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CLINICAL ARTICLE

Hydrosonographic assessment of the effects of 2 different suturing techniques on healing of the uterine scar after cesarean delivery ☆

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ABSTRACT

Objective: To compare the effects of 2 suturing techniques (single versus double layer) on healing of the uterine scar after a cesarean delivery. *Methods:* In the present randomized, prospective study, 36 women with a term pregnancy who had an elective cesarean delivery were randomly assigned to closure of the uterine incision with a single-layer locked suture or with a double-layer locked/unlocked suture. Six months after the operation, the integrity of the cesarean scar at the uterine incision site was assessed by hydrosonography. The healing ratio and the thickness of the residual myometrium covering the defect were calculated as markers of uterine scar healing. *Results:* There were no significant differences between the groups in terms of estimated blood loss, operation time, or additional hemostatic suture. However, the mean thickness of the residual myometrium covering the defect was 9.95 ± 1.94 mm after a double-layer closure and 7.53 ± 2.54 mm after a single-layer closure ($P = 0.005$). The mean healing ratio was significantly higher after a double-layer closure (0.83 ± 0.10) than after a single-layer closure (0.67 ± 0.15; $P = 0.004$). *Conclusion:* A double-layer locked/unlocked closure of the uterine incision at cesarean delivery decreases the risk of poor uterine scar healing.

1. Introduction

Cesarean delivery is one of the most common operations undertaken worldwide. Because its rate is constantly increasing, the number of women with uterine scars is also rising. A scar defect is a wedge-shaped distortion at the uterine incision site, a well-known phenomenon reported by various authors [1–7] using radiologic, ultrasonographic, endoscopic, and histologic methods. These defects reflect poor uterine scar healing and have been implicated as an etiologic factor in clinical problems such as rupture of the uterus during a subsequent pregnancy [8,9], ectopic pregnancy at the cesarean delivery scar [10,11], cesarean scar endometriosis [12], secondary infertility [13,14], postmenstrual spotting [15], and dysmenorrhea [4].

In almost any surgical wound, the suturing technique and the mechanical forces affecting the wound area are the main determinants of the ultimate integrity of the incision site. Previous studies have found no association between a particular uterotomy closure technique and poor uterine scar healing [16]. The present prospective, randomized study was designed to analyze the effects of single-layer and double-layer closure of the uterine incision on cesarean scar formation.

2. Materials and methods

The present prospective, randomized cohort study was conducted at the Department of Obstetrics and Gynecology, Bezmialem Vakif University, Istanbul, Turkey, from January 1, 2012, to February 28, 2013. The exclusion criteria were a history of previous uterine surgery, multiple pregnancies, prematurity (pregnancy duration 36 weeks or less), cervical dilatation of more than 5 cm, and continuation of active labor for more than 5 hours [17]. The study was approved by the Research and Ethics Committee of Bezmialem Vakif University Hospital, and written informed consent was obtained from all participants. Random Number Generator version 1.0 (Segobit Software, Issaquah, WA, USA) was used to randomly assign the participants in a 1:1 ratio to single-layer or double-layer closure of the uterine incision.

All cesarean deliveries were performed under endotracheal general anesthesia using a slightly modified Misgav Ladach technique [18]. After delivery of the fetus and removal of the placenta, the internal cervical ostium of patients with a closed cervix was dilated digitally by introducing a forefinger into the cervical canal to form an open passage to the vagina [19]. In patients randomly assigned to have a single-layer closure, a holding stitch stabilized the right corner; the whole thickness

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of the uterine wall (including the endometrium) was then sutured with a single-layer continuous locking stitch using Vicryl 1.0 (Ethicon, Somerville, NJ, USA). Patients randomly assigned to a double-layer closure had an initial closure that was identical to the single-layer closure described earlier. An additional layer of Vicryl 1.0 suture with a continuous unlocked stitch was then used to imbricate the first layer. Additional single sutures for hemostasis were added as required in both groups. The surgical technique included exteriorization of the uterus and visceral and parietal peritonization, apposition of the rectus musculature, and closing of the subdermal space in all patients (performed by S.A.).

Every patient received a prophylactic dose of antibiotics (1 g intramuscular cefazolin sodium). An intravenous infusion of 20 U of oxytocin was administered intraoperatively and again during the early postoperative period.

All patients started breastfeeding during the early postoperative period with the help of a nurse who specialized in the care of newborns. Each patient was discharged within 3 days and scheduled for a saline contrast hydrosonography (instillation of saline into the uterine cavity during scanning) at 6 months after the cesarean delivery [20].

The hydrosonographic examinations were performed with a 7-MHz covered ultrasound vaginal probe (Voluson 730 Expert; GE Medical Systems, Zipf, Austria) after complete emptying of the bladder [21]. The ultrasound examiner (O.S.) was blinded to the closure technique. The incision site was viewed longitudinally. In all women, 3 parameters were measured: the thickness of the residual myometrium covering the scar, the thickness of the anterior myometrium adjacent to the scar, and the thickness of the posterior uterine wall at the level of the uterine incision (Figs. 1 and 2). A scar defect was defined as a deviation of at least 1 mm from the full thickness of the anterior uterine wall as measured on the ultrasound image. The healing ratio was calculated as the thickness of the residual myometrium covering the defect, divided by the sum of the thickness of the residual myometrium covering the defect and the height of the wedge-shaped defect.

The statistical analysis was performed with SPSS version 10.7.0 (IBM, Armonk, NY, USA). Continuous variables with normal distribution were compared with the Fisher exact test. All categoric variables were compared with the Mann–Whitney *U* test. $P < 0.05$ was considered statistically significant.

3. Results

The study included 36 patients, with 18 assigned to single-layer closure and 18 assigned to double-layer closure. In total, 13 patients in the single-layer group and 2 patients in the double-layer group were lost at follow-up because the patients had been referred to the study hospital from different cities in the region. The demographic variables—mean age, pregnancy duration, number of prior vaginal deliveries, duration of active labor, cervical dilatation at during cesarean delivery, and birth weight—were similar in the 2 groups (Table 1).

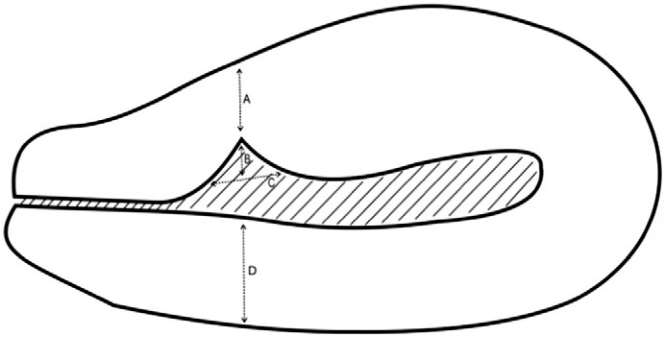

Fig. 1. Healing ratio. A. Thickness of the residual myometrium covering the defect. B. Height of the defect. C. Length of the defect. D. Posterior wall thickness.

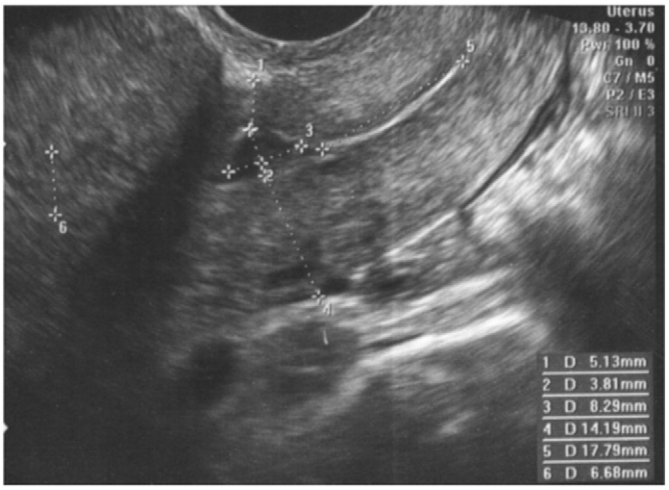

Fig. 2. Sonographic appearance of a poorly healed uterine scar following a cesarean incision. 1. Thickness of the residual myometrium covering the defect. 2. Height of the defect. 3. Length of the defect. 4. Posterior wall thickness. 5. Thickness of the endometrium. 6. Length of the cervix.

Estimated blood loss, duration of surgery, and number of additional hemostatic sutures were not significantly different between the groups (Table 2). However, the mean thickness of the residual myometrium covering the defect differed significantly (double-layer closure, 9.95 ± 1.94 mm; single-layer closure, 7.53 ± 2.54 mm; $P = 0.005$). Moreover, the mean healing ratio was significantly higher in the group with double-layer closure (0.83 ± 0.10) than in the single-layer closure group (0.67 ± 0.15, $P = 0.004$) (Table 2).

4. Discussion

The reasons for poor healing of a uterine incision following cesarean delivery remain unknown; however, known risk factors for poor healing include the number of previous cesarean deliveries, maternal age, position of the uterus, trial of labor, induction of labor, and type and technique of the uterus closure [17]. A systematic review [16] of 21 studies found that the prevalence of a uterine scar defect varied between 20% and 86% with a median of 56%. This variability may be attributable to interobserver variability, differences in the indications for cesarean delivery, and differences in the postoperative evaluations (different postoperative time intervals and different imaging techniques) [2,7,22,23].

In the present study, hydrosonographic examination at 6 months after cesarean delivery was used to compare the cesarean scar formation with 2 different surgical techniques, namely double-layer uterine closure versus single-layer uterine closure. Even the smallest deviations from the normal shape of the anterior isthmic wall are better evaluated by hysterosonography than by transvaginal ultrasound

Table 1
Demographic characteristics of the participants at delivery.[a]

Parameter	Single-layer closure (n = 15)	Double-layer closure (n = 16)	*P* value
Maternal age, y	29.7 ± 6.5	29.4 ± 7.3	0.781
Pregnancy duration at cesarean delivery, wk	38.6 ± 0.8	39.0 ± 1.2	0.340
Number of previous vaginal deliveries	0.7 ± 1.4	0.9 ± 1.3	0.469
Duration of active labor, h[b]	0.7 ± 1.2	0.5 ± 0.9	0.520
Cervical dilatation at cesarean delivery, cm	2.0 ± 1.5	2.2 ± 1.4	0.653
Birth weight, g	3443 ± 432	3388 ± 380	0.453

[a] Values are given as mean ± SD.
[b] Number of hours with regular contractions.