI<19	39	16	16	18	0.9
Previous surgeries					
One	58	23	6	7	<b>0.001</b>
More than one	22	9	0	0	<b>0.001</b>

Table 2: Wound assessment on Postoperative day 3-7, N=336

Variables	Mattress sutures		Subcuticular sutures		P value
	N1=249	%	N2=87	%	
Induration	78	31	24	27.2	0.5
Erythema	85	34	22	25.6	0.1
Discharge					
Serosanguinous	16	6.4	3	3.4	0.2
Purulent	18	7.2	6	6.8	0.3
Wound dehiscence					
Superficial <3cm	34	13.6	4	4.5	<b>0.04</b>
Superficial >3cm	14	5.6	1	1.1	0.6
Deep	8	3.2	0	0	0.4
Burst abdomen	3	1.2	0	0	0.9
Surgical site infection	18	7	4	4	0.5

Table 3: Pain (mean score as per visual analogue scale) assessment on postoperative day 3-7

	Mattress	Subcuticular	P value
Pain	6.4	3.8	<b>0.001</b>

Table 4: Scar assessment on postoperative week 4-6, total subjects-312  
(24 subjects lost for followup)

	Mattress sutures N1-232 (mean score)	Subcuticular sutures N2-80 (mean score)	P value
Scar assessment by Patient Observer Scar Assessment Scale (POSAS)	32.7	27.3	0.3
Patient's scar satisfaction	3.9	1.8	<b>0.001</b>

## V. CONCLUSION

Mattress suturing leads to poorer immediate skin approximation, more pain, longer hospital stay, and poor patient satisfaction compared to subcuticular suturing. However objective scar assessment at 6 weeks yielded similar results for two groups, despite higher prevalence of obesity and previous abdominal surgeries in the former group.

### 6.1 Limitation

It is not a randomised control study but only an observational study with an inherent selection bias as surgeons opted for mattress skin sutures for obese women and for those with previous abdominal surgeries. Also larger group of mattress suture is compared with smaller group of subcuticular suture, thus number of participants in each group being unequal.

## **6.2 Merits**

All skin closures by mattress technique is done with 2-0 Ethilon (nylon) and subcuticular technique with monocryl (poliglecaprone 25). Thus there is uniformity in suture materials used.

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