ORIGINAL ARTICLE

Effect of Single versus Double Layer Suturing of the Uterus on Uterine Healing and Formation of Scar Niche

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Abstract

Background: ***It is common knowledge that every cesarean section(CS) results in the production of uterine scars; 50-70% of individuals experience a cesarean scar deformity as a result of inadequate tissue repair.***

Aim and objectives: ***To evaluate the effect of two suture patterns used in closure of uterine incision during cesarean section and their role in CS niche formation in elective CS.***

Patients and methods: ***The 88 pregnant women who participated in this prospective comparative randomized trial were split into two groups based on the pattern of sutures used to close the uterine incision after a cesarean section. From June to December of 2024, researchers from Al-Hussein and Bab Al-Sharya University Hospital's Obstetrics and Gynecology Department carried out the study.***

Results: ***Fifty percent of patients in the single-layer group and 29.5% in the double-layer group had niche scars, a difference that was statistically significant (p=0.01). However, with a p-value of only 0.09, the median depth of the niche scar was 2.5 mm in the double-layer group and 1.8 mm in the single-layer group. The single-layer group had a median niche scar length of 4.6 mm, whereas the double-layer group had a median length of 2.9 mm (p=0.02). With a p-value of 0.001, the median niche width was 4.2 mm in the single-layer group and 1.9 mm in the double-layer group.***

Conclusion: ***This study found that double-layer uterine closure result in less rates of niche formation, also it was associated with decrease in length and width of scar. While single-layer closure offered the advantage of shorter operative times, it did not appear to increase the risk of immediate postoperative complications in our sample.***

Keywords: Double layer suturing; Uterine healing; Scar niche

1. Introduction

Cesarean sections (CS), which account for an average of 22%–40% of deliveries worldwide, are the most prevalent abdominal surgery technique.[1]

Morris first documented this pouch-like structure in 1995; other names for it include niche or cesarean scar dehiscence. The scar from a prior cesarean section marks its placement on the anterior uterine isthmus.[2]

As the number of CS operations rises, CS defects are more common and can cause infertility, spotting, pelvic pain, and delayed postmenstrual bleeding.[3]

The lower uterine segment (LUS) thins as a result of the obstetric problem known as CS defect. The degree of LUS thinning detected near term is significantly correlated with the likelihood of uterine rupture at birth. At 37 weeks of pregnancy, a lower uterine segment thinner than 3.5 mm increases the likelihood of uterine rupture.[4]

Diagnostic tools for uterine niche issues include transvaginal ultrasonography (two- or three-dimensional), sono-hysterography (two- or three-dimensional), hysteroscopy, hysteron-salpingography, and magnetic resonance imaging (MRI).[5]

To assess the integrity of the uterine wall, 2D transvaginal ultrasonography is utilized first and is the least invasive diagnostic tool. If needed, other tests like SIS or GIS are added to the examination. The CS niche can also be diagnosed with 3D transvaginal ultrasonography.[6]

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The aim of this study is to evaluate the effect of two suture patterns used in closure of uterine incision during CS and their role in cesarean scar niche formation in elective CS.

2. Patients and methods

For this prospective comparative randomized study, researchers randomly assigned 88 pregnant women to one of two groups based on the suture patterns used to close the uterine incision during cesarean sections. Patients were assigned to the intervention group based on these patterns. Every aspect of the intervention is carefully controlled to ensure that the participant groups are as homogeneous as feasible. The research ran from June 2024 to December 2024 at the University Hospitals of Al-Hussein and Bab Al Sharya in the Department of Obstetrics and Gynecology.

A popular way to ensure higher-quality outcomes of clinical trials is to use blinding or randomization to eliminate subjective biases and maximize the validity of the study results. To minimize systematic intervention planning and predictability, the random assignment process made sure that participants were randomly assigned to various treatment groups.

The second primary goal of randomization is to make the intervention and control groups comparable so that discrepancies in outcomes or results may be explained by treatment. (To make sure that neither the researchers nor the patients may affect the study, double-blind randomization is used.).

Inclusion criteria:

Age from20-35years; BMI<30kg/m2; pregnant woman undergo elective cesarean section for first time (PG); the indications for cesarean delivery are, cephalo pelvic disproportion, fetal malpresentation, fetal macrosomia, decreased fetal kicks, IUGR caused by placental insufficiency, preeclampsia and prolonged pre-labor rupture of the membranes; participants have no gynecological complaints before getting pregnant, periods, dysmenorrhea, and persistent pelvic pain are among the symptoms that may be experienced.

Exclusion criteria:

Previous uterine scar; patients with placenta previa; uterine fibroid; congenital uterine malformations; obstructed labour, and fetal distress after failed trial of normal vaginal delivery.

Suture patterns:

Group-A (Double layer closure): double continuous running unlocked sutures in two layers, the first including junction start at decidua & myometrium, taking part of myometrium, while the 2nd includes the rest of the myometrium layers.

Group B (Single-layer closure): single locked suture, including the whole myometrial thickness without decidual involvement, with one to three transverse mattress sutures if needed.

The relationship between type of suture pattern and presence of cesarean scar defect (niche) will be assessed by transvaginal ultrasonography.

Timing:

During the early follicular phase, six months after the CS, when the uterine incision has healed, an evaluation of the uterine scars and the presence of a niche was conducted. This was done because, in the thin endometrium, it may be easier to detect a niche and estimate its depth and size. All ultrasounds were conducted by the same team of highly trained professionals to ensure objectivity.

Assessment:

A transvaginal probe was used, and the following were examined:

The position of the uterus (anteverted or retroverted). Niche evaluation; according to(modified Delphi procedure guidelines), 2019 that involves taking measurements of the following: length, breadth, depth, myometrial thickness above the uterine scar (AMT), residual myometrium (RMT) above the cesarean scar, documentation, and measurement of the branches of the existing niche; The sagittal plane was used to measure the niche's length, depth, and RMT, while the transverse plane was used for measuring its width and branching. If it reaches a depth of 50%-80% of the uterine muscle or if the RMT is less than 2.2mm in TVUS, it is considered to have a large niche.

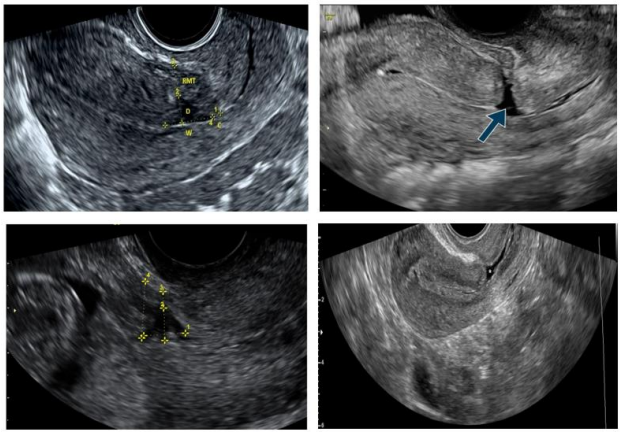

Figure 1. Shows ultrasound uterine niches.

Methods for the diagnosis of niche:

The 2D, 3D US, saline sonohysterography, hysterosalpingography, hysteroscopy, and MRI were used in the diagnosis of niche.

Primary outcome:

The relationship between the type of suture pattern and the presence of a cesarean scar defect (niche).

Secondary outcomes:

Variations in average operating time between

the two sets of patients. Normalized blood loss during caesarean section. Number of packed RBCs units needed. Postoperative complications during the first 24 hours include postpartum hemorrhage. Infection and thromboembolism. Post-cesarean gynecologic sequelae, such as chronic pelvic pain and postmenstrual bleeding. Cost Effectiveness: The total costs of the patients in both groups will be evaluated and then divided by their number, so the average costs of each patient can be evaluated. Then, the two groups will be compared, which will be less costly in terms of efficacy.

Sampling method:

Participants were chosen at random from among women who met the inclusion criteria using a systematic random sampling method. Following the instructions in the randomization table, sixty opaque envelopes were assigned a group and their associated letter was placed inside each envelope. After then, each envelope was sealed and placed in a single box. A computer-generated randomization sheet was utilized for the purpose of randomization in MedCalc© version 13.

Sample size:

The statistical calculator, MedCalc® version 12.3.0.0, was utilized to determine the sample size, power of the study (80% with α error), and 95% confidence interval. Patients were selected among pregnant women attending the Obstetrics and Gynecology Department; a minimal sample size of 88 cases was generated using these values, which correspond to a 5% sample size calculation. Using a randomized controlled trial, we selected the instances.

Ethical considerations:

The patient gave her informed consent before being enrolled in the study after receiving an understandable explanation of the clinical trial's purpose, scope, and potential effects. When the patient's name appeared on any other document, only their initials were recorded in the case report. In order to facilitate record identification, the investigators kept a personal identity list of patients.

The protocol and all associated paperwork were submitted for ethical and research approval by the council of the OB/GYN department at Al Azhar University before the study began, ensuring compliance with any local regulations.

Statistical analysis:

We used SPSS 25.0 for Windows (SPSS Inc., Chicago, IL, USA) and NCSS 12 for Windows (NCSS LCC., Kaysville, UT, USA) to conduct our statistical analysis. For quantitative data that did not follow a normal distribution, the median and range (minimum - maximum) were determined.

while normal distribution quantitative data were presented as mean ± standard deviation (Goldstein and Lumsden). Frequency and percentage were used to express the qualitative data. The following analyses were carried out: Mann-Whitney. If your dependent variable is continuous and non-normally distributed, you can use the U test to compare the two groups' differences. When looking for a correlation between two categorical variables, the chi-square (X2) test—also known as Pearson's chi-square test or the chi-square test of association—is the way to proceed. Fisher. When working with tiny samples, an exact test can be utilized instead of a chi-square test in a two-by-two 2 table to determine statistical significance. When comparing means of more than two variables, a one-way analysis of variance (ANOVA) was employed, provided that the data follow a normal distribution.

3. Results

Table 1. Baseline maternal and obstetrical features of the research participants.

	SINGLE-LAYER GROUP (N = 44)	DOUBLE-LAYER GROUP (N = 44)	P-VALUE
MEAN AGE± SD, YEARS	30.2 ± 5.6	32.4 ± 4.3	0.68
MEAN BODY MASS INDEX, KG/M2	29.34 ± 3.2	30.43 ± 3.6	0.45
MEAN GESTATIONAL AGE AT DELIVERY, WEEK	38.0 ± 2	38.1 ± 2.1	0.87
MEAN BIRTHWEIGHT, IN GRAMS	3431.5 ± 534	3541.4 ± 452	0.09

Transvaginal ultrasonography was used to assess the niche. See table 1 and figures 1-2 for a breakdown of the research groups' mothers' and infants' demographics and health, (table 1; figures 2&3).

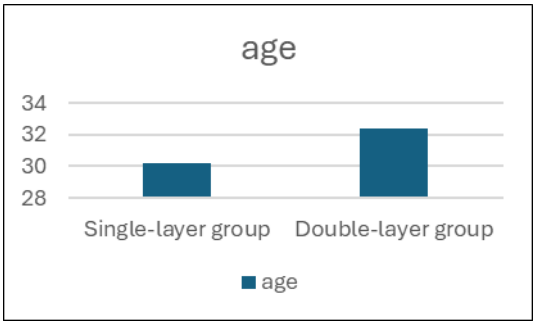

Figure 2. Comparison between both techniques regarding age.

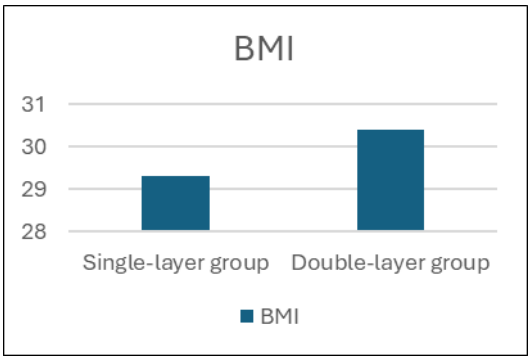

Figure 3. Comparison between both techniques regarding BMI

Table 2. Specifics of each group's caesarean sections.

	SINGLE-LAYER GROUP (N = 44)	DOUBLE-LAYER GROUP (N = 116)
MEDIAN DURATION OF UTERINE CLOSURE, MIN	5 (3-8)	8 (6-14)
MEDIAN OPERATION TIME, MIN (RANGE)	24 (17-40)	35 (26-55)
POST-OPERATIVE 0BLEEDING > 1000 ML	–	1
NEED FOR TRANSFUSION, N (%)	–	1

Fifty percent of patients in the single-layer group and 29.5% in the double-layer group had niche scars, a difference that was statistically significant (p=0.01). Conversely, with a p-value of only 0.09, the median depth of niche scar was 2.5 mm in the double-layer group and 1.8 mm in the single-layer group. The single-layer group had a median niche scar length of 4.6 mm, whereas the double-layer group had a median length of 2.9 mm (p=0.02). With a p-value of 0.001, the median niche width was 4.2 mm in the single-layer group and 1.9 mm in the double-layer group, (tables 2&3).

Table 3. Follow up of Niche scar.

	SINGLE-LAYER GROUP (N = 44)	DOUBLE-LAYER GROUP (N = 44)	P-VALUE
NICHE PRESENCE WITH TVUS, N (%)	22 (50%)	13 (29.5%)	0.01
MEDIAN DEPTH OF NICHE, MM (RANGE)	2.5 (1.5-9.8)	1.8 (1-6.7	0.09
MEDIAN LENGTH OF NICHE, MM (RANGE)	4.6 (1.3-8.9)	2.9 (1.3 - 5.9)	0.02
MEDIAN WIDTH OF NICHE, MM (RANGE)	4.2 (1.2-11.3)	1.9 (1.1-5.8)	0.001

4. Discussion

The rising rates of global cesarean deliveries promote an increasing number of women who are at risk of associated complications. The short-term issues like bleeding and infection are common; there are also significant long-term risks, including uterine rupture, dehiscence, cesarean scar defects, cesarean scar pregnancies, and placental adhesion anomalies.[7]

A cesarean scar defect occurs when the myometrium thins and indents due to inadequate healing at the site of a cesarean incision. While often asymptomatic, some of the consequences that can arise from this condition include irregular or postmenstrual bleeding, persistent pelvic pain, infertility, placenta accreta or previa, rupture of the uterine wall, and ectopic pregnancy resulting from a cesarean scar.[8]

Cesarean scar malformations are common, with an incidence ranging from 19% to 61% following a single cesarean and reaching 100% in mothers with three or more cesarean sections. Many women do not have any symptoms, and healthcare providers may not be fully aware of the problem; thus, these numbers could be understated. One can evaluate the shape of a cesarean scar using ultrasonography, hysteroscopy, or saline infusion sonography (SIS). Surgical procedures such as hysteroscopy, laparotomy, or laparoscopy may be used to treat scar deformities.[9]

Birthweight, gestational age at delivery, parity, age at first pregnancy, and body mass index (BMI) were not significantly different between the two groups of mothers in our study. Our comparisons between the two suture procedures are strengthened by the similarity in baseline characteristics.

The average age of the subjects in our study (30.2±5.6 years for the single-layer group and 32.4 ± 4.3 years for the double-layer group) is similar to that of previous research in this area. For instance, Stegwee et al.,[10] This meta-analysis and comprehensive review of cesarean section closure procedures revealed an average age of 33.5 years.

This agrees with Neethika and Guramrit,[11] who compared two suture techniques: Group A, which used single-layer locked sutures, and Group B, which used double-layer unlocked sutures. The aim was to determine which technique offers better outcomes in preventing isthmocele formation and improving overall uterine scar healing. In terms of age and body mass index, neither group differed significantly from the other.

This was consistent with findings from the research carried out by Yıldız et al.,[12] and Alper et al.,[13] on whose behalf no statistically significant disparities in age or body mass index were detected.

We found that the two groups differed significantly with respect to the specifics of the operations. In comparison to the double-layer group, which took an average of 8 minutes to close the uterus, the single-layer group only needed 5 minutes.

Consistent with other research, including the systematic review by Stegwee et al.,[14] It discovered that more time was saved during operations when only one layer was closed.

Our research also found that the median

surgery time for the single-layer group was 24 minutes, far lower than the 35-minute median operation time for the double-layer group. When it comes to high-volume obstetric units, this eleven-minute variation could have real-world consequences for anesthetic duration, infection risk, and resource consumption.

Contrary to the findings of the current study, Khamees et al.,[15] sought to evaluate uterine scar healing following single- and double-layer suturing. When looking at predicted blood loss and surgery time, they found no substantial variations between the groups.

In another study conducted by Sumigama et al,[16] eight cases involved serious blood loss (>1500 mL), two cases required blood transfusions, and one case involved postoperative vaginal bleeding.

Qayum et al,[17] We set out to evaluate the ultrasonographic results and complication rate of two different uterine closure procedures following a cesarean section: single-layer (SL) and double-layer (DL). According to their findings, the two methods yielded similar outcomes regarding the volume of blood loss.

In our study, the follow-up results of niche scar formation, which is a key focus of our study. The prevalence of niche presence detected by transvaginal ultrasonography (TVUS) was higher in single layer group.

Fifty percent of patients in the single-layer group and 29.5% in the double-layer group had niche scars, a difference that was statistically significant (p=0.01). Conversely, with a p-value of only 0.09, the median depth of the niche scar was 2.5 mm in the double-layer group and 1.8 mm in the single-layer group. The single-layer group had a median niche scar length of 4.6 mm, whereas the double-layer group had a median length of 2.9 mm (p=0.02). With a p-value of 0.001, the median niche width was 4.2 mm in the single-layer group and 1.9 mm in the double-layer group.

This confirms what has been found in earlier research, which indicated that niche prevalence is higher with single-layer closure. Take this example:, Di Spiezio Sardo et al.,[18] found no difference in the rate of cesarean scar abnormalities between protocols that used single-layer or double-layer closure of the uterine incision after a caesarean section.

Recent randomized, prospective investigations in the area have shown results that are consistent with these hypotheses Sevket et al.,[19] In order to measure the healing ratio and RMT as indicators of uterine scar healing six months following CD, they discovered that, following a double-layer closure, the RMT covering the defect was 9.95±1.94 mm, and following a single-layer closure, it was 7.53±2.54 mm (p=0.005). Following a double-layer closure (0.83±0.1) compared to a single-layer closure (0.67±0.1; p=0.004), the average healing ratio was noticeably greater. According to their findings, the likelihood of subpar scar healing after a uterine incision can be reduced by using a double-layer locked/unlocked closure at CD.

Inconsistencies between our results and those of other research show how multifaceted niche formation is, with variables outside suture technique—including surgical strategy, suture material, and patient attributes—possibly playing a role.

Limitations: The discrepancy between our findings and some previous studies highlights the complex nature of niche formation and the potential influence of other factors beyond suture technique, such as the specific surgical approach, suture material, and patient characteristics.

4. Conclusion

Our study found that double-layer uterine closure result in less rates of niche formation, also it was associated with decrease in length and width of scar. Although single-layer closure reduced operating times, our sample did not show any increased risk of acute postoperative problems.

Disclosure

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Authorship

All authors have a substantial contribution to the article

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