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*Original Article*

# A comparison of the effects of two different treatment methods on cesarean section scar diverticulum: the surgical repair of cesarean scars via combined laparoscopy and hysteroscopy vs. cyclic estrogen/progesterone therapy

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**Abstract:** Objective: In Obstetrics and Gynecology Hospital of Fudan University, the surgical approach scar excision and repair by laparoscopy combined hysteroscopy has been carried out and achieved good results. This study compared it with estrogen and progesterone cycle therapy to explore the value of it. Methods: From February 2009 to January 2012, the 145 patient has been collected and been divided into laparoscopy combined hysteroscopy group and the estrogen and progesterone cycle therapy group. The improvement of vaginal bleeding and wound healing situation etc were analyzed. Results: The rate of incision healing well in the study group accounted for 73.5%, and the patients monthly vaginal bleeding time ≤7 days accounted for 38.8%, and that for 8-14 days accounted for 51%. In control group incision defect had no significant improvement, and the rates were 8.5% and 21% respectively. The differences between two groups were significant. Conclusion: The effectiveness and thoroughness of the surgery were significantly higher than estrogen and progesterone cycle therapy, so the method should be widely applied.

**Keywords:** Cesarean section scar diverticulum, combined laparoscopy and hysteroscopy therapy, cyclic estrogen/progesterone therapy

## Introduction

The endometrium and myometrium are prone to protrusion as a result of cesarean section incision, which is referred to as Cesarean section scar diverticulum (CSSD). This condition carries long-term sequelae, for example abnormal uterine bleeding or abdominal pain, which can adversely affect subsequent pregnancies. Additionally, pregnancy in the diverticulum increases the hazard of uterine scar rupture, jeopardize the life of both the mother and embryo. In China, due to the high rates of cesarean sections recently [1], the incidences of CSSD has significantly increased, which has become a common disorder treated by gynecology clinics.

To explore more effective therapy for CSSD, improve life quality of patients, our hospital has screened a wide variety of approaches for many years. At present, two main clinical treatments for this disease are utilized in our hospital: estrogen and progesterone cycle therapy (EPT) and scar excision and repair by laparoscopy combined hysteroscopy (LHER). In practice, we have found that conservative drug therapy alone exhibited low efficacy; in particular, the

CSSD defect could not be repaired, and vaginal bleeding recurred after discontinuing the drug therapy [2]. The newer treatment of LHER has been reported that in women with cesarean section scar defects, it has achieved satisfactory short- and long-term effects.

In this study, cohort analysis was employed to compare this surgical method and conservative cyclic drug therapy with respect to efficacy and relevant conditions. This analysis suggested that the surgical approach is superior to EPT in many respects and should therefore be clinically applied selectively.

## Materials and methods

### *Patients*

Study participants were drawn from the group of patients with CSSD who received treatment in the Obstetrics and Gynecology Hospital of Fudan University between February 2009 and January 2012. The inclusion criteria were (1) a history of a previous cesarean section; (2) the presence of a defect in the lower segment muscle of the uterine anterior wall observed by B-mode ultrasound; and (3) irregular vaginal bleeding or abdominal pain between menstrual periods. The exclusion criteria were (1) the presence of other uterine lesions or potential causes of irregular bleeding; (2) the inability to eliminate the possibility of endocrine disorders; and (3) the presence of contraindications for laparoscopic surgery, including dysfunction of important organs.

In accordance with the above criteria, 145 patients voluntarily entered either the group treated with the LHER (the experimental group, 98 cases) or the EPT (the control group, 47 cases). This study had been approved by the medical ethics committee of the Obstetrics and Gynecology Hospital of Fudan University, and the patients or their family members had signed the informed consent to treatment.

### *Diagnosis*

Patients in both groups were diagnosed in the ultrasound center of our hospital using transvaginal color Doppler ultrasound (using a vaginal ultrasound probe with a frequency of 6 MHz). The ultrasonography revealed a dark area of fluid in the cesarean incision muscle at the lower segment of the anterior uterus; this area was triangular or U-shaped and was anechoic or hypoechoic.

### *Treatment*

Based on their group assignment, patients received either surgical LHER or EPT medication.

*LHER:* The bladder peritoneal fold was opened, and the bladder was pushed down to expose the lower uterine segment until the anterior wall of the cervix by laparoscopy. A hysteroscope was inserted into the uterine cavity, and the position and size of the diverticulum were observed. Under the guidance of light provided by the hysteroscope, the laparoscope was used to determine the scope and position of the weakness. The scar tissue in the weakness area was cut by an ultrasonic scalpel with coagulation until the edges of the normal tissue were reached. Then the incision was sutured, and the bladder peritoneal fold was sutured discontinuously. Finally, the diverticulum repaired was observed with the hysteroscope, and the translucence of the uterine wall was assessed with laparoscope.

*EPT:* In accordance with the patient's menstrual cycle, a chosen short-acting oral contraceptive, such as Marvelon (Ethinyl estradiol desogestrel tablets) one tablet per day or Diane-35 (Ethinyl estradiol cyproterone tablets) one tablet per day taken from 1-5th day of the menstrual cycle, was administered.

### *Follow-up*

All patients received regular follow-up for at least one year. The follow-up time performed at 1, 6, 12th month after the treatment. The follow-up contents included the status of the subsequent pregnancy (could pregnancy or not) after the CSSD treatment, recovery of menstruation and abdominal pain. Compared with menstruation before treatment, the recovery of post-treatment menstruation could be defined as returned to normal (the typical length of time between the first day of one period and the first day of the next was 21 to 45 days in young women, and 21 to 31 days in adults), no change (the length of time was the same as before), increased menses (length of time was shorter compared with before). The chance of abdomi-

**Table 1.** Comparison of the demographic and clinical characteristics between the study and control groups

| Items | Study group* (n=98) | Control group* (n=47) | *P* value** |
|---|---|---|---|
| Age (years) | | | 0.890 |
| ≤30 | 22 (22.4) | 10 (21.3) | |
| 31-40 | 69 (70.4) | 33 (70.2) | |
| >40 | 7 (7.1) | 4 (8.5) | |
| Gravidity (times) | | | 0.698 |
| ≤3 | 68 (69.4) | 34 (72.3) | |
| 4-6 | 26 (26.5) | 11 (23.4) | |
| >6 | 4 (4.1) | 2 (4.3) | |
| Parity (times) | | | 0.464 |
| 1 | 68 (69.4) | 35 (74.5) | |
| 2 | 26 (26.5) | 10 (21.3) | |
| 3 | 4 (4.1) | 2 (4.2) | |
| Years since the last cesarean section | | | 0.723 |
| ≤1 | 67 (68.4) | 31 (66) | |
| 1-3 | 27 (27.6) | 14 (29.7) | |
| >3 | 4 (4) | 2 (4.3) | |
| Symptoms | | | 0.858 |
| Vaginal bleeding | 79 (80.6) | 38 (80.9) | |
| Abdominal pain | 8 (8.2) | 4 (8.5) | |
| Vaginal bleeding + abdominal pain | 11 (11.2) | 5 (10.6) | |
| Duration of vaginal bleeding (days) | | | 0.674 |
| ≤7 | 5 (5.1) | 2 (4.3) | |
| 8-14 | 42 (42.9) | 23 (48.9) | |
| >14 | 51 (52.0) | 22 (46.8) | |
| The day of maximal vaginal bleeding (mL/day) | | | 0.394 |
| ≤30 | 11 (11.2) | 7 (14.9) | |
| 31-50 | 81 (82.7) | 38 (80.8) | |
| >50 | 6 (6.1) | 2 (4.3) | |
| Maxmum diameter of CSSD (cm, by ultrasound) | | | 0.848 |
| ≤1 cm | 15 (15.3) | 7 (14.9) | |
| 1-2 cm | 57 (58.2) | 28 (59.6) | |
| >2 cm | 26 (26.5) | 12 (25.5) | |

*Data are presented as count (%). **Two-sided $\chi^2$ test.

nal pain could be defined as no pain (VAS score 0), significant improvement (the VAS score was lower than before), no change (The VAS score was the same as before).

*Statistical methods*

The differences in categorical data between the study and control groups were compared using the two-sided $\chi^2$ test. Fisher's exact test was used if the number of classifications =2. Student's t-test was used to assess quality of life between the study and control groups during follow-up. Statistical analysis was performed using SPSS 19.0 software (IBM, Armonk, New York, USA), and $P<0.05$ was considered statistically significant.

## Results

*Preoperative demographic and clinical data*

This study included 145 patients, with 98 cases in the experimental group and 47 cases in the control group (**Table 1**). The mean time from the last cesarean section to the onset of

**Table 2.** Comparison of the short-term symptoms and long-term sequelae between the study and control groups*

| Items | Study group* (n=98) | Control group* (n=47) | *P* value** |
|---|---|---|---|
| Duration of vaginal bleeding (days) | | | <0.01 |
| ≤7 | 38 (38.8) | 4 (8.5) | |
| 8-14 | 50 (51) | 21 (44.7) | |
| >14 | 10 (10.2) | 22 (46.8) | |
| The day of maximal vaginal bleeding (mL/day) | | | 0.410 |
| ≤30 | 26 (26.5) | 10 (21.3) | |
| 31-50 | 72 (73.5) | 35 (74.5) | |
| >50 | 0 (0) | 2 (4.2) | |
| Menstruation | | | <0.01 |
| Returned to normal | 24 (24.5) | 2 (4.3) | |
| No change | 72 (73.5) | 45 (95.7) | |
| Increased menses | 2 (2) | 0 (0) | |
| Abdominal pain (days) | | | <0.01 |
| No pain | 3/19 (15.8) | 1/9 (11.1) | |
| Significant improvement | 10/19 (52.6) | 2/9 (22.2) | |
| No change | 6/19 (31.6) | 6/9 (66.7) | |
| Caesarean scar condition (under ultrasound) | | | <0.01 |
| Completely healed | 72 (73.5) | 0 (0) | |
| Significantly reduced | 20 (20.4) | 0 (0) | |
| No change | 6 (6.1) | 47 (100) | |

*Data are presented as count (%). **Two-sided $\chi^2$ test.

symptoms, the mean time from the onset of symptoms to treatment, the maximum diameters of the diverticula (by B-mode ultrasound) were provided in **Table 1**. There were no significant differences between the experimental and control groups.

*Treatment time, bleeding, and complications from the combined laparoscopy and hysteroscopy surgical treatment and the conservative drug therapy regimen*

There was no case of either conversion to laparotomy or bladder injury in the experimental group. The mean blood loss during surgery was 47.5±29.2 ml. No instances of massive intraoperative bleeding were observed. The mean surgical time was 87.2±36.6 minutes. The mean postoperative hospital stay was 4.2±1.1 days. EPT was conducted simultaneously in control group.

*Postoperative vaginal bleeding, abdominal pain, B-mode ultrasonic examinations, and the status of subsequent pregnancies*

To facilitate the statistical analysis, we regarded the first five-day period as the menstrual period, and any additional was regarded as irregular bleeding time. After surgery, the duration of vaginal bleeding, the sensorial reduction in vaginal bleeding volume, repair of the diverticulum (by B-mode ultrasound) were provided in **Table 2**, which were statistically superior in experimental group patients compared to control group. No significant differences between the two groups were observed with respect to the symptom of abdominal pain. And there were significant differences between the two groups in the improvement rates of abdominal pain (P<0.01) (**Table 2**).

*Pregnant again and the score of the physical function, body pain, health status, and vitality*

No control group patients intended to pregnant again, whereas 25 cases in the experimental group intended to pregnant in the future in **Table 3**. Until the end of the follow-up, only one patient had conceived successfully and had given birth at full-term by cesarean section. The quality of life during follow-up, the score of the physical function, body pain, health status, and vitality of the experimental group were significantly increased compared with those of the control group in **Table 4**.

**Table 3.** Willingness to pregnant again

| Groups | Willingness to pregnant again* | | *P* value** |
|---|---|---|---|
| | Yes | No | |
| Study group | 25 (25.5) | 73 (74.5) | <0.01 |
| Control group | 0 (0) | 47 (100.0) | |

*Data are presented as count (%). **$\chi^2$ test ($p<0.01$).

**Table 4.** Comparison of quality of life between the study and control groups during follow-up*

| Items | Study group (n=98) | Control group (n=47) | *P* value** |
|---|---|---|---|
| Physical function | 79.33±5.01 | 71.12±4.95 | <0.05 |
| Body role | 82.47±5.34 | 82.18±5.21 | >0.05 |
| Body pain | 81.08±5.19 | 72.74±5.46 | <0.05 |
| Health status | 79.64±5.37 | 72.38±5.51 | <0.05 |
| vitality | 82.12±5.18 | 74.36±5.84 | <0.05 |
| Emotional role | 85.41±5.33 | 84.67±5.29 | >0.05 |
| Mental health | 84.14±6.05 | 83.48±5.94 | >0.05 |
| Social function | 82.29±5.84 | 81.93±5.76 | >0.05 |

*Data are presented as. **t test.

## Discussion

Since the first cases of CSSD were treated at the Obstetrics and Gynecology Hospital of Fudan University in 1998, researchers at the institution have accumulated more than ten years of clinical experience and constantly renewed the strategies for CSSD treatment. Treatments have evolved from the initial implementation of conservative drug alone to hysteroscopic surgery, and finally to LHER. Internationally, the medication approaches for CSSD included anti-inflammatory hemostatic therapy, semi-cyclic drug therapy with progesterone and EPT, and surgical approaches included hysteroscopic incision diverticulum drainage, vaginal or abdominal surgical repair of CSSD [3]. Each of these approaches presents certain advantages and disadvantages. The main symptom of CSSD is irregular vaginal bleeding, which may be accompanied by lower abdominal pain. Poor drainage, which causes the diverticula to act as reservoirs, and internal bleeding in diverticular depressions acted as the two main mechanisms of this phenomenon [4, 5]. Furthermore, the poor contractile force of the tissue surrounding a scar may also contribute to diverticular bleeding near an incision site [6]. The exfoliation of the intimal layers and endometria of diverticula are not synchronized, and the resulting inconsistency in bleeding times may cause irregular bleeding between menstrual periods [7]. Wider diverticula may be associated with longer bleeding durations [8].

Cyclic estrogen/progesterone drug therapy is a simple and safe approach that can reduce the occurrence of irregular bleeding during the course of treatment [6, 9, 10]. However, the long-term efficacy of this approach is poor, particularly for patients with large uteri [10]. For patients who do not wish to undergo surgery, drug therapy can reduce the duration of irregular vaginal bleeding and improve the quality of life. Unfortunately, this vaginal bleeding is mostly to recover to pretreatment levels after discontinuing the drug treatment. The diverticulum site weakens during the course of a subsequent pregnancy, and the therapy does not reduce the risk of uterine rupture during this pregnancy. Because irregular vaginal bleeding often manifests as a prolonged menstrual period or irregular bleeding during the first half of the menstrual cycle, the drugs for endometrial repair are typically administered from 1-5th day of the menstrual cycle.

Hysteroscopic surgery alone has also been utilized as an effective treatment methodology for CSSD. This surgery is mostly performed by gradually cutting with coagulation from the bottom of the diverticulum toward the cervix, excising the fibrous scar tissue around the incision. The main objective is to facilitate blood drainage [11, 12]. The cutting and coagulation of the dilated blood vessels exposed in the diverticular depression, as well as the coagulation of the endometrial tissue of the diverticulum, are important steps that can address internal bleeding in the diverticular depression. However, in practice, we have found that the removal of scar tissue in this manner causes a widening of the incision. As a result, patients were more prone to experience abdominal pain associated with diverticular inflammation; moreover, the surgery produced no improvement in vaginal bleeding duration. Furthermore, the incision site became thinner and weaker in subsequent pregnancies, with an increased risk of uterine rupture during pregnancy [13, 14]. Particularly for patients with posterior

uteri, the specific angle of the uterus and cervix caused the continued persistence of the reservoir effect, and as many as 80% of patients failed to exhibit significant improvement [15-18].

In the LHER approach, sutures are applied after the excision of the diverticular depression, allowing the weakness in the lower uterine segment. Ultrasonic examinations at 3 months after surgery revealed good incision healing in 73.5% of treated patients and significant reductions in irregular vaginal bleeding. Additionally, the hysteroscopic test of translucence could distinguish the edges of the diverticulum distinctly. The laparoscopic approach provides a broad operating space, enabling superior the surgical approach at the vaginal fornix [19, 20]. Three surgical precautions are required in this approach. (1) Preoperative B-mode ultrasound must be adequately used to assess the relationship between the bladder and the incision. If bladder injury occurs, this injury should be repaired after careful observation of the bladder trigone position. (2) An appropriate quantity of the scar tissue around the diverticulum should be excised. An overly large excision would form a large angle in the lower uterine segment, affecting blood flow. Moreover, a safe distance must be maintained to avoid damage to the ascending branch of the uterine artery. If the excision is overly small, a large quantity of hard, tough scar tissue will remain at the peripheries of the incision, preventing good healing. (3) The placement of a probe into the cervical canal and lower segment of uterus during suturing helps to ensure the suturing process does not produce narrow passageways or even atresia.

In summary, cesarean section incision diverticula should be prevented, and keys to achieving this goal include an accurate indications and timing for cesarean sections to reduce the proportion of cesarean section births for patients who intend to pregnant again or wish to achieve full improvement of CSSD symptoms, thus surgical treatment is a better choice. LHER has significant advantages, such as its surgical thoroughness and accuracy, tiny entry wounds. An obvious disadvantage is its high medical cost. However, after a comprehensive comparison, including improvements of patient's quality of life, reductions in doctor visits, we believe that the LHER is effective and should be promoted.

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## Disclosure of conflict of interest

None.

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