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Original Research Article

## Modified mattress sutures vs running sutures in uterine closure: which is better?

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### ABSTRACT

**Background:** Conventional closure of uterus has been known to bear risk of scar dehiscence and scar rupture in subsequent pregnancies and thus, a study was conducted to compare the outcome of uterine closure with modified mattress manner and running manner and to establish a better method of uterine closure during caesarean section. Objective was to compare the conventional single layer running sutures and single layer modified mattress sutures for closure of uterus in caesarean section and find out which method is superior.

**Methods:** This prospective interventional study was carried out in Dhiraj Hospital, a tertiary care hospital in Vadodara. 60 pregnant women in the study criteria were equally divided randomly into 2 groups. Uterine closure was done in single layered sutures, one by running sutures and other group by modified mattress sutures.

**Results:** Uterine scar thickness on 8th day and 6 months post-operatively was significantly more in single layered suturing by modified mattress suture compared to running suture ( $p < 0.05$ ).

**Conclusions:** Uterine closure by single layered modified mattress suture is better in comparison to conventional single layer running suture.

**Keywords:** Caesarean section, Modified mattress suture, Running suture, Scar thickness, Suturing technique, Uterine closure

### INTRODUCTION

Caesarean section is one of the most commonly performed surgery around the world and the rate at which it is performed per delivery is constantly increasing. The technique of caesarean section has undergone many changes since it was first identified. Till date, ideal method of uterine repair is the most controversial issue.

Since the first documented caesarean section in 1020 A.D., various changes have been made in the technique. Initially, it was the surgery performed as the last resort, mostly peri or post-mortem.<sup>1</sup> The uterine wound in caesarean section was not initially sutured as it was

thought that the contraction and relaxation of the uterus would make the placement of uterine sutures ineffective.<sup>2</sup> In 1769, Lebas was the first one to advocate the closure of uterine incision.<sup>2,3</sup> The sutures used during those days were non-absorbable sutures which were left protruding from the wound for later removal which greatly increased chances of maternal mortality due to sepsis. In 1876, Italian professor Eduardo Porro started performing a subtotal hysterectomy after caesarean section to control uterine haemorrhage and prevent systemic infection so as to save the mother's life; however, this was at the cost of her fertility.<sup>4</sup> In 1882, Max Sanger of Leipzi insisted on suturing of uterus and he recommended a silver suture that produced minimal tissue reaction.<sup>5</sup>

Changed by leaps and bounds, presently, caesarean section is one of the most common surgical procedure performed on women and has become a much safer procedure. However, it has an increased risk of complications in present as well as future pregnancies of which one specific risk factor is the fear of scar rupture.

Closure of the uterine incision is of prime importance in caesarean section, particularly given the increasing awareness of future scar dehiscence. It is imperative therefore, that the optimal surgical technique is used to minimize the morbidity in both the present case and in any future deliveries. In spite of all this, there is no universally accepted technique for performing caesarean section, and every step in this surgical procedure differs from surgeon to surgeon.<sup>6</sup>

Although not consistent across all studies, there remains sufficient concern of a conflict between minimizing short-term complications with the use of single layer closure without adversely affecting subsequent pregnancy outcome. It would seem prudent to consider a woman's reproductive ambitions in determining the correct uterine closure approach.<sup>7</sup>

However, if a technique can combine the short-term advantages of single layer and can provide perceived long-term strength to the uterine scar provided by a double layer technique, it would become an ideal suturing technique for uterine closure. Probably an anatomically proper closure of the incision on the uterus would prevent the uterine scar dehiscence in future pregnancies.<sup>7</sup>

## METHODS

The study is a prospective, interventional and comparative study to compare the outcome of two methods of single layered uterine closure: modified mattress and running sutures which was carried out over a period of 9 months at Dhiraj hospital in Obstetrics and Gynaecology Department, Piparia.

60 patients (30 cases and 30 control cases), primigravida and multigravida at term, coming to Dhiraj Hospital, undergoing lower segment caesarean deliveries were studied.

### Inclusion criteria

- All pregnant women (primigravida and multigravida) at term undergoing lower segment caesarean section.

### Exclusion criteria

- Women who had undergone a prior surgery of uterus/previous caesarean section
- Uterine anatomical anomalies
- Prolonged and obstructed labour
- Placenta previa/abnormal placentation

- Previous lower abdominal surgery
- Severe anaemia
- Presence of pelvic infection and adhesions
- Coagulation disorders
- General anaesthesia
- Morbid obesity
- Foul smelling vaginal discharge.

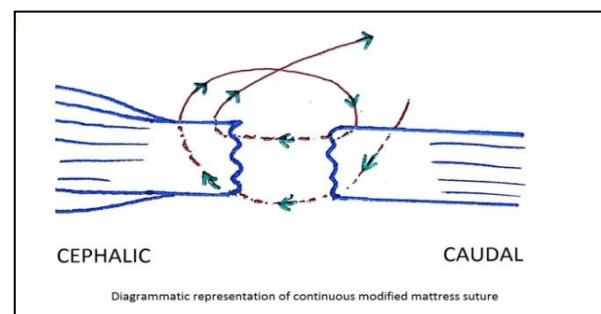
### Statistical Analysis

Analysis was done using the student's unpaired t-test to calculate the p-value and know the significance of the findings.

Detailed history and thorough clinical examination of each antenatal patient was carried out and routine pre-operative investigations were done.

In caesarean section, Pfannenstiel skin incision followed by blunt separation of the individual layers of the abdominal wall was done. The parietal peritoneum was dissected with scissors. A transverse incision of 2-3 cm was made on the lower uterine segment in midline using a scalpel and blunt dissection of remaining uterine fibres and opening of the foetal membranes. Lateral digital extension of uterine incision was done and foetus was delivered. Infusion of 20 units oxytocin was started in 500 ml of ringer lactate and the placenta was removed by trans abdominal massage combined with light cord traction. Uterus was exteriorised.

Uterine incision was sutured with a single layered closure with vicryl 1-0 by running sutures (Group A) or by continuous modified mattress suture (Group B) technique (developed by KM Babu and Navneet Magon).<sup>7</sup> The patients were divided randomly into these two groups. Thorough cleansing of the abdominal cavity using a suction unit was performed. The visceral and parietal peritoneum was not sutured. The rectus aponeurosis was sutured with a simple running stitch of the same material. The skin was closed with a sub-cuticular continuous stitch of Ethilon 2-0 (Monofilament polyamide black). The urinary bladder was catheterized with a Foley catheter for 24 hours after surgery. The new technique of closure was adopted.



**Figure 1: Diagrammatic representation of continuous modified mattress suture of uterine wall.**

The new technique (developed by KM Babu and Navneet Magon for uterine closure).<sup>7</sup>

“The uterus is closed with delayed absorbable suture polyglactin 910 (0) or PGA (0), by continuous modified mattress suture technique in a single layer excluding the decidual layer. The aim of using this method is to ensure the correct anatomical approximation of the deciduas to deciduas, myometrium to myometrium and serosa to serosa layers.”

**Step 1**

“After securing the angle of the incision, a full thickness needle bite is taken starting 1 cm away from the margin of the incision and coming out at the junction of the myometrium and decidua of the lower edge of the incision. We then enter at the junction of the myometrium and decidua of the upper edge of the incision, and come out 1 cm away from the margin of the upper edge. This ensures good approximation of the deciduas without overlapping of the decidual margins. The assistant will maintain the traction at this stage.”

**Step 2**

“Without changing the direction of the needle, a superficial bite is taken encircling the outer margins, sub peritoneal fascia and outer myometrium from the lower edge and followed by the upper edge, and then the needle bite as described in the first step is started.”

**Step 3**

“At this stage, two loose loops are formed at the cranial and caudal ends. Surgeon will pull the caudal loop, and the cranial loop gets tightened once the assistant leaves the traction. The surgeon now tightens the caudal loop by pulling the thread.

Both the deep and superficial bites are tightened and the assistant maintains the traction of the thread and the surgeon continues the same process for the next bite. This technique will ensure full thickness decidua-to-decidua, myometrium-to-myometrium and serosa-to-serosa approximation of the uterine cut margins and good homeostasis.” Intra operatively, the need for extra sutures for hemostasis was compared in both the suturing techniques for uterine closure.

Also, the time taken for closure of the uterine wound was taken into consideration (time taken from starting of uterine closure to the completion of uterine closure until hemostasis was achieved, time taken for taking extra stitches for achieving hemostasis was also counted)

Post-operatively, post-operative pain scoring was done for first 24 hours, 8 hourly using NPS (numeric pain scale) and compared. Also the amount of lochial discharge was compared (amount of lochia compared by the number of fully soaked pads changed by the patient per day). The pads supplied by our hospital were taken as standard size. Post-operative infection was also taken into consideration in terms of fever and foul smelling vaginal discharge.

On the day of discharge (8<sup>th</sup> post-operative day) and after 6 months, the uterine scar thickness was measured for the case and control group patients.

Scar was measured in mid-sagittal plane perpendicular to the uterine wall by trans abdominal ultrasonography.<sup>8</sup> The scar was identified as a discontinuity in the architecture of the uterus in the mid-sagittal plane and manifested by either a hyper echoic or hypo echoic line perpendicular to the wall of uterus.<sup>8</sup> Measurements were done by one of the investigator who was blinded to the allocation group for type of closure.<sup>8</sup> All ultrasound examinations were carried out on the same machine by the same examiner.

All examinations were carried out regardless of phase of the menstrual cycle, with the woman having an empty bladder and lying on her back, with a wedge-shaped hard cushion under her lower back and pelvis.<sup>8</sup> No media was used to inflate the uterus. The uterus was visualized in a sagittal plane with both the endometrium and the cervical canal visible, the scar area was magnified and the outcome measures were obtained from a frozen image.<sup>8</sup>

**RESULTS**

The 60 women in the study were divided into 2 groups randomly of 30 each. Group A consisted of women who had undergone uterine closure by running sutures and Group B consisted of women who had undergone uterine closure by modified mattress sutures.

**Table 1: Patients’ characteristics and obstetric data.**

Parameter	Group A (Running suture)	Group B (Modified mattress suture)	p-value
Maternal age in years	25.26 (3.15)	24.7 (4.8)	0.11
Gestational age in weeks	38.2 (1.5)	37.4 (2.3)	0.30
Birth weight in kg	2.86 (0.6)	2.87 (0.6)	0.84

**Table 2: Sonographically measured scar thickness, time taken, number of suture materials used and post-operative pain comparison between both the groups.**

Parameter	Group A (Running suture)	Group B (Modified mattress suture)	p value
Scar thickness on 8 <sup>th</sup> day	26.80 mm (23.25 mm, 32.20 mm)	33.6mm (30.00 mm, 37.50 mm)	<0.05
Scar Thickness after 6 months	4.65 mm (3.87 mm, 5.57 mm)	5.90 mm (5.30 mm, 6.75 mm)	<0.05
Time taken for uterine closure	5 min 48 Sec (5 min 24 Sec, 6 min 0 Sec)	9 min 48 Sec (8 min 48 Sec, 11 min 15 Sec)	<0.05
Post op pain (numeric pain scale)	17 (16,19)	16 (15,18)	0.796
No. of extra suture taken	1 (0.75,2.00)	1 (0,1)	<0.05

The general characteristics of the study groups reported in Table 1. The differences between the two groups for maternal age, gestational age at delivery and neonatal birth weight were statistically insignificant. The specific characteristics taken into consideration of the study are reported in Table 2.

The scar thickness was evaluated on 8<sup>th</sup> postoperative day and after 6 months of surgery by trans abdominal sonography. The median for scar thickness in mm on 8<sup>th</sup> day and after 6 months for group A was 26.80mm (IQR: 23.23,32.20) and 4.65 (IQR: 3.87,5.57) and that of group B was 33.6 mm (IQR:30.00,37.50) and 5.90 (IQR: 5.30,6.75) respectively. The difference between both groups is significant ( $P<0.05$ ).

The study also compared the time taken for uterine closure in both the groups. The time taken for taking extra sutures for achieving hemostasis during uterine closure was also taken. The median for time taken for uterine closure in group A was 5 min 48 sec (IQR: 5 min 24 sec,6 min 0 sec) and in group B was 9 min 48 sec (IQR: 8 min 48 sec, 11 min 15 sec). The difference between both the groups is significant ( $p<0.05$ ). Moreover, more additional sutures were required to achieve in group A compared to group B which is also statistically significant ( $p<0.05$ ). No significant difference was found in the total pain score in both the groups.

The amount of lochial discharge and post-operative infections were compared in both the groups and it was also statistically insignificant.

## DISCUSSION

For emergency surgery, 55% of obstetricians use single layer closure of the uterine incision, 37% use double layer closure while 11% use single layer closure only in women undergoing concomitant sterilization.<sup>9</sup>

The immediate requirement of the uterine closure at the time of caesarean is closure of the wound on the uterus and good haemostasis.<sup>7</sup> The conventional single layered

running suturing achieves this. However, the prime requirement of a good scar by full thickness healing of the cut margins, which can withstand the stress of labour in future, may not be achieved in the single layer method due to the nature of the lower segment and difficulty in identifying the cut margins of the uterus due to the process of labour.<sup>7</sup> This leads to poor healing of the uterine wall and results in thinned out scars.<sup>7</sup> The aim of this technique was to achieve the full thickness approximation of the cut margins, and hence full thickness healing of the uterine incision.

Williams believed that the uterus heals by regeneration of the muscular fibers and not by the scar tissue. On inspecting the uterus on repeat caesarean section there was no trace of previous scar, an almost invisible linear scar was seen.<sup>10</sup> Schwarz even concluded that if the cut surfaces are closely apposed with each other, then there is minimal proliferation of the connective tissue and the normal relation of the smooth muscle to connective tissue is gradually re-established.<sup>11</sup> This indicates that proper approximation of the cut edges of the tissue is one of the important factors in the healing. Correct approximation of the cut margins can be achieved and ensured by this new method, that is, the continuous modified mattress suture. More recently, Roberge et al.<sup>12</sup> evaluated the available evidence regarding the association between single-layer closure and uterine rupture. They reviewed nine studies, which included a total of 5810 women. Overall, the risk of uterine rupture during trial of labour after a single-layer closure was not found to be significantly different from that after a double-layer closure: however, the authors brought out an interesting finding that locked, and not unlocked single-layer closures were associated with a higher risk of uterine rupture in women attempting a trial of labour after caesarean section. Gyamfi et al. concluded in his study that conventional single layered uterine closure is more likely to result in uterine rupture.<sup>13</sup>

The safe cut off thickness of scar in post lower segment caesarean section uteri varies from 1.5 to 3.5 mm, and though not a criteria for vaginal birth after caesarean section, the thinning of the site is surely the cause of



worry for obstetricians. The ultrasonographic measurement of the thickness of the scar is thus useful for deciding the best type of delivery for patients.

After suturing uterine wound with the new technique, the cases were evaluated by trans abdominal sonography comparing it with the group which underwent uterine closure by conventional single layered running suture. There was significant difference seen in between these two techniques on 8<sup>th</sup> post-operative day and 6 months post-operatively.

From the present study, it is evident that the scar measured on 8<sup>th</sup> post-operative day was significantly thicker among women submitted to modified mattress technique of hysterotomy closure than those submitted to a single layered running closure technique ( $P < 0.05$ ).

Furthermore, the median caesarean section scar thickness 6 months post operative was significantly thicker among women submitted to modified mattress technique than those submitted to a single layered running closure technique ( $P < 0.05$ ). Hence it can be assumed that the uteri sutured by modified mattress technique (Group B) can better withstand the stress of labour.

Involution and remodelling of the lower segment caesarean section scar site takes more than the normal six weeks; and may be because of the reaction to the suture material while closing the uterus. However, the qualitative assessment of the scar is possible only if the patient delivers without rupturing the uterus.

This technique, primarily described by KM Babu and Navneet Magon has the potential to be the technique of choice for closure for uterus at LSCS in cases where the future reproductive choices of women need be preserved.<sup>7</sup>

The uteri sutured by this method are more likely to stand the rigors of vaginal delivery as there is proper end to end approximation of each layer, very less connective tissue in between and more thickness of the scar. This will decrease the risk of uterine dehiscence and rupture in women attempting TOLAC. Eventually, this can effectively bring down the increasing trend of caesarean section done for non-recurrent indication.

However, further large randomized controlled trials are required to assess the strength of uterus closed by this new technique in withstanding trial of labour after caesarean section.

There are emerging studies indicating that technique of uterine closure is very important for uterine scar healing. Regardless to this, there are no national or international guideline to which one can adhere to for uterine closure in caesarean section. Multiple trials have been done focusing on short-term operative complications but evaluation of its long-term impact on future pregnancies

still remains as a mystery. Even today, we have scarce literature to establish long term relationship between method of uterine closure and its long-term complications. It becomes more imperative that such studies are conducted so as to fill this undiscovered patch in our knowledge.

## CONCLUSION

The new technique of uterine closure by modified mattress sutures is feasible, even though it takes more time, it does not alter the immediate outcome of surgery. Moreover, in all other aspects it is comparable to the conventional single layered running suture technique. This technique yields a better scar thickness on 8<sup>th</sup> and 6 months postoperatively so it seems definitely better. Also, as we get a thicker scar which is less likely to give way as compared to a thinner scar. Even though the rate of scar dehiscence and scar rupture is likely to be less with this technique, we still need further large randomized control trials to prove it.

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