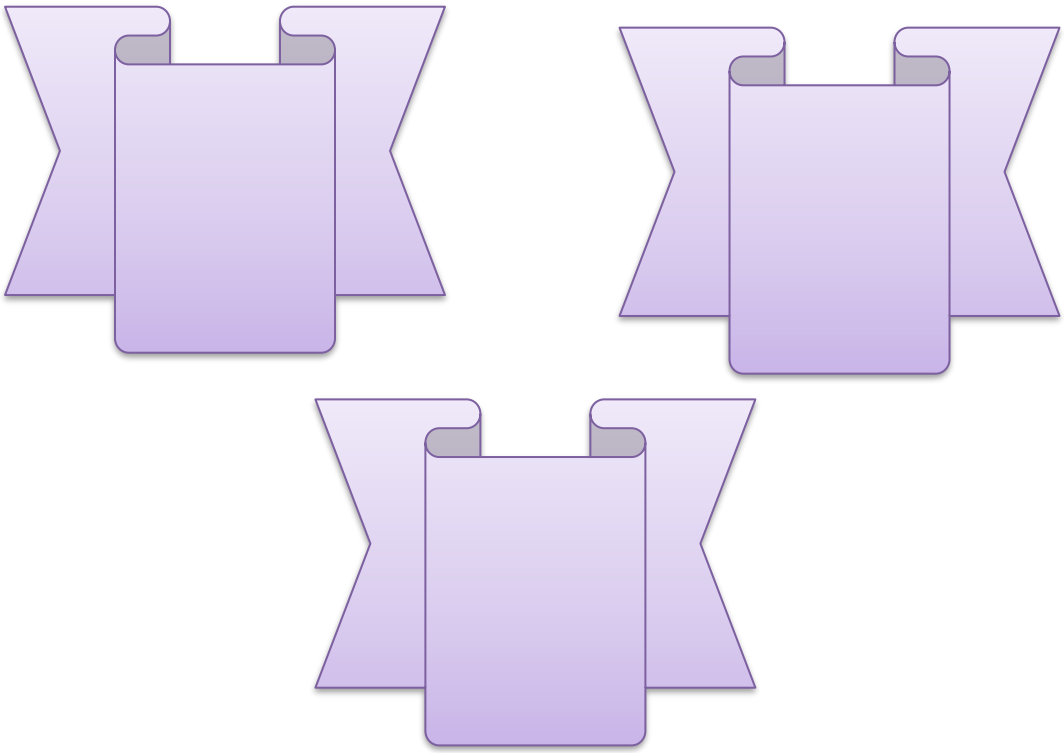
International Journal of Medical Arts

Volume 5, Issue 3, March 2023

https://ijma.journals.ekb.eg/



Print ISSN: 2636-4174

Online ISSN: 2682-3780

Available online at Journal Website
https://ijma.journals.ekb.eg/
Main Subject [Gynecology and Obstetrics]

Original Article

Comparative Study between Purse-String Double-Layer and Classical Closure for Repairing the Uterine Incision During Cesarean Section

Mohamed Elsayed Shenishan *, Mahmoud Farouk Midan, Alaa Eldin Mahmoud Megahed, Hamada Aboelmaaty

Department of Obstetrics and Gynecology, Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt

Article information

Received: 06-12-2022

Accepted: 16-04-2023

DOI: 10.21608/IJMA.2023.179242.1566.

*Corresponding author

Email: ffd3994@gmail.com

Citation: Shenishan ME, Midan MF, Megahed AM, Aboelmaaty H. Comparative Study between Purse-String Double-Layer and Classical Closure for Repairing the Uterine Incision During Cesarean Section. IJMA 2023 March; 5 [3]: 3085-3092. doi: 10.21608/IJMA.2023.179242.1566.

ABSTRACT

Background: Caesarean section rates continue to raise concerns due to their steady rise, especially in middle- and high-income countries.

Aim of the work: The purse string double layer technique [Turan technique] and the conventional double layer method for closing the uterine incision following caesarean section were compared in the postoperative findings of this study.

Patients and Methods: Eighty subjects divided randomly into two groups: Group [I]: pregnant women underwent uterine incision closure by classic double layer technique. Group [II]: pregnant women underwent uterine incision closure by purse string double layer [Turan] technique. Patients were examined and evaluated at the out -patient Gynecology Clinic in Al-Azhar University Hospital [Damietta].

Results: The length of the uterine closure and the overall operation duration, which were greater in Group II, as well as the length of the Kerr incision after suturing [cm], which was shown to be longer in Group I, were both highly statistically significant differences between the two groups. Additionally, there were more statistically significant differences between the two groups in terms of the length of the Kerr incision before suturing [cm], the number of patients who needed additional sutures for haemostasis, the levels of haemoglobin before and after surgery, the amount of blood lost during the procedure, and the level of pain after the procedure.

Conclusion: Based on the results of this study, Turan technique associated with better cesarean scar healing as regard [RMT, incidence of CS defect, scar length] than classic double layer technique.

Keywords: Cesarean Section; Purse-string; Double-layer.

INTRODUCTION

Human civilization has always included caesarean deliveries; various modifications have been made to the procedure [1]. Because of the consistent rise in caesarean section rates, concern is felt throughout the world. Caesarean delivery rates have risen, especially in middle- and high-income nations, and currently approach 30% in several developed nations [2].

Despite the fact that caesarean sections are often performed on women around the world, choosing the most suitable surgical method is difficult due to a lack of knowledge [3]. Numerous risk factors, such as the method of uterine closure, the quantity of caesarean sections, the gestational age, tension on the wound suture, the location of the uterine incision, the uterus' flexion, the failure to properly coapt divided fibres, and single or multiple foetal gestations, can affect the integrity of a caesarean scar [4].

A caesarean scar defect is a myometrial discontinuity at the location of a prior caesarean section scar, also known as a deficient uterine scar or a scar dehiscence following a caesarean section [5]. Abnormalities in the caesarean scar can cause a number of clinical problems, such as dysmenorrhea, irregular uterine bleeding when not pregnant, placenta accreta, and ectopic pregnancy at the caesarean scar site. It is thought that these problems are related to the poor uterine scar healing following caesarean procedures [6].

Methods for closing the uterine incision must be considered in terms of potential benefits and dangers in order to offer caesarean section patients with the best surgical treatment feasible. The two most crucial elements affecting the integrity of the incision are the surgical suturing technique and the mechanical load on the surgical wound [7, 8]. To compare the post-operative results of the double layer purse-string approach [Turan technique] and the conventional double layer strategy, we developed this prospective randomised clinical research.

PATIENTS AND METHODS

Sample size: 90% power, 5% significance level, 5% error margin, and 95% confidence level are required. In the group using the traditional double layer technique, it was predicted that 38 subjects would be needed. For the Turan technique group, it was predicted that 38 subjects would be needed. Pregnant women in group [I] underwent traditional double-layer uterine incision closure. Pregnant women in group [II] had purse string double layer [Turan] uterine incision closure. Patients were examined and evaluated at Al-Azhar University Hospital's outpatient gynaecology clinic [New Damietta].

Inclusion Criteria: Primary cesarean section, gestational age > 34 weeks and singleton pregnancy.

Exclusion criteria: women who were pregnant yet chose not to participate, a number of pregnancies before caesarean delivery, less than 10 g/dl of haemoglobin before surgery those with diabetes, history of uterus surgery, including myomectomy and hysterotomies.

Methods: Ultrasound was done to ensure viability, determine the gestational age, the presenting part, the position of the placenta, the amniotic fluid and the estimated fetal weight using convex transducer. Routine preoperative investigations included CBC, PT and ABO and Rh typing, preoperative preparation, pre-operative prophylactic antibiotic, operation time [min], time of closure of uterus [min], Kerr incision length [cm] before and after suturing with sterile sound, the number of sutures used, and whether further sutures were required for haemostasis, Blood loss using gravimetric measurement [9].

Surgical technique [All the caesareans performed by the same surgeon]: Spinal anesthesia was used in all cesarean sections, Foley uretheral catheter was inserted, standard abdominal preparation by povidone-iodine scrub and toweling. Abdomen was incised using Pfannenstiel technique, incision of sub-cutaneous tissue and rectus sheath, separation of the two recti, bladder flap was done, uterus was incised using Kerr technique [10]. Fetus extracted aided by gentle transabdominal fundal pressure and placenta was delivered, exteriorization of the uterus.

In group [I], with continuous double-layer sutures made from No. 1 Vicryl, the decidual layer as well as the uterine incision were sewn together [11]. In group [II], the uterine incision was stitched up in two layers, with the first layer continuously running through the line between the inner and outer myometriums between the

decidua and the visceral peritoneum. After then, the initial string was wrapped around itself and knotted at the beginning. A single No. 1 vicryl figure-of-eight suture was used to close the hole in the centre of the uterine incision after the double-layered purse string closure [8].

When necessary, more sutures for haemostasis were applied. After all caesarean sections achieved satisfactory haemostasis, the parietals were closed, and all patients were discharged the following day.

Post-Operative evaluation: Pain following surgery [12], haemoglobin level on the first postoperative day [g/dl]. The evaluation of the scar integrity from a caesarean section [8, 13] included measuring the sagittal myometrial thickness and the length of the caesarean scar in the transverse section. The residual myometrial thickness was measured as the distance between the apex of the hypoechoic triangle and the surface of the anterior uterine wall [RMT]. RMT, then, refers to the thickness of the myometrial layer where the hysterotomy was performed. Only in situations where the CS scars had completely healed were the transverse and longitudinal sections to check the incision's integrity. If cesarean scar defect is present its height was recorded, the height of cesarean scar defect all this were assessed 3- and 6-month post-operative.

Statistical analysis of data was done as follows. Descriptive statistics e.g. number, percentage, mean, standard deviation. Median was used as a measure of central tendency. Range was used as a measure of dispersion. Analytic statistics were used to find out the possible association between studied factors and the targeted disease.

RESULTS

The study included 80 pregnant women with primary caesarean section. Five patients were lost to follow up [3 patients in Group I and 2 patients in Group II].

Age, gravity, gestational age in weeks, parity, and other demographic factors did not statistically differ between the two groups [Table 1].

As illustrated in table [2], there was a highly statistically significant difference between the two groups regarding the whole duration of the operation and the duration of uterine closure [$p < 0.05$], both are longer in group II as compared to group I.

There was no statistically significant difference between the two groups regarding Kerr incision length before suturing [$p > 0.05$], while there is statistically significant difference between them regarding Kerr incision length after suturing which was proved longer in the first group[$p < 0.05$] [Table 3].

Table [4] showed a significant statistical difference between the two groups regarding residual myometrial thickness and uterine incision length three months post-operative. In group II the residual material sickness is thicker, and the incision length is shorter than that of group I.

Figure [1] showed that there was no statistically significant difference between the two groups for the height of the uterine incision defect, but there was a significant difference between the two groups for residual myometrial thickness and uterine incision length six months after surgery.

Table [1]: Demographic data of all studied pregnant women

Data		[n=75]
Age [years]	Mean ± SD [Range] Median	28.59±4.71 [18 – 39] 29
Gravity	Mean ± SD [Range] Median	2.31±1.27 [1-6] 2
Gestational age[weeks]	Mean ± SD [Range] Median	38.64±1.61 [35 – 42] 39
Parity	Primigravida Multigravida	24 [32%] 51 [68%]
Indication of CS	CPD Failed induction Breech presentation	9 [12%] 44 [58.7%] 22 [29.3%]

Table [2]: Comparison between group I and II regarding operation time and uterine incision closure time

Data		Group I [n=37]	Group II [n=38]	Test	p-value
Operation time [min]	Mean ± SD Range Median	37.16 ± 3.91 30-45 37	39.74 ± 2.88 36-47 39	t = 3.242	**0.002***
Uterine closure time [min]	Mean ± SD Range Median	13.73 ± 2.33 10-18 14	16.76 ± 2.39 11-20 17	Z = 4.779	**< 0.001***

t: Independent Samples t-test; Z: Mann-Whitney U test; *: statistically significance

Table [3]: Comparison between group I and II regarding Kerr incision length before and after suturing [cm]

Data	Group I [n=37]	Group II [n=38]	Test	p-value
Kerr incision length before suturing [cm]				
Mean ± SD	7.97 ±1.09	7.89 ±1.11	Z –0.308	0.758
Range	6-10	6-10		
Median	8	8		
Kerr incision length after suturing [cm]				
Mean ± SD	5.74 ±1.15	4.23 ± 0.99	Z – 5.121	**< 0.001***
Range	3-8	3-6.5		
Median	6	4		

Z: Mann-Whitney U test*: statistically significance

Table [4]: Comparison between group I and II regarding ultrasonographic findings 3 months postoperative

Data		Group I [n=37]	Group II [n=38]	Test	p-value
Residual myometrial thickness [mm]	Mean ± SD Range Median	6.7±0.75 5.5-7.9 7	7.64±0.58 6.4 - 8.6 7.85	Z = 4.96	**< 0.001***
Uterine incision length [mm]	Mean ± SD Range Median	25.51 ± 3.82 17.5-32 26	19.94 ± 2.23 17-24 19.55	Z = 5.8	**< 0.001***
Uterine incision defect	Present Absent	11 [29.7%] 26 [70.3%]	7 [18.4%] 31 [71.2%]	$\chi^2 = 1.314$	**0.252**
Hight of uterine incision defect [mm]	Mean ± SD Range Median	0.51±1.04 0-5 0	0.42±0.98 0-4 0	Z – 0.89	**0.372**

Z: Mann Whitney U test, χ^2: Chi Square test *: statistically significance

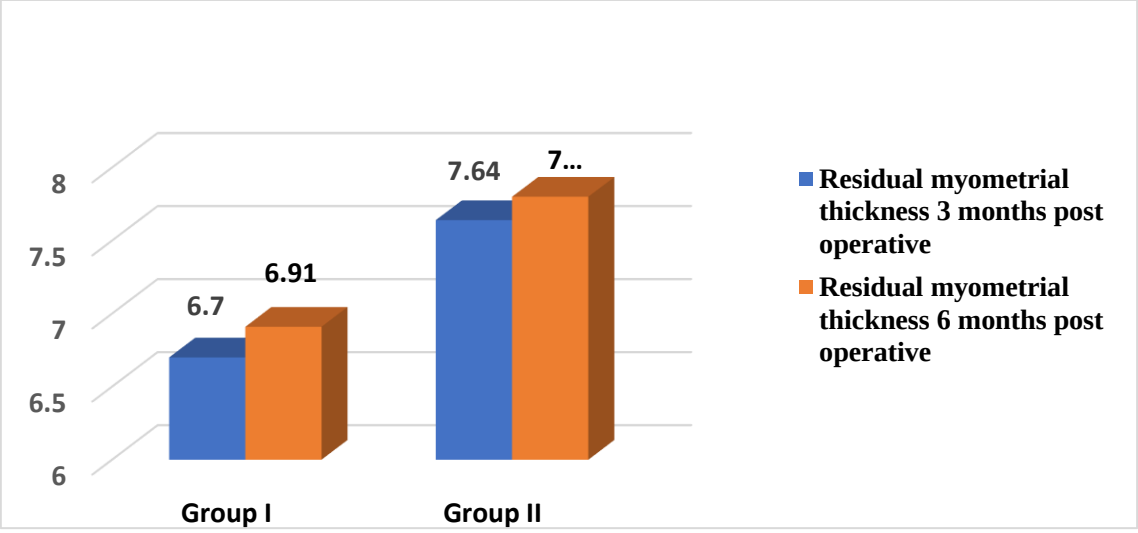


Figure [1]: Comparison between Group I and group II regarding uterine incision length [mm] by ultrasound 3- and 6-months post-operative

DISCUSSION

One of the most frequently used surgical procedures globally is the caesarean section [CS] [14]. Various caesarean section techniques have been created to speed up the process, make it easier, work better, save money, lessen the risk of problems, lower postoperative morbidity, and shorten hospital stays. Despite the fact that surgical techniques vary from surgeon to surgeon and that only a small subset of these techniques have been evaluated in randomised controlled trials, the uterine incision closure technique is crucial for successful healing and preventing future complications from caesarean deliveries [15]. According to a number of studies, uterine incision issues occur 20–60% of the time with standard uterine closure treatments. It makes sense to assume that inadequate scar repair contributes to aberrant uterine scars. Mechanical strain on the lower uterine segment may be the cause of this subpar restoration since it could reduce blood supply to and oxygenation of the tissues that are healing. The process of healing a wound depends on the oxygenation of the tissue [8].

Uterine incision defects have been associated with placental issues such as placenta previa and accrete, irregular uterine haemorrhage, post-operative pelvic adhesions, and ectopic pregnancy at the site of a caesarean section, as well as uterine rupture during a subsequent pregnancy, dysmenorrhea between pregnancies and unusual uterine haemorrhage are also common [16]. In a study, **Turan *et al.*** compared the Turan technique to the traditional two-layer strategy to assess the short- and long-term impacts of caesarean procedures [8]. Patients were randomised at random to either the double-layer purse-string technique arm [study group, 40 patients] or the conventional double-layer strategy [control group, 40 patients]. In order to assess immediate results, all patients were scheduled for complete transvaginal ultrasound scans three and six months after treatment. At this point, a wedge-shaped uterine scar defect [uterine scar defect] was identified. An ultrasonogram revealed uterine scar defects in 7 patients in the research group and 11 in the control group [or 29.7% of all scar defects].

The measurement and reporting of the uterine incision's length revealed that it was 21.4 mm in the study group and 26.3 mm in the control group. In the current study, we found that the length of the uterine incision is shorter when using the purse string approach than when using the traditional double-layered technique, and the frequency of scar defects was lower [18.4% [7/40] vs. 29.7% [11/40]]. [26 mm vs. 19.5 mm] These findings are in line with those that **Turan *et al.* [8]**. The Turan method, which is very significant clinically, considerably decreased the rate of uterine scar abnormalities in both patients with a history of past caesarean sections and in patients who had primary caesarean sections. To do this, the mechanical tension at the Kerr incision site was decreased [8].

Voet *et al.* [17] observed that 50–60% of scars also become deficient in studies about uterine scar defect conducted at a later time [12 weeks or more], when menstruation resumes following caesarean section, which is further supported in a systematic review and meta-analysis. The uterus Kerr incision line's fibrotic tissue could be the cause of the healing tissues' poor blood flow and oxygenation, which results in uterine scar defect. Because all of the patients in this study had primary caesarean sections, there were fewer cases of caesarean scar defects than in the previous investigations. According to earlier research, the incidence of caesarean scar defects in patients who had primary caesarean sections ranges from 10 to 30 percent, which is consistent with the findings of the current study. Saline infusion sonography was used by **Regnard *et al.*** [18] to evaluate 33 patients who had previously undergone caesarean deliveries. It took an average of 5.5 months from the day of the SIS evaluation to the day of birth. It was shown that 57.5% of the patients had a niche. The outcome of the current investigation was 17.5%, which is lower than the results previously reported by **Regnard *et al.*** [18]; this may be because the methods used for diagnosis were different. Six months after caesarean delivery, 108 patients had their caesarean scars examined by **Vikhareva Osser *et al.*** [19] using ultrasonography and SIS. It was discovered that SIS was more effective than ultrasonography at identifying the scar defect. Furthermore, when SIS was carried out, flaws that were not visible on ultrasonography became apparent. **Glavind *et al.*** studied retrospectively 149 women who had recently undergone caesarean deliveries and had a single or double layered closure of their uterine scar [20]. Along with measuring the scar defect's length, breadth, and depth, the residual myometrial thickness [RMT] above it was also

determined. In women who underwent double-layer closure, the average defect diameter was 4.8 mm. The findings of this analysis are in agreement with those that **Glavind *et al.*** [20]. The current study's findings were quite similar to those of **Bennich *et al.*** [21] who contrasted the single layer approach and double layer technique in terms of the difference in RMT at discharge and five months following delivery. After five months postpartum, RMT in the double layer uterine closure procedure was 5.7 2.2 mm.

The RMT in this study was at variance with **Tekiner *et al.*** [22] who conducted a prospective cross-sectional study on 280 women with primary CS comparing single and double layer uterine closure technique and found that the RMT in double layer uterine closure technique was 9.1 ± 2.2 mm; the result for the current study was 6.81± 0.56 mm which was less than reported previously by **Tekiner *et al.*** [22] which may be due to the difference in the duration between delivery and evaluation of the CS scar as **Tekiner *et al.*** [22] evaluated the scar 6 months after the delivery.

Hayakawa *et al.* [23] found the incidence of cesarean scar defects observed on transvaginal ultrasound one month after surgery among the cases with double layer closure group is 15 %. The incidence recorded in this study [27 %] was more than reported in **Hayakawa *et al.*** [23] which may be due to the difference in the sample size between the two studies.

Additionally, the present study measurement for RMT in classic double layer group has been found compatible with those of **Roberge *et al.*** [24] who evaluated the impact of 3 techniques of uterine closure after cesarean delivery on uterine scar healing in a randomized controlled trial. The Primary outcome was residual myometrial thickness [RMT] at the site of the scar, measured by transvaginal ultrasound 6 months after delivery and the result for the double-layer closure with unlocked first layer was 6.1 ± 2.2 mm which is compatible with the result of the present study.

In order to compare the caesarean scars seen on SIS, **Sevket *et al.*** [25] looked at 36 patients who underwent either single-layered or double-layered closure of their uterine wounds six months after giving birth. The results of the current investigation did not match with their findings. After a double-layer closure, they estimated the RMT to be 9.95 1.94 mm, which is larger than the result of the current study and may be explained by the difference in time between delivery and the scar measurement. The development of caesarean scar defects is not significantly different between the two forms of uterine incision closure [single vs. double], it is important to keep in mind. Important randomised studies on caesarean section surgical techniques, CORONIS and CAESAR, offered critical information to inform clinical practise [26, 27]. The NICE guidelines from 2011 and its modifications from 2012 and 2014 still recommend double layer closure of the uterine incision, especially for women who want several children and elect trial of labour following caesarean [TOLAC] [28].

Yasmin *et al.* [29] The number of patients who experienced scar dehiscence was reported to be 14%, and the scar thickness at 3 months in the classic double layer group was 14.58 mm, which is greater than that reported in this study. This study compared the effects of various suturing techniques in repeat caesarean sections regarding a variety of terms. The outcome of the current investigation is consistent with that which was reported in **Yasmin *et al.*** [29].

Inability to repeat ultrasonographic evaluation of the uterine scar at a later date, as well as longer follow up of patients through their subsequent pregnancies to record obstetric outcome constitute unintended limitations of the current study However, a previous systematic review by **Roberge *et al.*** [13] has reported no change in the rate of scar defect when evaluated after three months compared to the early scanning.

Menada *et al.* [30] revealed that whether ultrasonography was done three to twelve months after surgery, one to five years after surgery, or ten years after surgery, the prevalence of caesarean scar abnormalities was identical. These results indicate that uterine incisions are healed by the third month following surgery.

The blood loss during a caesarean section must be minimised. There was no difference between the double layer technique used in this series and the double layer purse string approach in terms of the amount of blood lost, the postoperative haemoglobin value, or the requirement for additional sutures.

In regard to blood loss during cesarean section, previous studies report contradictory findings with some reported less blood loss with single layer closure compared to double layer closure [11, 27], which is refused by others [13, 26].

The need for additional suture in classic double layer group in the current study was 21.6% which is much less than reported in **Turan *et al.*** [8] which may be due to the difference in sample size between the two studies.

Conclusion: Based on the results of this study, Turan technique associated with better cesarean scar healing as regard [RMT, incidence of CS defect, scar length] than classic double layer technique. Accordingly, given that there is little difference in the volume of blood lost between the two approaches, the Turan technique deserves to be widely used, the need for further hemostatic suture, post-operative hemoglobin value and post-operative pain.

Conflict of Interest and Financial Disclosure: None.

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International Journal of Medical Arts

https://ijma.journals.ekb.eg/
Print ISSN: 2636-4174
Online ISSN: 2682-3780