

# Impact of Methods for Uterine Incision Closure on Repeat Caesarean Section Scar of Lower Uterine Segment

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## ABSTRACT

**Objective:** To compare the effect of different suturing techniques in repeat caesarean section in terms of scar thickness, blood loss, operative time and scar dehiscence at the time of next caesarean section.

**Study Design:** A randomized double blinded trial.

**Place and Duration of Study:** Obstetrics and Gynaecology Department of Bahawal Victoria Hospital, Bahawalpur, from June 2005 to June 2010.

**Methodology:** Ninety patients undergoing repeat caesarean section were included and randomly assigned to one of the three groups. Group A underwent one layer closure; Group B underwent two layer closure while Group C underwent modified two layer closure of the uterine incision. Ultrasonographic evaluation of the scar thickness was performed at 6 weeks post operatively and longer follow-up was done in next caesarean for scar dehiscence. Frequency percentages were obtained and compared using chi-square test with significance at  $p < 0.05$

**Results:** In only 2 (6.6%) of modified two layer closure cases, it was necessary to use additional haemostatic sutures, compared with 16 (53%) of one layer closure group, and 10 (33%) of the two layer closure group. At 6 weeks, the mean scar thickness in group C ( $17.08 \pm 1.635$  mm) was significantly greater ( $p < 0.001$ ) as compared to group A ( $13.19 \pm 1.32$  mm) and group B ( $14.58 \pm 1.18$  mm). At long-term follow-up, only 1 (6%) case from group C showed the "uterine window" at the time of repeat caesarean section as compared to 3 (23%) in group A and 2 (14%) in group B.

**Conclusion:** Scar thickness was significantly increased with modified two layer closure when compared with traditional one and two layer closure of lower transverse uterine incision at the time of repeat caesarean section.

**Key words:** Uterine incision closure. Repeat caesarean section. Scar thickness. Modified two layer closure. Ultrasonography. Lower transverse uterine incision.

## INTRODUCTION

Caesarean section is one of the most commonly performed operations on the women throughout the world. Despite the additional risks over vaginal delivery, the rates of caesarean deliveries have increased dramatically in recent years from 12% in 1990 to 24% in 2008 with no improvement in outcome for the baby.<sup>1</sup> Moreover, the rate of vaginal birth after caesarean section has decreased from 28.3% in 1996 to 10.6% in 2003, leading to increase in repeat caesarean sections.<sup>2</sup> Further studies have described risks of vaginal birth after caesarean section, which may well increase the trend towards planned repeat caesarean delivery.<sup>3</sup>

Currently, a low transverse incision is the preferred method of caesarean delivery. Traditionally, closure of the uterine incision has been in two layers, although in the past decade an increasing number of obstetricians have moved to single layer closure due to advantage of shorter operative time, decreased blood loss, lower

rates of endometritis and shorter hospital stay.<sup>4,6</sup> A one layer closure involves a single continuous running or locking layer of absorbable suture. A two layer closure typically adds a fold of muscle on the upper and lower side to cover the first layer, with absorbable suture. Many studies have shown an increase in uterine scar disruption after one layer closure, while others have shown no effect.<sup>5-9</sup> The CORNIS trial, which is currently ongoing, is expected to provide useful answers relating to controversial areas of surgical techniques for caesarean section. The authors introduced a new method for closure of uterine incision at the time of repeat caesarean section, especially, because lower segment is most thinned out at that time. It consists of full thickness closure by interrupted horizontal mattress sutures in first layer followed by a continuous running suture in the second layer (Modified two layer closure).

To assess the healing of scar and the risk of uterine rupture in a subsequent pregnancy, ultrasonography is used in the evaluation of uterine scar in the third trimester<sup>10,11</sup> and the post partum period.<sup>12,13</sup> It is generally been found that, the thicker the uterine scar, the lower the rate of complications.<sup>12,14</sup> One may postulate that the thicker scar is stronger, and thus performs better than a thinner one. The question, whether the thickness of scar varies with the surgical

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technique used still requires exploration. The hypothesis was that a change in suturing technique might affect the thickness of uterine scar detected by ultrasonography in post partum period and risk of scar dehiscence in next pregnancy. The objective of the study was to compare the effect of different suturing techniques in repeat caesarean section in terms of scar thickness, blood loss, operative time and scar dehiscence at the time of next caesarean section.

### METHODOLOGY

The study was conducted at Obstetrics and Gynaecology Department of Bahawal Victoria Hospital, Bahawalpur from June 2005 to June 2010. Patients were identified as potential study subjects, if they were admitted for repeat caesarean section in Gynae Unit II, Bahawal Victoria Hospital, Bahawalpur. Inclusion criterion was singleton term pregnancy, parity less than 5, history of previous caesarean section (one to

three). Exclusion criteria were multiple gestation, polyhydramnios, parity greater than 5, maternal Diabetes, anaemia and connective tissue disorder. Before initiation of study, random allocation was performed using premade allocation cards (n=90), specifying “one layer (group A)”, “two layer (group B)” and “modified two layer (group C)”. After obtaining written consent and confirming entry into study group each patient was asked to pick the cards from a box. The group allocation was revealed to the surgeon during the surgery just before the uterine incision closure (Figure 1).

Patients randomly assigned to one layer closure, had their transverse uterine incision closure in one layer with running locking sutures penetrating the full thickness of myometrium with chromic catgut no. 2. Patients randomly assigned to the two layer closure had an initial closure identical to the one layer closure as above. An additional layer of chromic catgut no. 2 was used to imbricate the first layer in a continuous non-locking

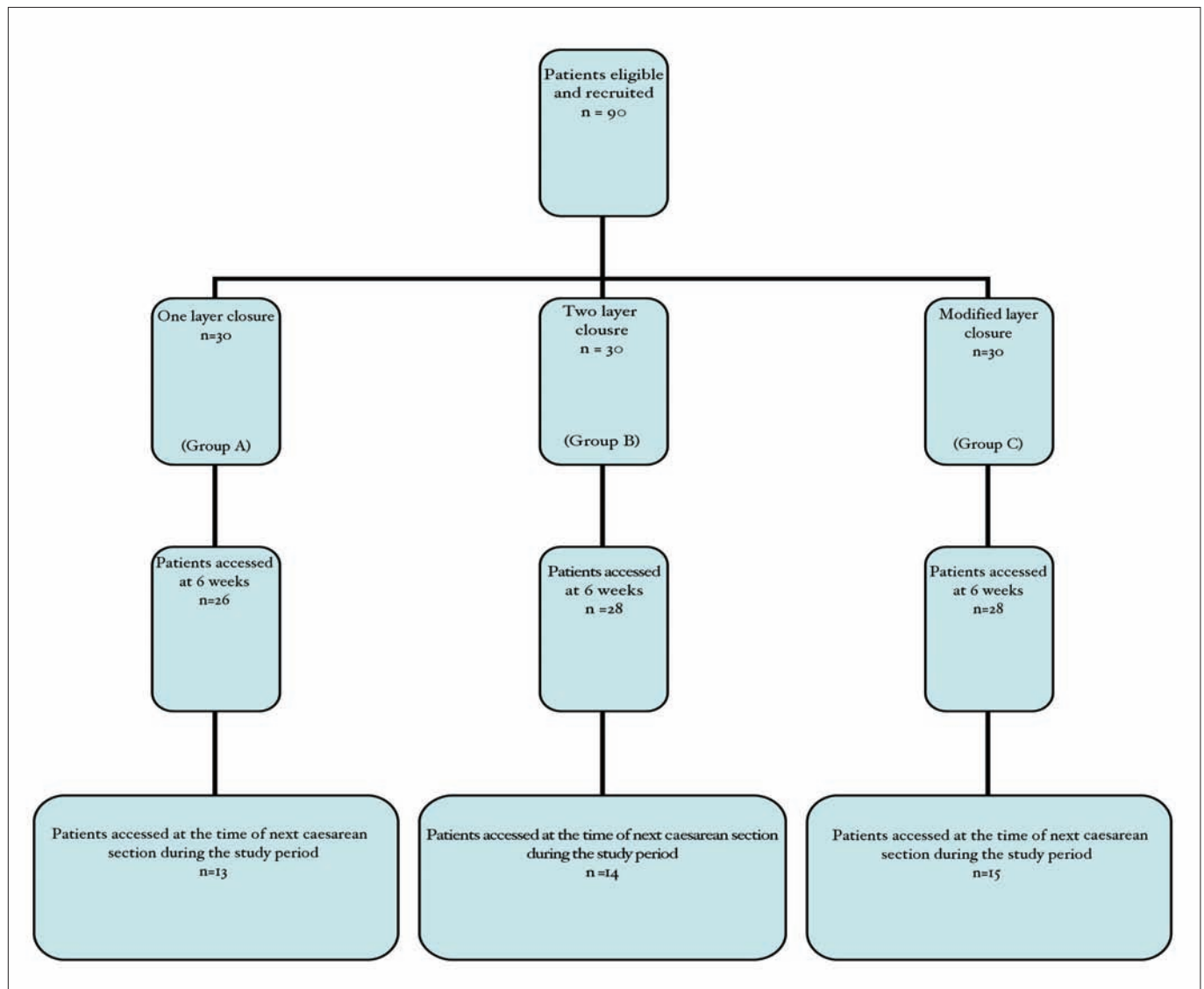


Figure 1: Flow diagram of recruitment and follow-up of the study population.

suture. Patients randomly assigned to “modified two layer closure”, had first layer closure by interrupted horizontal mattress sutures taking full thickness of decidua and myometrium. The previous scar tissue was not excised. Care was taken to select the site of each stitch and to avoid withdrawing the needle once it penetrated the myometrium. This minimized the perforation of unligated vessels and subsequent bleeding. The second layer folded muscles over the first layer of sutures in running non-locking sutures.

All the closures were performed by one of the investigators, according to the study protocol. For each patient, additional haemostatic sutures were placed at the discretion of the operating surgeon and the number of the additional sutures was recorded. Duration of surgery and estimated blood loss at surgery were also recorded. All the patients received first dose of first generation cephalosporin antibiotic at umbilical cord clamping. These intravenous antibiotics were continued to all the patients for 24 hours as per hospital protocol. None of the patients had wound sepsis.

Postoperative evaluation of the uterine incision involved identifying the uterine scar as described by Koutsougeras and measuring the scar in midsagittal plane perpendicular to the uterine wall by trans abdominal ultrasonography.<sup>12</sup> The scar was identified by a discontinuity in the architecture of the uterus in the midsagittal plane and was manifested by either a hyper echoic or hypo echoic line perpendicular to the wall of uterus. Measurements were done by one of the investigators who were blinded to the allocation group for type of closure. A transabdominal approach was attempted, but if scar was poorly visualized transvaginal ultrasonography was done and scar thickness was noted (Figure 2). Patients were fully counselled and informed about the study continuation for at least two years and advised to consult in their next pregnancy and to have repeat caesarean section at the study place. The patients who had their repeat caesarean after 18-24 months of previous caesarean were included in the long-term follow up (Figure 1). However, 25% of the patients failed to fulfill the criteria of long-term follow-up and another 25% patients were lost from each study group. The remaining 50% patients who came for repeat caesarean section were again operated by the investigators themselves. The presence or absence of the scar dehiscence (uterine windows) was noted intra operatively in each study group as a long term follow-up



Figure 2: Ultrasonographic scan representing scar thickness (21 mm), the scar is between the two arrows.

of the different surgical techniques used for the closure of the uterine incision.

Data was analyzed using SPSS version 11. ANOVA test was used for the values scar thickness, blood loss and operative time being quantitative in nature, whilst chi-square test was used for the value scar dehiscence and additional sutures needed being qualitative in nature. In every case the level of significance ( $\pm$ ) was taken 0.05.

## RESULTS

Ninety patients were recruited and randomly assigned to one layer, two layer or modified two layer closure (Figure 1). Demographic and clinical characteristics of the study group are shown in Table I.

All the patients had allocated closure type. In only 2 (6.6%) of modified two layer closure cases the surgeon deemed it necessary to use additional haemostatic sutures, compared with 16 (53%) of one layer closure group, and 10 (33%) of the two layer closure group ( $p < 0.001$ ). There were no significant differences seen in operative time however, estimated blood loss in group C was significantly low as compared to groups A and B (Table II).

In all, follow-up visit was kept at 6 weeks. Uterine scar thickness was visualized. At 6 weeks scar thickness in group C  $17.08 \pm 1.635$  was significantly greater ( $p < 0.001$ ) as compared to group A  $13.19 \pm 1.32$  and group B  $14.58 \pm 1.18$  (Table II).

Table I: Demographic and clinical characteristics of women at enrollment.

Characteristics	One layer closure	Two layer closure	Modified two layer closure
Age (years)	20-35	20-35	20-35
Parity	1-4	1-4	1-4
Gestational age in weeks	37-40	37-40	37-40
No. of previous caesarean sections	Previous 1=8 Previous 2=12 Previous 3=10	Previous 1=9 Previous 2=11 Previous 3=10	Previous 1=10 Previous 2=8 Previous 3=12

**Table II:** Comparison of outcome in the three groups.

Operative outcomes	Group A (n=30)	Group B (n=30)	Group C (n=30)	P-value
1. Operative time (minutes)	40.06 ± 2.98	41.067 ± 3.77	42.167 ± 6.33	0.218
2. Additional sutures necessary	16 (53%)	10 (33%)	2 (6.6%)	< 0.001
3. Estimated blood loss in ml	626 ± 42.63	587 ± 49.97	542 ± 42.258	< 0.001
4. Scar thickness at 6 weeks	13.19 ± 1.32 mm (10.1-15.4)	14.58 ± 1.18 mm (11.9-16.4)	17.08 ± 1.635 (13.5-21.0)	< 0.001
5. Number of patients having scar-dehiscence (uterine windows)	3/13 (23%)	2/14 (14%)	1/15 (6%)	0.465

In the long-term follow-up, it was found that only 1 (6.0%) from group C showed the “uterine window” at the time of repeat caesarean section as compared to 3 (23%) in group A and 2 (14%) in group B (Table II).

## DISCUSSION

These results demonstrate that the change in scar thickness was dependent on the method of closure and confirmed the working hypothesis.

Prior efforts with ultrasonographic evaluation of uterine scar have focused on ante partum assessment and less on postoperative evaluation of caesarean incision repair stratified by closure technique. For example, investigators have elucidated natural history of scar thickness in women with a prior uterine scar<sup>15</sup> and found a correlation between ultrasonographic and clinically determined thickness at caesarean delivery.<sup>16</sup> Other investigators have found that antepartum uterine scar thickness inversely correlates with risk of intrapartum rupture<sup>17</sup> and that antepartum assessment can predict term intrapartum uterine rupture with a high degree of accuracy.<sup>11</sup> This study was designed to determine if uterine closure technique has an effect on scar thickness measured ultrasonographically and risk of uterine rupture in subsequent pregnancies.

Initial reports with one compared with two layer closure focused on intra operative and immediate post operative outcomes and found them to be equivalent.<sup>7,8</sup> Many other studies provide important information but nonetheless are limited by their retrospective design and unknown confounders affecting the decisions for initial closure.<sup>6,18</sup> Additionally, confounders such as operative technique and other intra operative factors could not be taken into account. In contrast, allocation to scar closure was randomized in this study to evaluate the effect postoperatively. Confounding variables were thus minimized.

In context of prior studies and over current understanding of relationship between scar thickness and wound strength, this data suggests that the closure type used at the time of closure of a low transverse uterine incision after caesarean delivery does matter. By using modified two layer closure technique not only the scar thickness was more as compared to one and two layer closure, at 6 weeks post partum, also the chances of scar dehiscence (windows) were less.

In the modified two layer closure we had full thickness of decidua and myometrium that led to increased scar thickness. Yazicodluf *et al.* also found that by selecting full thickness suturing technique including decidua one may significantly lower the incidence of incomplete healing of uterine incision after caesarean section.<sup>19</sup> Hayakawa *et al.* conducted a study to evaluate whether the method for myometrium closure effects on caesarean section scars of lower uterine segment.<sup>20</sup> They concluded that methods for myometrial closure as well as other factors influence the conditions of myometrial healing and incidence of scar defects one month after caesarean section varies with method applied for myometrial suturing.

A proposed pathophysiology is that predominant transverse orientation of muscle fibers in lower uterine segment is the reason of success of this new technique in this study. As most of the obstetricians must have experienced that continuous suturing in already thinned out lower segment leads to cutting through the suture line, creating holes. In this modified two layer closure technique we had interrupted horizontal mattress sutures in first layer so that transverse thinned out muscle fibers were repaired in a better way. This technique creates little tension on suture line and being interrupted hampers the vascularity less and hence promotes healing. The second layer of continuous running sutures folds the muscle over the first layer so preventing the first layer to get loose during involution. Potential limitations of the study were the time of the surgery and application of additional haemostatic sutures which were at the discretion of the surgeon. We tried our best to minimize it by performing the closures by one of the investigators only.

Although, this sample was small, significant results were obtained regarding the thickness of scar over the study interval. The study provides a longitudinal description of a new modified two layer closure of uterine lower segment incision. Ultrasonographic measurements of scar thickness at 6 weeks post partum establishes the effects of uterine closure type on myometrial scar morphology. The observation enhanced myometrial wound healing knowledge and may open novel areas of investigations for potential therapeutic intervention in humans to reduce the risk of uterine dehiscence and rupture during next pregnancy, after prior caesarean section.

## CONCLUSION

Change in suturing technique affected the thickness of uterine scar as detected by ultrasonography in post partum period and risk of scar dehiscence in next pregnancy. Scar thickness was significantly increased and amount of blood loss during surgery was decreased with modified two layer closure when compared with traditional one and two layer closure of lower transverse uterine incision at the time of repeat caesarean section.

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