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Transvaginal Management of Cesarean Scar Section Diverticulum: A Novel Surgical Treatment

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Study Design A
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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Background: The aim of this study was to investigate the clinical value of transvaginal management of cesarean section scar diverticulum.

Material/Methods: We evaluated 64 patients receiving transvaginal management of previous cesarean scar defect (PCSD).

Results: The PCSD was successfully treated by transvaginal surgery, without evident complications. The mean operation time was 33.6±4.1 min, blood loss was 37.9±16.8 ml, and the mean hospital stay after surgery was 6±2.9 days. Symptoms related to the prolonged menstruation in 53 patients were improved after surgery, vaginal bleeding time was reduced by an average of 7.3±2.8 days, and a significant difference was noted between the mean pre- and post-operative duration of menstruation ($P<0.01$). Of 11 patients with guttate between menstrual periods, guttate was absent in 9 patients and improved in 2. Clinical improvement was observed in 85.9% (55/64).

Conclusions: Transvaginal intervention is feasible and safe for the management of PCSD.

MeSH Keywords: Cesarean Section • Diverticulum • Uterine Diseases

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Background

Cesarean section scar diverticulum, also known as previous cesarean scar defect (PCSD), is defined as deficient uterine scars or scar dehiscence following a cesarean section, which involves the myometrial discontinuity at the cesarean scar. PCSD is a serious complication of cesarean section. PCSD has been reported to be associated with prolonged postmenstrual bleeding, dysmenorrhea, abnormal uterine bleeding throughout menstrual cycle, and dyspareunia [1–3]. Over the past decade, with the increase in cesarean section rate and improvement in diagnostic modalities, the incidence of PCSD is increasing, and in random populations it was present in 24–69% of women evaluated with transvaginal sonography [4].

Due to the unclear pathogenesis of PCSD, its treatment has yet been elucidated. Although oral contraceptives (OC) may result in the temporary improvement in symptoms [5], many patients cannot their adverse effects. Hysteroscopic treatment has been introduced in recent years [6,7]; however, the clinical improvement rate is just 59.6% after hysteroscopic treatment [8] and the cause of failure is still unknown. An abdominal approach to repair the uterine defect can completely correct the defect [9], but its invasiveness and complications significantly restrain its wide application in clinical practice. To date, only 1 study has been conducted to investigate the transvaginal management of PCSD [10].

Since December 2008, the transvaginal repair of uterine defect has been conducted in our department as a new treatment for cesarean scar diverticulum. This article summarizes our experience in transvaginal management of PCSD and evaluates its feasibility and effectiveness.

Material and Methods

The study was designed as a retrospective cohort study, and was planned as a quality assurance project. Due to our surgical technique for PCSD, it was not required to be formally approved by an ethics committee. From December 2008 to December 2011, a total of 64 patients receiving transvaginal intervention for PCSD were recruited into our study. The diagnosis was confirmed on the basis of medical history, clinical symptoms (postmenstrual spotting), transvaginal ultrasonography (TVU), magnetic resonance imaging (MRI) findings, and hysteroscopy. The exclusion criteria were: 1) irregular menstrual cycle before cesarean section; 2) previous placement of an intrauterine contraceptive device; and 3) presence of other organic uterine pathology responsible for abnormal uterine bleeding, such as endometrial hyperplasia, polyps, malignancy, or submucosal myomas.

TVU was used to identify the lesions, which were characterized by hypoechogenic areas (filling defect) in the myometrium

Figure 1. TVU image: irregular liquid dark area in the myometrium of lower uterine (arrow).

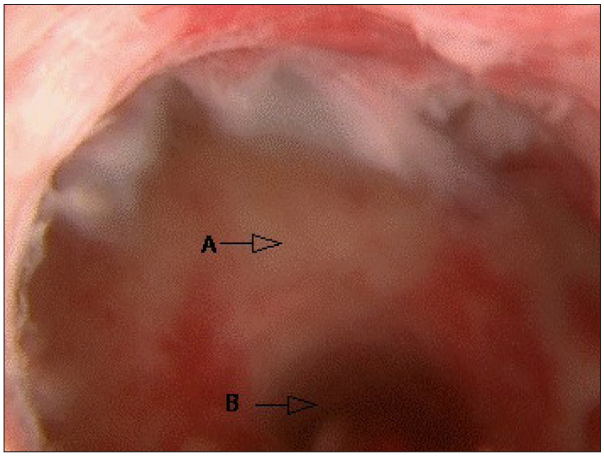

Figure 2. Hysteroscopic image: the uterine anterior wall with defect at the isthmus (arrow A: defect; arrow B: internal orifice of cervix).

of lower uterine segment at the cesarean scars. This was performed transvaginally using a Voluson E8 ultrasound machine (GE Medical systems, Zipf, Austria) without saline/gel instillation, by 1 observe with 5 years of experience in ultrasound. Once identified, the scar depth, width, and thickness of the residual myometrium were measured (Figure 1). All patients underwent hysteroscopic examination, which showed the uterine anterior wall defect at the isthmus below the internal orifice of the cervix. Fibrotic tissues and depression were found in the diverticulum of the scar defect. Blood clots were also observed (Figure 2).

Operative procedures

Transvaginal intervention for cesarean section scar diverticulum was performed under general anesthesia. All patients were placed in a dorsal lithotomy position and the bladder was emptied. A pair of vaginal hooks was placed to the vaginal wall to

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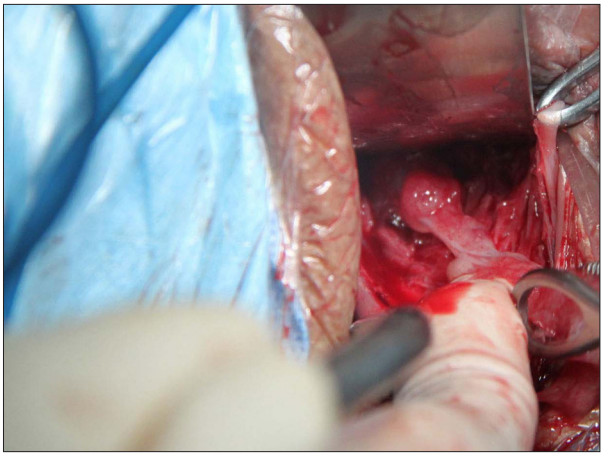

Figure 3. The defect was removed.

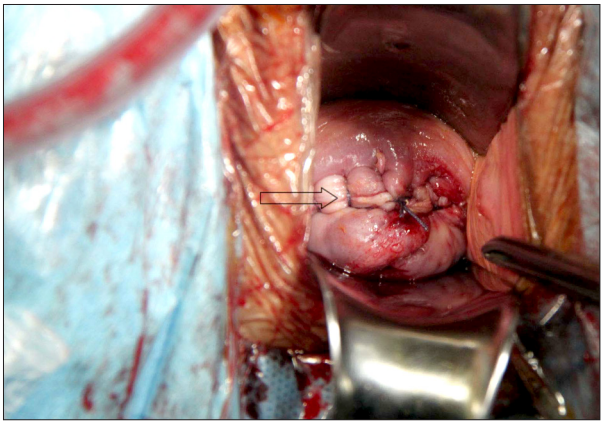

Figure 4. The myometrial and vaginal defects were closed with 2-0 absorbable sutures (arrow).

expose the cervix, and then a toothed tenaculum was used to grasp and retract the cervix. Adrenaline (0.3 mg in 500 ml of normal saline) was injected submucosally at the level of the cervicovaginal junction for hydrodissection and hemostasis. An incision was made at the anterior cervicovaginal junction, and the bladder was dissected away until the anterior peritoneal reflection was identified. Then, the anterior drawing hook was inserted to the vaginal incision to retract the bladder upwards. The defect was located in the previous cesarean incision, where the residual myometrium was thin. With the guidance of a probe in the uterus, a small hollow or depression was present in the anterior wall of the lower uterus below the internal orifice of the cervix. A transverse incision was made at the most prominent area of the bulge, which usually presented with blood clots. The defect was removed and the edges of the incision were trimmed to repair the defect (Figure 3). Then the myometrial and vaginal defects were closed with a continuous locking suture using 2-0 absorbable sutures (Figure 4).

All patients were followed up for 3–6 months via telephone or by hospital visit. Regardless of whether the diverticulum was cleared, the wound healing, menstruation, and postoperative complications were evaluated. TVU was used to re-examine at 1 month after the surgery.

Statistical analysis

The age, parity, number of CS, time of last CS, pre- and post-operative duration of menstruation, operation time, blood loss, outcome, and pathological findings were collected. Statistical analyses were performed using Stata Statistical Software (SPSS) version 13.0 (SPSS Inc., Chicago, IL). Participant baseline and bleeding time were presented as mean ±SD for normally distributed variables. Student's t-test was used for comparison of continuous variables. A value of $P<0.05$ was considered statistically significant.

Results

The mean age of the 64 patients was 34.4 years (range: 23–42 years). All patients had at least 1 transverse lower segment cesarean section delivery. The time to last CS was 6 months to 15.5 years (median: 6.1 years). The menstrual cycle was regular before CS in all patients. After CS, 53 patients developed prolonged menstrual bleeding, with the spotting occurring for up to 10–20 days, and the remaining 11 patients had abnormal vaginal bleeding starting several days after menstruation and lasting for 8–15 days. All patients had regular menstrual cycle and normal blood loss in menstruation.

Findings in TVU before surgery showed that there was a hypoechogenic area in the previous cesarean scar, located in the lower uterine segment; the maximum diameter of lesions ranged from 2.5 to 22 mm (median: 9.5 mm). The residual myometrium were thin and generally ranging from 2 mm to 5 mm in thickness. MRI in 5 patients showed that the uterine anterior wall was blurred at the junction of the uterus and cervix. The hysteroscopic examination revealed that the uterine defect was located in the anterior part of the isthmic portion of the uterus. The diameter ranged from 5 mm to 25 mm.

In all patients, the operation was uneventful, and no evident complications were observed. The median operation time was 33.6 min and blood loss was 37.9 ml (S=16.8). The median hospital stay after surgery was 6 days. Clinical improvement was observed in 85.9% (55/64) of patients. The prolonged menstruation symptoms were improved after surgery in 53 patients, and the vaginal bleeding time was reduced by an average of 7.3±2.8 days. A significant difference was found between the mean pre-operative and post-operative duration of menstruation ($P<0.05$) (Table 1). In addition, of 11 patients with guttate between menstrual periods, guttate was absent in 9 patients and was improved in 2.

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Table 1. Uterine bleeding time before and after surgery.

Group	N	Bleeding time (min)	t	P
Before	53	15.3±2.7		
After	53	8.6±2.4	9.63	<0.01
d	53	7.3±2.8		

Pathological examination revealed that there was an increase in collagens and smooth muscles, and endometrial glands were seen in the fibrous scar tissues, which confirmed the diagnosis of PCSD. Infiltration of inflammatory cells was noted in 32 patients.

Discussion

PCSD is attributed to the poor healing of the cesarean wound, which resulted in occurrence of small hollows or depressions in the previous cesarean scar. In recent years, clinicians pay increasing attention to the importance of the previous cesarean scar in the menstrual abnormality, due to the significant increase in the prevalence of CS.

The diagnosis of PCSD is usually made on the basis of a history of CS, clinical symptoms, and findings in imaging examinations such as TVU and hysteroscopy. Abnormal vaginal bleeding and infertility are the main clinical manifestations of PCSD. However, conditions such as endometrial polys, endometrial hyperplasia, use of exogenous hormones, hematologic disorders, and endometrial cancer should be excluded before diagnosis. TVU is a simple and sensitive diagnostic modality. The best time to identify the pouch with sonography is during the bleeding episode, usually a few days after the menses, because the principal symptom is postmenstrual spotting. The uterine longitudinal section is the best section to show the defects in the uterine incision. In the lower uterine segment, there is an irregular, liquid, dark area connected to the uterine cavity, with a distance from the serosa layer of less than 0.2 cm. According to the TVU findings, the defects can be classified into 3 types: 1) triangular or ovoid defect, 2) linear defect, and 3) cystic or bar-shaped defect. In addition, hysterosalpingography and MRI are also helpful for the diagnosis of PCSD. For the confirmed diagnosis, hysteroscopic examination is needed. Depression may be in the presence of dark/brown mucus or blood retention, with endometrial tissue growth appearing incidentally.

The pathogenesis of the myometrial defect in the CS scar remains unclear. The reasons for significantly prolonged menstrual bleeding may be: 1) The lower segment of the uterus is mainly composed of collagenous tissues and the lack of myometrium may result in poor contraction at the diverticular site. Thurmond et al. found the difference in the strength of myometrial contraction on either side of the decision, and the re-approximation of incision edges of differing thickness, leads to the formation of CS scar defect [11]. 2) There are fibrotic and necrotic tissues in the uterus scar diverticulum, with poor blood supply, which may cause slow and poor wound healing after periodic endometrial denudation. 3) There is endometrium at the site of depression, but its growth is not synchronized with the growth of normal endometrium, creating the extension of endometrial denudation. 4) The mucus and blood retained in the diverticulum may be complicated with infection and bleeding, which may cause the prolonged menstrual bleeding. In our study, 32 of 64 patients developed postoperative pathology, suggesting that there was infiltration of inflammatory cells at this site.

Tahara et al. reported good outcome in 11 PCSD patients who were treated conservatively with oral contraceptives [5]. This may be because oral contraceptives can inhibit the secretion of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), keeping endogenous estrogen in the early follicular phase state, which may benefit from the atrophy and absorption of the ectopic endometrium. However, Erickson et al. [11] and Florio et al. [12] found no change in the symptoms of some patients treated with oral contraceptives. Moreover, the adverse effects and long-term treatment with oral contraceptives significantly limit their wide clinical application.

Hysteroscopic treatment has been demonstrated to be a feasible and effective modality [6–8]. The hysteroscopic treatment aims to facilitate the drainage of menstrual flow. Fabrec et al. [13] investigated 24 patients treated with hysteroscopy and followed for 2 years. Results showed improvement in symptoms in 20 patients, and 11 patients were pregnant after surgery. However, the clinical improvement rate was only 59.6%, which is relatively worse in patients with a retroflexed uterus [8]. Moreover, as the myometrium in the diverticulum is thin (about 2–5 mm in this study), the hysteroscopic treatment has a risk of bladder injury and uterine perforation while applying thermal energy to the scar. Thus, this treatment requires good control of hysteroscopic instruments, which limits its wide application in primary hospitals. An abdominal approach with resection of fibrotic tissues followed by repair of intact

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myometrium can completely correct the defect [14,15], but this modality cannot access the lower edge of the uterine defect.

In the light of the above findings, we changed the surgical technique used to close the anterior incision during repair of the defect. Our results showed that the transvaginal intervention, as a new therapeutic strategy for cesarean scar diverticulum, could remove the fibrotic tissues and repair the uterine defect simultaneously. This strategy is feasible and effective for the treatment of PCSD and can be carried out in major primary hospitals.

The reasons for failure to achieve improvement in clinical symptoms may be related to their wound healing ability and whether the lesions and meager tissues surrounding the defect are completely removed.

Potential limitations of this retrospective study are: 1) the information about cause of CS defect was not collected; and 2) information regarding to the suturing, indications for cesarean section, and postoperative conditions were not recorded. In addition, how these factors influence the occurrence of PCSD and the failure of transvaginal management is still unclear, and the therapeutic efficacy of our strategy was not compared with that of other therapeutic modalities. These issues will be resolved in our future studies.

Conclusions

Transvaginal intervention is feasible and safe for the management of PCSD, and can be carried out in the major of primary hospitals. As a new therapeutic strategy for cesarean scar diverticulum, it can remove the fibrotic tissues and repair the uterine defect simultaneously.

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