Int J Clin Exp Med 2015;8(11):21187-21193
www.ijcem.com /ISSN:1940-5901/IJCEM0014264

Original Article

Efficacy of transvaginal debridement and repair surgery for cesarean scar pregnancy: a cohort study compared with uterine artery embolism

Yu-Qing Chen[1], Hua-Shan Liu[2], Wen-Xin Li[2], Chen Deng[2], Xiao-Wen Hu[2], Pei-Jun Kuang[2]

[1]Gynecology and Obstetrics, The First Affiliated Hospital, Sun Yat-sen University, Guangzhou 510080, Guangdong Province, China; [2]Zhongshan Medicine School, Sun Yat-sen University, Guangzhou 510080, Guangdong Province, China

Received August 10, 2015; Accepted October 31, 2015; Epub November 15, 2015; Published November 30, 2015

Abstract: Objective: Compared with uterine artery embolism (UAE), we aimed to investigate the efficacy and safety of transvaginal debridement and repair surgery (TDRS) and analyze the association between postoperative recovery and individual related factors. Methods: A total of 128 patients diagnosed with cesarean scar pregnancy (CSP) from January 2006 to June 2014 were divided into 2 groups. Group A: 38 cases were treated with UAE. Group B: 90 cases were treated with TDRS, of whom 41 received preoperative chemotherapy. Results: The failure rate in Group A was 5.3% (2/38) and the 2 cases of secondary vaginal hemorrhage after UAE were cured by hysterectomy and TDRS respectively. All patients were successfully treated in Group B and the postoperative outcomes of the patients who received preoperative chemotherapy showed no statistically differences compared with those who didn't. The hospital stays, serumβ-hCG and menstruation recovery in Group B were significantly shorter than those in Group A ($P<0.001$). In Group B, there was no significant correlation between serumβ-hCG recovery, menstruation recovery and individual related factors including serumβ-hCG, gestational age and maximum diameter of gestational sac at diagnosis. Conclusion: Compared with UAE, TDRS is safer, more effective and with a rapider recovery. As an alternative therapeutic option, its prognosis isn't associated with some individual related factors. Furthermore, preoperative chemotherapy is unnecessary.

Keywords: Cesarean scar pregnancy, transvaginal surgery, uterine artery embolism

Introduction

Among pregnant women with cesarean delivery history, cesarean scar pregnancy (CSP) arises at a rate of 1:1800~1:2226, and the incidence of CSP is greatly increasing in recent years due to an increased rate of cesarean section [1, 2]. Moreover, it can result in some life-threatening complications such as uterine bleeding and rupture [3]. It was in 1999 [4] and 2005 [5] that laparoscopy and hysteroscopy were initially advocated for the treatment of CSP respectively, and since then the concept of minimally invasive treatment has been widely applied to the treatment of CSP. To date, however, there is still no consensus concerning the ideal treatment of CSP and the association of patients' recovery and individual related factors remains unknown. Under the guidance of this novel concept, our hospital developed transvaginal debridement and repair surgery (TDRS) for CSP in 2009 [6]. Therefore, this study aimed to summarize our experience with this treatment of CSP and elucidate the problems above through retrospective analysis of 128 cases in our hospital.

Materials and methods

General data

A total of 128 CSP patients from January 2006 to June 2014 were divided into 2 groups in the First Affiliated Hospital, Sun Yat-sen University. Between January 2006 and November 2009, there were 30 CSP patients, all of whom underwent uterine artery embolism (UAE). 98 CSP patients were reviewed from December 2009

Table 1. Characteristics of patients with CSP treated with the two therapies.

	Group A (n=38)	Group B (n=90)	*P*
Age (years)	32±3.3	32.7±4.4	0.291
Cesarean section (times)	1 (1-2)	1 (1-2)	0.962
Gestational age (days)	53 (41.8-70.2)	49.5 (43-63)	0.960
Serum HCG at diagnosis (mIU/mL)	13259.5 (8597.3-24901.5)	25407.5 (5639.3-50196.0)	0.107
Duration from the last cesarean Section to the CSP (months)	47.5 (25.8-65.3)	50.5 (36-80)	0.137
Maximum diameter of Gestational scar (cm)	2.9 (2.4-3.3)	2.7 (2-3.5)	0.519
Cardiac activity	71.1% (27/38)	75.6% (68/90)	0.595

Note: There were no statistically differences between the two groups.

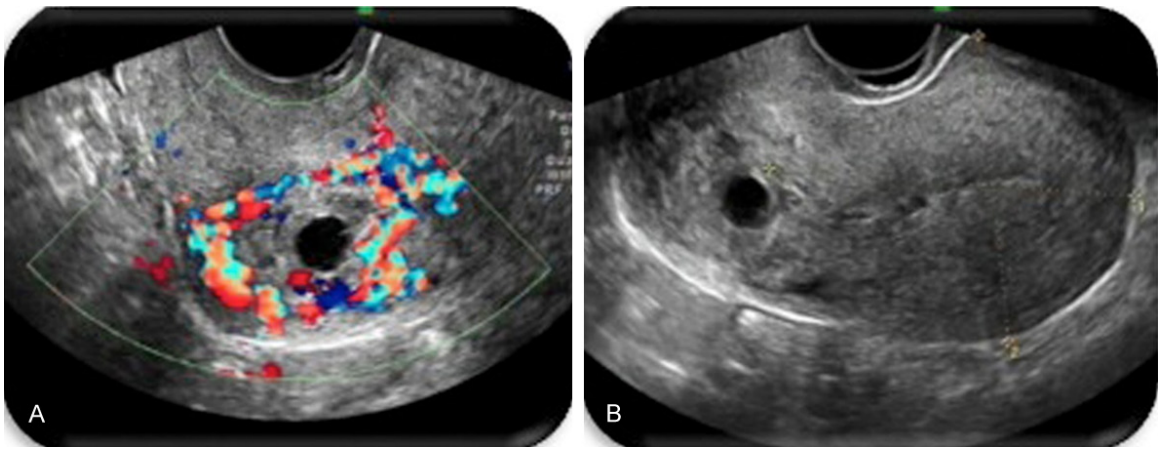

Figure 1. Ultrasound scans revealed the gestational scar (B) with increased blood flow (A) surrounded.

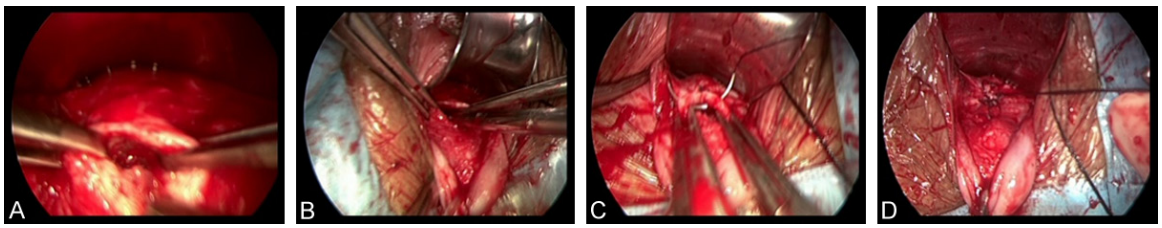

Figure 2. Operating steps: After the surgical incision was done, the ectopic pregnancy tissue was shown at the caesarean scar (A). And then we removed the ectopic pregnancy tissue by sponge forceps and suction (B) and the scar tissue was exsected simultaneously (C). For better apposition of the incision edges, the surgical incision was closed with interrupted suture and then continuous locking sutures (D).

to June 2014, 90 and 8 of whom underwent TDRS and UAE respectively. It was noted that from December 2009 to June 2014 therapeutic option of TDRS or UAE was according to patients' willingness after the pros and cons of the two methods were totally informed. Group A was 38 cases treated with UAE. Group B comprised 90 cases treated with TDRS. Furthermore, in Group B, preoperative chemotherapy was chosen to use according to the patients' willingness: 41 patients received preoperative chemotherapy (Group B1) and the rest of 49 cases didn't (Group B2) after they all were sufficiently informed the advantages and potential disadvantages of preoperative chemotherapy. Voluntary informed consent was signed by all patients, with the approval of Institutional Research Ethics Committee.

Table 2. Comparison of clinical characteristics for each subcategory of Group B

	Group B1 (n=41)	Group B2 (n=49)	*P*
General variables			
Age (years)	32.5±4.0	33.0±4.8	0.601
Cesarean section (times)	1 (1-2)	1 (1-2)	0.855
Gestational age (days)	49 (43-66.5)	50 (41-57)	0.463
Serum HCG at diagnosis (mIU/mL)	23672 (3902-50265)	26391 (6309.5-49598.5)	0.906
Duration from the last cesarean			
Section to the CSP (months)	51 (36-95.5)	50 (36-74)	0.961
Maximum diameter of			
Gestational scar (cm)	3 (2-3.8)	2.6 (2.1-3.2)	0.644
Cardiac activity	75.6% (31/41)	75.5% (37/49)	0.991
Intraoperative data			
Operative time (min)	55 (35-77.5)	55 (30-65)	0.626
Estimated blood loss (ml)	50 (30-50)	50 (25-50)	0.920
Postoperative data			
Hospital stays (days)	4 (3-5.5)	4 (3-5)	0.792
Serum HCG recovery (days)	21 (14-35)	21 (14-28)	0.977
Menstruation recovery (days)	30 (28-32)	30 (28-33)	0.916

Note: There were no statistically differences between the two groups.

Table 3. Cumulative results of transvaginal hysterotomy

Hysterotomy by transvaginal Approach: study and year	Patient no.	Postoperative Hospital Stay (d)	Serum HCG Recovery	Menstruation Recovery
Kang, et al., 2011	1	1	Not reported	2 months
He, et al., 2011	6	6	Within 1 month[a]	Not reported
Lu, et al., 2011	15	40	2.7 weeks	Not reported
Wang, et al., 2012	12	Not reported	15.8 days	28.3 days
Le, et al., 2013	15	Not reported	16.8 days	29.2 days
Chen, et al., 2014	64	6	Not reported	Not reported
Li, et al., 2014	49	5.18	2.91 weeks	1.20 months
Wang, et al., 2014	22	4.9	Not reported	25-60 days[a]
Huanxiao, et al., 2015	40	4.95	Within 1 month[a]	Not reported

Note: Data are given as means or cases. [a]Values are range.

Diagnostic criteria

The diagnosis of CSP was mainly based on the results of transvaginal B ultrasound, including no pregnancy intrauterine, no cervical canal pregnancy, the pregnancy sac was observed in the anterior uterine isthmus, and the depressed area was formed in the myometrium between gestational sac and bladder wall [7].

Clinical treatment and follow-up

To determine whether patients were eligible for surgery, preoperative routine examinations (Routine Blood Test, Prothrombin Time, Liver Function Test, Renal Function Test, Electrocardiogram, etc.) were done in every case. Group A utilized the absorbable gelatin sponge as the embolus of UAE. Whereas group B comprised patients treated with TDRS. Exclusion criteria of UAE and TDRS included surgical contraindications. All the procedures were operated by the same medical unit.

The follow-up has lasted at least 12 months and contained recovery time of menstruation and serumβ-hCG, as well as transvaginal B ultrasound which aimed to demonstrate whether scar diverticulum still existed after treatment.

We also observed patients' physical condition of postoperative pregnancy.

Statistical analysis

SPSS 16.0 software was used in the analysis and the *p* values for all hypothesis tests were two-sides and significance was set at $P<0.05$. Firstly, Shapiro-Wilk was administrated to demonstrate if the data showed a normal distribution with an equal variance and then we summarized continuous variables as means ± standard deviation (SD) or medians and IQRs. In contrast, quantitative data were documented with cases (%). Chi-square test or continuous corrected chi-square test or Fisher's exact test was conducted for the analysis of quantitative data and t-test or Mann-Whitney U test was conducted for the analysis of continuous variables. The last but not the least, the correlation analysis would be conducted using Person analysis if double variants accorded with normal distribution, and would be replaced by Spearman analysis if the normal distribution was not shown.

Results

For all patients, no patients had contraindications for UAE or TDRS and all the procedures were successfully performed. There were no significant differences in data on demographic variables and clinical characteristics between Group A and Group B ($P>0.05$) (**Table 1**).

In Group A, 2 patients suffered from ineffective treatment of UAE manifesting secondary vaginal hemorrhage. Therefore the failure rate of Group A was 5.3% (2/38). One of the 2 cases was cured by hysterectomyin May 2007 and the other was cured by TDRS in October 2010. Besides, fever occurred on 2 patients and 8 patients suffered from mild abdominal pain, but they all recovered after symptomatic treatment. Moreover, in the follow-up, 3 cases had term delivery and 3 cases suffered from dripping wet ungodliness of menstruation period, all of whom refused ultrasound scans in the follow-up.

In Group B, all patients were satisfactorily treated. Also, there were no adverse events, such as surgery or anesthesia related complications, postoperative infection, impaired wound healing, bladder injury, etc. As for a further comment, in the follow-up no abnormal menstruation occurred and 12 patients underwent pregnancies.

To demonstrate whether scar diverticulum still existed after therapy, transvaginal B ultrasound was recommended to perform in all patients in the follow-up. There were 21 and 74 patients receiving ultrasound scans in Group A and B respectively and the others refused ultrasound scans. Interestingly, the outcomes of transvaginal B ultrasound of the 95 patients presented no scar diverticulum at the incision. A representative case was demonstrated: A 34-year-old, Gravida 3, Para 1, woman was diagnosed with CSP at a gestation of 7 weeks, complaining of vaginal bleeding. Serumβ-hCG was 24852.0 mIU/mL. Based on the transvaginal B ultrasound, the gestational scar (**Figure 1B**) with increased blood flow (**Figure 1A**) surrounded was observed in the anterior uterine isthmus. The patient opted for TDRS, without preoperative chemotherapy. The operation (**Figure 2**) lasted for 45 minutes and the blood loss was 50 ml. The postoperative course of the patient was uneventful. Transvaginal B ultrasound of the patient in the follow-up revealed no scar diverticulum at the incision.

In order to demonstrate the efficacy of TDRS, we conducted a comparative analysis between Group A and B: significant differences were shown in indexes such as hospital stays [10.0 (9.0-12.0) vs 4.0 (3.0-5.0) days, $P<0.001$], serumβ-hCG recovery [59.5 (49.0-73.3) vs 21.0 (14.0-28.0) days, $P<0.001$], menstruation recovery [45.5 (41.8-54.0) vs 30.0 (28.0-32.3) days, $P<0.001$]. And then we conducted another comparative analysis between Group B1 and B2 to clarify the role of preoperative chemotherapy: there were no significant differences in every index of related variables ($P>0.05$) and details were shown in **Table 2**.

Furthermore, the association of postoperative recovery and individual related factors was demonstrated by the following analysis: 1) The correlation between serumβ-hCG recovery and individual related factors including serumβ-hCG, gestational age at diagnosis, and maximum diameter of gestational sac was showed. The correlation coefficient was $rs=-0.04$, $P=0.710$; $rs=-0.120$, $P=0.260$; $rs=-0.093$, $P=0.385$ respectively, showing no significant correlation. 2) The correlation between menstrua-

tion recovery and individual related factors including serumβ-hCG, gestational age at diagnosis, and maximum diameter of gestational sac was revealed. The correlation coefficient was *rs*=-0.08, *P*=0.453; *rs*=0.055, *P*=0.604; *rs*=-0.183, *P*=0.085 respectively, also showing no significant correlation.

Lastly, we performed a literature review about TDRS in PubMed. To date, we found that a total of 224 patients were treated by this novel technique and the reported hospital stays were 1-6 days. Serumβ-hCG returned to normal within 1 month and the recovery time of menstruation was up to a maximum of 2 months. There was one more point, we should touch on that there were no reports on surgery related complications. However, it is noteworthy that some studies failed to provide the information above. Details were presented in **Table 3**.

Discussion

Our findings show that compared with UAE, TDRS is safer, more effective and with a rapider recovery, the prognosis of which isn't influenced by some individual related factors and preoperative chemotherapy may be hardly necessary.

It is known that UAE can deactivate the trophoblastic tissue by blocking the blood flow, reducing the possibility of vaginal bleeding and hysterectomy. Our current data provided a successful rate of UAE as 94.7% (36/38). Nevertheless, Li JJ reported that the failure rate of the UAE was 70% and the recovery of serumβ-hCG and menstruation was 59.5 (49.0-73.3) days, 45.5 (41.8-54.0) days respectively [8], which were slower than those of the current study. Generally, after UAE, necrosis of ectopic pregnancy tissue occurs and the tissue will be taken up. However, patients receiving UAE are at a risk of secondary and uncontrolled vaginal bleeding, which may lead to inevitable hysterectomy [9]. Indeed, 2 patients suffered secondary vaginal hemorrhage in the current study. The reasons for secondary vaginal bleeding could be collateral circulation formation and blood flow reperfusion resulting from degradation of the embolus of UAE. Additionally, patients undergoing UAE predispose ischemic complications such as fever, abdominal pain, etc. Furthermore, UAE cannot eliminate scar diverticulum. As opposed to occasional, 3 cases receiving UAE suffered from dripping wet ungodliness of menstruation period in the follow-up, which suggests that scar diverticulum may still maintain (It was a pity that they all refused ultrasound scans in the follow-up). Theoretically, UAE may reduce the blood supply to the ovaries, which indicates that the effects of UAE on ovarian and fertility function are noteworthy to investigate further.

Transvaginal surgery was advocated by Kang SY for the first time in 2009 [10]. And then as a promising option of CSP, quite a few authors further demonstrated that it was relatively safe, effective and minimally invasive [6, 10-16]. In contrast, according to Fuchs N [17], laparoscopic surgery, as a pleasurable treatment for CSP, possessed advantages: safe, effective and minimally invasive, which were similar to those of transvaginal surgery. However, there are several limitations of laparoscopy: to begin with, its requirements to laparoscopic settings are not easily met, especially in financially-challenged hospitals. Also, its application requires an experienced surgeon. Lastly, this operation should only be performed where conversion to emergency laparotomy is available should laparoscopic surgery fail. Conversely, transvaginal surgery overcomes laparoscopic limitations to a certain extent. As a consequence, TDRS could be much more widely used, especially in areas with poor-developed medical condition.

Recently, our hospital has developed the transvaginal surgery and now we have considerable CSP patients and experience of treatment of CSP. Our data indicates that this technique could be the superior option compared with UAE. There is much experience for our favorable results: 1) In order for a clear visual field, 2 U pituitrin was injected in cervix uteri, which contributed to reducing intraoperative bleeding. 2) Urinary bladder was separated from cervix uteri and pushed down to avoid intraoperative bladder injury. 3) After incising peritoneum covering the bladder and uterus, surgical incision was chosen at the thinnest section of uterus scar under the guidance of a probe. 4) To eliminate residual tissue as thoroughly as possible, we removed ectopic pregnancy tissue by sponge forceps and suction tubes (**Figure 2B**) and then we exsected scar tissue simultaneously (**Figure 2C**), which could contribute to reducing recurrence. 5) Its hemostasis relied

on clamps and suture rather than contractions of scar uterine, greatly reducing the risk of intraoperative and postoperative bleeding. Consequently, transvaginal surgery is performed under a relatively controllable and doable condition, which will improve the chance of surgical success. Also, for patients with urgent and lethal bleeding, TDRS is an excellent option for immediate and effective hemostasis compared with UAE.

Concurrently, our data implies that postoperative recovery isn't of relevance to individual related factors and preoperative chemotherapy is hardly necessary. Consequently, the information above suggests that this surgery possesses wider indications without restriction of serumβ-hCG, gestational age, maximum diameter of gestational sac at diagnosis and it can be independently utilized for termination of pregnancy and removal of ectopic pregnancy tissue. Transvaginal surgery greatly shortens hospital stays and treatment period, making the treatment of CSP simpler and more efficient than before.

The limitation of this investigation is that this research contains only two therapeutic methods, no comparisons among other first-line treatment options. Therefore, the efficacy of TDRS on CSP requires further demonstration by comparing with other therapeutic methods through prospective, multi-center clinical examinations.

Conclusions

Compared with UAE, transvaginal debridement and repair surgery, as a feasible option for CSP, reaps huge fruits mainly manifesting rosier efficacy and rapider recovery. The prognosis of patients receiving TDRS isn't associated with individual related factors including serumβ-hCG, gestational age, diameter of gestational sac at diagnosis and preoperative chemotherapy may be hardly inevitable. This technique contributes to a simple and efficient curative method of CSP.

Acknowledgements

This study was funded by Laboratory Open Project of Sun Yat-sen University 20150522 and Guangdong Province Science Project 2013B0218002370.

Disclosure of conflict of interest

None.

Address correspondence to: Yu-Qing Chen, Department of Gynecology and Obstetrics, The First Affiliated Hospital of Sun Yat-sen University, Guangzhou 510080, Guangdong, China. E-mail: chenyqfeng@163.com

References

[1] Smith GC, Pell JP and Dobbie R. Caesarean section and risk of unexplained stillbirth in subsequent pregnancy. Lancet 2003; 362: 1779-1784.

[2] Deans R and Abbott J. Hysteroscopic management of cesarean scar ectopic pregnancy. Fertil Steril 2010; 93: 1735-1740.

[3] Ko JK, Li RH and Cheung VY. Caesarean scar pregnancy: a 10-year experience. Aust N Z J Obstet Gynaecol 2015; 55: 64-69.

[4] Lee CL, Wang CJ, Chao A, Yen CF and Soong YK. Laparoscopic management of an ectopic pregnancy in a previous Caesarean section scar. Hum Reprod 1999; 14: 1234-1236.

[5] Wang CJ, Yuen LT, Chao AS, Lee CL, Yen CF and Soong YK. Caesarean scar pregnancy successfully treated by operative hysteroscopy and suction curettage. BJOG 2005; 112: 839-840.

[6] He M, Chen MH, Xie HZ, Yao SZ, Zhu B, Feng LP and Wu YP. Transvaginal removal of ectopic pregnancy tissue and repair of uterine defect for caesarean scar pregnancy. BJOG 2011; 118: 1136-1139.

[7] OuYang Z, Yin Q, Xu Y, Ma Y, Zhang Q and Yu Y. Heterotopic cesarean scar pregnancy: diagnosis, treatment, and prognosis. J Ultrasound Med 2014; 33: 1533-1537.

[8] Wang JH, Qian ZD, Zhuang YL, Du YJ, Zhu LH and Huang LL. Risk factors for intraoperative hemorrhage at evacuation of a cesarean scar pregnancy following uterine artery embolization. Int J Gynaecol Obstet 2013; 123: 240-243.

[9] Shen L, Tan A, Zhu H, Guo C, Liu D and Huang W. Bilateral uterine artery chemoembolization with methotrexate for cesarean scar pregnancy. Am J Obstet Gynecol 2012; 207: 386, e1-6.

[10] Kang SY, Park BJ, Kim YW and Ro DY. Surgical management of cesarean scar ectopic pregnancy: hysterotomy by transvaginal approach. Fertil Steril 2011; 96: e25-28.

[11] Lu HY, Zhang WH, Shan J, Tian QS, Zhang XQ, Wu LC, Zhou YX, Li S, Peng YM, Li D and Hu LN. [Study on 31 cases with cesarean scar pregnancy treated by transvaginal surgery]. Zhonghua Fu Chan Ke Za Zhi 2011; 46: 917-922.

[12] Le A, Shan L, Xiao T, Zhuo R, Xiong H and Wang Z. Transvaginal surgical treatment of cesarean scar ectopic pregnancy. Arch Gynecol Obstet 2013; 287: 791-796.
[13] Chen Y, Chang Y and Yao S. Transvaginal management of cesarean scar section diverticulum: a novel surgical treatment. Med Sci Monit 2014; 20: 1395-1399.
[14] Li JB, Kong LZ, Fan L, Fu J, Chen SQ and Yao SZ. Transvaginal surgical management of cesarean scar pregnancy: analysis of 49 cases from one tertiary care center. Eur J Obstet Gynecol Reprod Biol 2014; 182: 102-106.
[15] Wang G, Liu X, Bi F, Yin L, Sa R, Wang D and Yang Q. Evaluation of the efficacy of laparoscopic resection for the management of exogenous cesarean scar pregnancy. Fertil Steril 2014; 101: 1501-1507.
[16] Huanxiao Z, Shuqin C, Hongye J, Hongzhe X, Gang N, Chengkang X, Xiaoming G and Shuzhong Y. Transvaginal hysterotomy for cesarean scar pregnancy in 40 consecutive cases. Gynecol Surg 2015; 12: 45-51.
[17] Fuchs N, Manoucheri E, Verbaan M and Einarsson JI. Laparoscopic management of extrauterine pregnancy in caesarean section scar: description of a surgical technique and review of the literature. BJOG 2015; 122: 137-140.