

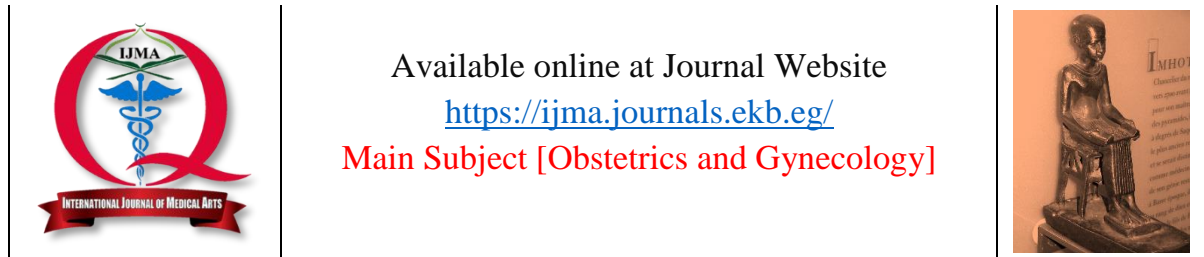
IJMA



INTERNATIONAL JOURNAL OF MEDICAL ARTS

VOLUME 6, ISSUE 7, JULY 2024

P- ISSN: 2636-4174
E- ISSN: 2682-3780



Original Article

Ultrasonographic Evaluation of Cesarean Scar Defect after Double-layered Uterine Suture versus Single-layer Continuous Uterine Suture

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ABSTRACT

Article information

Received: 20-01-2024

Accepted: 16-04-2024

DOI: 10.21608/ijma.2024.264112.1913.

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Citation: Mohamed AA, Oun AR, Elbassioune WM. Ultrasonographic Evaluation of Cesarean Scar Defect after Double-layered Uterine Suture versus Single-layer Continuous Uterine Suture. IJMA 2024; July; 6 [7]: 4708-4714. doi: 10.21608/ijma.2024.264112.1913.

Background: Currently, researchers are comparing uterine incision closure techniques and looking for ways to reduce associated risks.

The aim of the work: To compare postoperative outcomes of single layer versus double layer unlocked sutures for closure of the uterine incision during cesarean section.

Patients and Methods: This randomized controlled trial was conducted at Al-Azhar University in Damietta, Egypt on 110 patients divided into two groups. In Group I [n=55], the uterine incision was closed with a single layer unlocked suture using No. 1 vicryl. In Group II [n=55], the uterine incision was closed with a double layer unlocked suture using No. 1 vicryl. All cases underwent full medical history taking, complete clinical examination, and preoperative investigations.

Results: While the uterine scar level was significantly lower in the single layer unlocked group [p= 0.012], the obtained scars after double layer unlocked suture were significantly thicker [RMT = 4.53 ± 2.09 vs. 6.96 ± 2.55]. A significant statistical difference was found between the two groups regarding residual myometrial thickness and defect depth and width three months postoperatively favoring Group II. A significant statistical difference was also found between the two groups regarding residual myometrial thickness and defect depth and width six months postoperatively favoring Group II.

Conclusion: The double layer unlocked uterine closure technique is associated with better cesarean scar healing in terms of RMT and CS defect incidence compared to the single layer unlocked technique.

Keywords: Ultrasonography; Cesarean Section; Uterine Rupture; Suture Techniques.



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INTRODUCTION

The caesarean section [CS] is the obstetric surgery procedure that is carried out the most frequently [1-3]. Cesarean sections are a lifesaver in many cases, but they are also associated with a host of risks, both immediate and later on. Thrombo-embolic disorders, discomfort, and irregular uterine bleeding are the short-term consequences. Ectopic pregnancies within the scar, placental anomalies and problematic subsequent pregnancies are all examples of long-term consequences [4].

One of the common recent sequelae among women who have had previous cesarean sections is postmenstrual spotting and dysmenorrhea. The niche, a cesarean scar defect that is seen by transvaginal ultrasound & is described as "at least 2 mm depth indentation at the site of cesarean scar," is largely responsible for these complications [5].

Cesarean scar niche is one of the novels mentioned complications of cesarean section due to the rising numbers of cesarean sections and improved imaging modalities. The causes of cesarean scar niche are still being investigated; one of them is the uterine closure method that should be studied to pick up the best one to decrease the incidence of niche after cesarean delivery [6].

While ultrasonography played a significant role in assessing uterine scars during pregnancy, its use in assessing scars in individuals who were not pregnant is still in its early stages [7]. More recent advances in ultrasonography have greatly improved the ability to assess the uterine cavity for factors such as remaining myometrial thickness, adjacent myometrial thickness, the depth of the cesarean scar defect [niche], and the existence of scar-related intrauterine adhesions [8].

When deciding which uterine closure approach is ideal for women having cesarean sections, it is important to weigh the potential advantages against the risks. Mechanical tension & the manner of suturing have a significant impact on the integrity of uterine wounds [9].

A number of researches have looked into the best way to close the uterus during CS, since this is the procedure that mostly decides how good the scar will be. Nevertheless, there is no conclusive data to back a particular method of uterine closure that would improve maternal

outcomes and decrease the likelihood of uterine rupture [10].

Among the current available methods for closing cesarean sections, the double-layered uterine suture technique has the potential to lessen the amount of damage to the uterine tissue, shorten the duration of the incision closure, decrease bleeding and minimize the risk of cesarean scars [11].

There is a lack of information regarding the most effective methods of uterine closure at this time. For example, double-layered uterine suture and single-layer continuous uterine suture [12].

The aim of this study was to validate best method for uterine closure comparing 2 different methods of uterine closure either Double-layered uterine suture and single-layer continuous uterine suture as regards occurrence of cesarean scar defect after surgery [niche] without increasing the peri-operative maternal morbidity for increasing women health care quality.

PATIENTS AND METHODS

This interventional, randomized trial evaluated the use of single-layer unlocked sutures for uterine closure after low transverse cesarean sections to that of double-layer unlocked sutures. Women who gave birth by first, elective, or term cesarean section between November 2022 and November 2023 at the Obstetrics & Gynecology department of Al-Azhar University Hospital [New Damietta] were included.

On the other hand, there were no limitations regarding the incision style, abdominal opening, or the layers of skin, peritoneum, or fascia that could be closed.

The patients were categorized into two groups based on the suture technique employed. In fifty percent of the cases, uterine scar closure was performed using a single layer of absorbable suture [1/0 Vicryl suture]. In the other 50% of cases, uterine scar closure was achieved through a double layer of absorbable suture [1/0 Vicryl suture].

The trans-vaginal ultrasound is the established method for assessing the uterine scar. Scar flaws are commonly described as being localized or specialized areas. The degree of the defect is determined by measuring the thickness of the

myometrium that remains at the location of the uterine scar .

The post CS ultrasonographic examination of the uterine scar involved assessing the presence of a uterine scar defect, which is defined as the observation of myometrial loss or deformity at the location of the cesarean scar. Additionally, the residual myometrial thickness was measured in millimeters.

Ethical approval and consent to participate:

The project received approval from the institutional review board of the Al-Azhar Faculty of Medicine [DFM-IRB00012367-22-011-006]. Before commencing the trial, all patients were provided with information regarding the purpose & details of the study, and a written informed consent was obtained.

The criteria for inclusion in the study were determined as the following

Patients who are in good health, aged between 18 and 40, who have a single pregnancy are eligible for this study. They will be undergoing a planned first cesarean birth at 38 weeks or more of gestation. Individuals without chronic illnesses, individuals who have not previously taken anti-coagulant medications, individuals without systemic conditions such as blood pressure and individuals without prior uterine incisions.

The exclusion criteria from the study were as the following

Factors that may increase the risk of complications during a cesarean section include the use of anticoagulants, a previous cesarean section or uterine incision, being in active labor during the procedure, having placenta previa, hypertensive diseases like preeclampsia during pregnancy, multiple pregnancies, thrombophilia, Müllerian anomalies, having a body mass index of 35 kilograms per square meter or higher, or having a known chronic inflammatory disease.

Randomization method

The process of randomization was conducted using computer-generated methods and closely monitored by a statistician. During the elective cesarean delivery, a surgical assistant provided the surgeon with a sequentially numbered, sealed & opaque envelope. This envelope had a written description & an image illustrating the suture procedure. Female participants were assigned to one of two groups: the first [group 1] single layer

unlocked uterine closure technique; the second [group 2] double layer unlocked uterine closure technique. All sutures were required to be continuous using absorbable suture material [1/0 Vicryl sutures].

Participants who met the criteria and agreed to participate were given a preventive antibiotic before their cesarean section surgery. The antibiotic, ceftriaxone vial [2g, I.V], was delivered for thirty minutes before making the incision on the skin.

Surgical technique

Each patient underwent all surgical procedures according to established protocols. The surgical procedures were carried out exclusively by a unified surgical team with identical suture materials. The patients underwent cesarean delivery through a lower segment uterine incision. The Pfannenstiel incision was utilized in all patients. The fascia was incised horizontally using precise cutting, while the peritoneum was opened using a non-sharp method. The peritoneum covering the bladder was compressed, followed by the incision of the uterus. After the fetus was delivered, two distinct closure techniques were utilized to close the uterus based on the groups. The fascia was closed in a continuous manner without being secured. The skin was stitched beneath the dermis.

Closure of the uterine incision

In the first group: The lower uterine part was sealed using an unlocked single layer continuous suture, with the endometrial layer sandwiched in between by one centimeter of tissue. The uterine serosa lacks suture coverage.

In the second group: A two-layer closure technique was used to close the lower uterine segment. The first layer involved a continuous unlocked suture, while the second layer involved a continuous unlocked suture that encompassed the surface myometrium. The suture [inverted lambert method] does not cover the uterine serosa.

Ultimately, all patients had the typical post-operative treatment & antibiotic prophylaxis routine, which involved taking oral metronidazole 500 milligrams along with a broad-spectrum antibiotic every 8 hours for a duration of forty-eight hours.

The operative evaluation included the operative time and additional needed sutures for hemostasis.

Estimated and calculated blood loss

The gravimetric method is an objective approach used to quantify blood loss. It involves positioning an absorbable sheet beneath the patients. The absorbable sheets used after a cesarean section, along with soaked pads & gauzes, are measured on a sensitive scale. The known dry weights of these materials are then subtracted from the measured weights to determine the actual blood loss.

- The achieved weight = [weight of absorbable sheets, soaked pads, soaked gauzes] – [dry weights of these materials].
- Volume of blood loss [ml] = the achieved weight [gm] ÷ 1.06 [13].

Postoperative follow-up

To assess the healing of the uterine scar, each participant was scheduled for an ultrasound evaluation of the scar within three to six months after the cesarean delivery. A transvaginal ultrasound was conducted utilizing the Voluson P8- GE Ultrasound system, LTD, equipped with an endo-cavitary transducer operating at a frequency of four to eight MHz. The purpose of the ultrasound was to evaluate the uterine scar. The procedure was carried out by a skilled sonographer.

The following data were collected, the number of patients developed niche, integrity of CS scar, postoperative pain, and hemoglobin value at the first postoperative day.

Assessment of cesarean section scar integrity

The residual myometrial thickness [RMT] is the measurement of the distance between the tip of the hypoechoic triangle & the surface of the anterior uterine wall. Therefore, RMT denotes the measurement of the thickness of the myometrial layer at the location of the hysterotomy. Only this characteristic was examined in situations when the CS scars were totally healed. In addition, scar distance and the depth and width of defect.

The postoperative pain was evaluated by the Numeric Category Scale. The scale is oriented horizontally, with the left end representing 0 pain, indicating the complete absence of pain. As we move towards the right end, which is labeled

as 10, the intensity of pain gradually increases, reaching an extreme level. Verbal instructions were provided on how to use & apply the scale. For evaluation, 0 indicated no pain, 1-3 for mild pain, 4-6 for moderate pain and 7-10 for strong pain.

The patients were queried regarding the Numeric Scale: [Which numerical value relates to the level of discomfort you are currently feeling?]. The scale was administered in three distinct contexts: during the patient's state of rest, while performing motions such as sitting down or standing up, & while walking. The objective was to assess the varying levels of pain observed during these fundamental activities [14].

Statistical analysis

The data were collected & organized using a personal computer equipped with Statistical Package of Social Science [SPSS] version 20 and Epi Info 2000 programs. The acquired data were then subjected to statistical analysis, employing the following statistical methods. There were two different kinds of statistical analysis carried out: The descriptive statistics e.g., percentage, number, standard deviation & mean. On the other side, analytic statistics employed to determine whether or not there is a possible connection among the factors that were investigated & the ailment that was being targeted. P value at < 0.05 was used to determine significance

RESULTS

Although uterine scarring level was significantly lower in single layer unlocked group [$p = 0.012$], the obtained scars after double layer unlocked suture were significantly thicker [RMT = 4.53 ± 2.09 Vs. 6.96 ± 2.55] [Table 1].

There was a significant statistical variance among the 2 groups regarding residual myometrial thickness and defect depth and width three months' post-operative as regard group II [Table 2].

In addition, there was a high significant statistical variance among the 2 groups regarding residual myometrial thickness and defect depth and width six months' post-operative as regard group II [Table 3].

Table [1]: Cesarean scar measurements in single- and double-layers groups

Ultrasound measurements	Single layer unlocked [n:50]	Double layer unlocked [n:50]	P value
Scar distance [mm]	29.63±5.09	32.61 ± 4.02	0.012*
RMT[mm][mean ± SD]	4.53 ± 2.09	6.96 ± 2.55	<0.001*
Defect length	1.75 ± 2.2	0.453 ± 1.76	0.017*
Defect depth	1.337 ± 1.84	0.237 ± 0.90	0.005*
Defect width	2.93 ± 4.06	0.37 ± 1.52	0.002*

Table [2]: Follow up analysis 3 months' post-operative

Data		Single layer unlocked [n=50]	Double layer unlocked [n=50]	Test	P Value
Niche	Present	11 [22%]	7 [14%]	1.314	0.252
	Absent	39 [78%]	43 [86%]		
Residual myometrial thickness [mm]	Mean±SD	6.7 ± 0.75	7.64 ± 0.58	4.96	< 0.001*
	Range	5.5-7.9	6.4 - 8.6		
	Median	7	7.85		
Defect depth [mm]	Mean±SD	25.51 ± 3.82	19.94 ± 2.23	5.8	< 0.001*
	Range	17.5-32	17 – 24		
	Median	26	19.55		
Defect width [mm]	Mean±SD	0.51 ± 1.04	0.42 ± 0.98	0.89	0.372
	Range	0-5	0-4		
	Median	0	0		

Table [3]: Follow up analysis 6 months' post-operative

Data		Single layer unlocked [n=50]	Double layer unlocked [n=50]	Test	P Value
Niche	Present	11[22%]	7 [14%]	1.314	0.252*
	Absent	39 [78%]	43 [86%]		
Residual myometrial thickness [mm]:	Mean±SD	6.91±0.898	7.8±0.67	4.32	≤ 0.001*
	Range	5 – 8.4	6 – 9		
	Median	7	8		
Defect depth [mm]:	Mean±SD	24.78±3.77	18.85±2.35	5.94	≤ 0.001*
	Range	17-31.5	15–23		
	Median	25	18		
Defect width [mm]:	Mean±SD	0.44±0.88	0.34±0.82	0.97	0.33
	Range	0-4	0-3.5		
	Median	0	0		

DISCUSSION

Among 149 women who had elective CS, Glavind *et al.* [15] looked at the CS defect

dimensions in 81 women who had a double-layer closure and 68 women who had a single-layer closure, as well as the depth, width, and the residual myometrial thickness. The length of the

CS defect was 6.8 millimeters in women with single-layer closure versus 5.6 millimeters in those with double-layer closure, according to the authors. On the other hand, the other metrics didn't vary significantly.

Here, we closed incisions using both single- & double-layer unlocking methods. Regarding the occurrence of the uterine niche, we discovered a notable disparity. Using a double-layer unlocking closure approach, surgeons can anticipate higher RMT with a lesser incidence of niche. With **Glavind et al.** [15], we get the same results.

Also, **Sevket et al.** [9] randomized 18 women to receive single-layer suturing and eighteen women to receive double-layer suturing in order to compare the two methods' impact on the healing of the uterine scar after a cesarean section. The depth of the CS defect and the thickness of the remnant myometrium were assessed at six months using SIS. Remaining myometrial thickness over the incision and the healing ratio were considered as indicators of uterine scar healing. The double-layer method yielded a considerably thicker residual myometrium [9.95 mm vs. 7.53 millimeters] than the single-layer method. Additionally, the double-layer approach had a substantially greater healing ratio.

Vitagliano et al. [16] conducted a meta-analysis and systematic review of nine trials with 3,969 individuals each. Although it did not approach statistical significance, five investigations comparing the two techniques found that the double-layer method was associated with CS defects more often than the single-layer method .

Also, the single-layer method resulted in substantially thinner residual myometrial tissue in five separate investigations. The included research used varied methodologies, uterine locations, and ultrasound technology, which explains why the results are inconsistent. Furthermore, various time periods were utilized for the postoperative evaluation due to the lack of agreement on how long it takes for scars to heal.

Six months following a caesarean section, we examined the CS defect in our research. Regarding the depth, breadth, and residual myometrial thickness of the cesarean scar, we discovered substantial variations between the single layer unlocked and double layer unlocked incision closure procedures, contrary to the results of **Vitagliano et al.** [16].

The procedure itself is a potential danger, along with the surgical method. Several variables, including inflammation, tissue ischemia, tissue manipulation, and inadequate homeostasis, can initiate the creation of niches after surgery [17].

Short follow-up and, of course, exclusion of subjects having a history of uterine scarring are the primary limitations of the current study. The employment of a legitimate randomization method to investigate the technique's impact on niche development, as well as the study's homogeneous population and prospective, randomized design, are its primary strengths. However, in order to make a definitive conclusion, future studies should include participants with prior uterine scars and conduct more long-term evaluations to demonstrate the effect of the scar on niche development.

Conclusion: Based on the results of this study, double layer unlocked uterine closure technique is related with better cesarean scar healing as regard [RMT, incidence of CS defect] than single layer unlocked technique. Accordingly, double layer unlocked uterine closure technique deserve to be widely practiced especially that there is no significant variance among the 2 techniques concerning amount of blood loss, the need for further hemostatic suture, post-operative hemoglobin value, post-operative pain and hospital stay.

Disclosure: None to be disclosed

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IJMA



INTERNATIONAL JOURNAL OF MEDICAL ARTS

VOLUME 6, ISSUE 7, JULY 2024

P- ISSN: 2636-4174
E- ISSN: 2682-3780