

Original Article

Application of laparoscopic internal iliac artery temporary occlusion and uterine repair combined with hysteroscopic aspiration in type III cesarean scar pregnancy

Xianghui Su, Miner Yang, Zhao Na, Canliang Wen, Meiling Liu, Chunfang Cai, Zhuohui Zhong, Bingqian Zhou, Xiang Tang

Department of Minimal Invasive Gynecology, Guangzhou Women and Children's Hospital, Guangzhou Medical University, Guangzhou 510000, Guangdong, China

Received February 18, 2021; Accepted October 19, 2021; Epub March 15, 2022; Published March 30, 2022

Abstract: To investigate the efficacy and safety of laparoscopic internal iliac artery temporary occlusion and uterine repair combined with hysteroscopic aspiration in type III cesarean scar pregnancy. 135 cases of cesarean scar pregnancy in Guangzhou Women and Children's Hospital from November 2017 to November 2020 were collected and 32 cases of type III patients were retrospectively analyzed. They were divided into internal iliac artery temporary occlusion (IIATO) group (21 cases), and bilateral uterine artery embolization (UAE) group (11 cases). The general condition, intraoperative bleeding, postoperative complications, and prognosis of the two groups were analyzed. In the IIATO group, the bilateral internal iliac arteries were temporarily blocked with No. 10 silk thread under laparoscopy. The scar pregnancy clearance and repair of the scar were performed after incision. Subsequently, we performed hysteroscopic aspiration. After the operation, the internal iliac artery ligation thread was removed. In the UAE group, the patients were treated with bilateral uterine artery embolization. Laparoscopic uterine scar repair and hysteroscopy aspiration were performed within 24 hours after embolization. There was no significant difference in age, times of pregnancy, times of cesarean section and gestational weeks between the two groups ($P>0.05$). No significant differences were observed in the diameter of gestational sac or gestational mass and serum human chorionic gonadotropin (β -hCG) level between the two groups before operation ($P>0.05$). The operations were successfully completed in 32 patients, and intraoperative blood loss was 67.14 ± 32.78 ml and 71.35 ± 31.56 ml, respectively ($P<0.05$). The length of hospital stay was 5.14 ± 0.32 day and 4.97 ± 0.21 day, respectively. No peri-procedural bleeding occurred and no secondary surgeries were required. Laparoscopic internal iliac artery temporary occlusion and uterine repair combined with hysteroscopic aspiration is an effective and safe treatment for type III cesarean scar pregnancy, with less postoperative complications and better protection of fertility function for patients.

Keywords: Internal iliac artery temporary occlusion (IIATO), cesarean scar pregnancy (CSP), uterine artery embolization (UAE)

Introduction

Cesarean scar pregnancy (CSP) is a kind of ectopic pregnancy in which the fertilized egg is implanted at the scar of previous cesarean section. According to WHO, since 1985, the cesarean section rate has been increasing year by year in both developed and developing countries. By 2018, the rate of cesarean section worldwide was 18.6%. Moreover, the average rate of cesarean section in Asian countries was 19.2% above the control level (10-15%). It

brings long-term risks to women's health and re-pregnancy.

The incidence of CSP ranged from 1:2656 to 1:1800, accounting for 1.15% of women with history of cesarean section. At present, the pathogenesis of CSP is still unclear, and there is no unified standard or guidelines for the diagnosis and treatment of CSP. In 2016, according to the expert consensus in China, the treatment principle of CSP could be summarized as early diagnosis, early termination, and early clear-

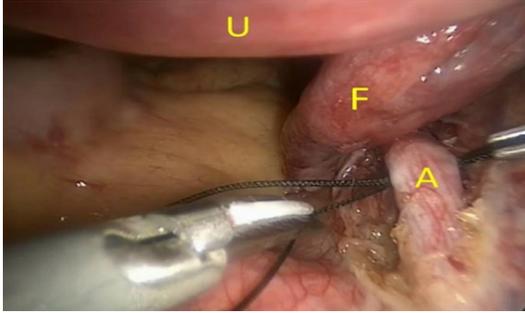


Figure 1. Laparoscopic internal iliac artery temporary occlusion. U: uterine, F: fallopian tube, A: right internal iliac artery.

ance. The CSP patients may suffer from bleeding, uterine rupture, uterine arteriovenous fistula, and even hysterectomy during and after curettage. In order to reduce bleeding and complications after surgery, we explored the safety of laparoscopic internal iliac artery temporary occlusion and uterine repair combined with hysteroscopic dilation curettage in the treatment of type III cesarean scar pregnancy.

Methods

135 cases of cesarean scar pregnancy in our hospital from November 2017 to November 2020 were collected and 32 cases of type III patients were retrospectively analyzed. All the patients met the following ultrasound standards: (1) the gestational sac was partially or completely implanted in the uterine scar; (2) the intrauterine and cervical canal of uterus were empty; (3) the thickness of myometrium between gestational sac and bladder was less than 3 mm; (4) CDFI: trophoblast blood flow signal (low resistance blood flow) was found in the scar. The patients were followed up for 2-12 months.

All patients were evaluated preoperatively, including preoperative biochemical indexes, chest X-ray, electrocardiogram, transvaginal color Doppler ultrasound, exclusion of surgical contraindications and signing of surgical consent. In the IIATO group, the retroperitoneum was opened and the bilateral internal iliac arteries were separated 2 cm below the bifurcation of iliac artery. No. 10 silk thread was used to temporarily block the internal iliac artery (**Figure 1**). Then we separated bladder peritoneum reflection and ultraviolet blue bulge mass was visible. Pituitrin was injected into the

uterine body. At this time, the bilateral internal iliac artery was temporarily blocked with a knot. Subsequently, we opened the most protruding part of the mass with ultrasonic knife, removed the pregnant tissue and performed suction of decidual tissue in uterine cavity. After repairing the myometrial tissue, we intermittently sutured full thickness incision with 2-0 absorbable suture and continuously sutured the seromuscular layer with 2-0 absorbable suture. The uterine cavity was examined by hysteroscopy. The residual tissue and bleeding point were treated by excision and electrocoagulation. After the operation, the No. 10 silk suture was removed and color of uterus was observed.

In the UAE group, the patients were treated with bilateral uterine artery embolization. Laparoscopic uterine scar pregnancy clearance and repair were performed within 24 hours after embolization. After uterine repair, aspiration of uterus and hysteroscopy were applied. The procedures of laparoscopic scar pregnancy clearance and repair were same as IIATO group. This study was approved by the Ethics Committee of the Guangzhou Women and Children's Hospital.

The measurement data in accordance with normal distribution were expressed by $\bar{x} \pm sd$, and comparison between the two groups was performed by independent sample t test. Non-normal distribution data were expressed by median [M (p25-p75)], and comparison between the two groups was performed by rank sum test. Statistical analyses were performed with SPSS 22.0. The level of statistical significance was set at $P < 0.05$.

Results

From November 2017 to November 2020, 32 cases of type III cesarean scar pregnancy were included in our study. There was no significant difference in gestational sac diameter, preoperative β -hCG level and intraoperative blood loss between the two groups (**Table 1**). However, there was significant difference in postoperative vaginal bleeding and postoperative menstrual recovery time. The possibility of vaginal bleeding more than 20 days after treatment in IIATO group was significantly less than that in UAE group ($P < 0.05$). There was no significant difference in the length of hospital stay between the two groups ($P > 0.05$), but the menstrual recovery time in UAE group was longer. The average of the menstrual recovery time in

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Table 1. Clinical characteristics of the two groups

| | IIATO (n=21) | UAE (n=11) | P value |
|-----------------------|--------------|-------------|---------|
| Age (y) | 34.38±4.30 | 33.70±4.09 | >0.05 |
| Gravidity | 2.95±0.12 | 3.04±0.09 | >0.05 |
| Parity | 1.50±0.75 | 1.62±0.85 | >0.05 |
| Number of CS | 1.75±0.23 | 1.64±0.31 | >0.05 |
| The time of pregnancy | 47.35±12.73 | 49.21±13.13 | >0.05 |

Table 2. Clinical characteristics and operative data of the two groups

| | IIATO (n=21) | UAE (n=11) | P value |
|---|--------------|-------------|---------|
| Gestational sac diameter (cm) | 2.93±0.54 | 2.89±0.39 | |
| Preoperative serum hCG (10000 mol/L) | 2.62±0.76 | 2.41±0.57 | >0.05 |
| Intraoperative blood loss (ml) | 67.14±32.78 | 71.35±31.56 | >0.05 |
| Hospital stay (d) | 5.14±0.32 | 4.97±0.21 | >0.05 |
| Postoperative vaginal bleeding time (d) | 23.33±10.71 | 25.21±11.15 | <0.05 |
| Recovery time of menstruation | 38.38±12.73 | 54.81±15.66 | <0.05 |

IIATO group was 38.38±12.73 days, while that in UAE group was 54.81±15.66 days ($P<0.05$) (Table 2). No serious complications were observed in both groups.

Discussion

CSP refers to the pregnancy sac, fertilized egg or embryo implanted in the previous cesarean scar, which was first put forward in 1978 [1]. The incidence of CSP was 1/2000 and 6.1% of ectopic pregnancies in women with history of Caesarean delivery. In the last decade, the incidence rate of CSP has gradually elevated with the increasing number of caesarean surgeries and the improvement of ultrasound diagnosis [2, 3].

However, CSP has no relationship with age of patients, and the interval from the previous cesarean section. The pathogenesis of scar pregnancy is still not clear. The possible mechanism may be speculated as the implantation in the defect of cesarean scar. There are risks of uterine rupture, placental implantation, and bleeding with the progress of CSP due to the poor elasticity of fibrous tissue in the scar. The placental villus is implanted into the myometrium or scar tissue with the middle decidual layer absent was considered as the pathological basis.

Studies have shown that uterine scar hinders embryo implantation not only owing to the phys-

ical existence of scar, but also because of the overall influence of endometrium after previous cesarean. Notably, the risk of scar pregnancy may be proportional to the size of scar defects in the anterior wall of the uterus. No evidence showed that scar pregnancy is related to the number of previous cesarean section, but women with previous elective cesarean section due to abnormal fetal position have a higher risk of CSP [4].

Most patients could get normal pregnancy after

CSP. Previous research reported that the incidence of recurrent CSP after curettage with or without UAE was 3.2-5.0% [5]. The risk factors of recurrent CSP include scar thickness less than 5 mm, pregnancy sac protruding to vesical peritoneal reflection, cesarean section performed in low level hospitals, abdominal pain and vaginal bleeding in previous CSP. In our study, the recurrence rate of CSP was 3.7% with 5 recurrent cases in all 135 CSP cases.

The average gestational age of scar pregnancy was 7.5±2.5 weeks [3]. In our study, the average gestational age of all CSP patients was 48.5±8.79 days. The average gestational age of UAE group was 47.35±12.73 days, while the average gestational age of IIATO group was 49.21±13.13 days. Compared with >9 weeks of gestation, CSP diagnosed at an gestation age ≤9 weeks was associated with a significantly lower risk of composite adverse outcome, such as massive hemorrhage, need for transfusion, uterine rupture and other emergency requiring urgent intervention [6].

At present, CSP is primarily diagnosed by ultrasound. In Li's research, contrast-enhanced ultrasound was more accurate in the diagnosis of CSP. The diagnostic sensitivity and specificity of scar pregnancy reached 77.8% and 100% respectively with PI ratio of cesarean scar and myometrium set to 1.08. The contrast-enhanced ultrasound improved the diagnostic rate of CSP and reduced the misdiagnosis [7].

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In Darwish's study, 47.6% of patients were asymptomatic, 33.3% patients complained vaginal bleeding, and 19.1% patients complained abdominal pain in association with vaginal bleeding [8]. If the first pregnancy ultrasound is later, the diagnosis may be delayed due to asymptomatic CSP [9]. In our study, out of 135 CSP patients, 43 (31.9%) were diagnosed by routine ultrasound examination with no symptoms. Besides, two patients were diagnosed with massive vaginal bleeding after amenorrhea. And the rest with vaginal bleeding after amenorrhea were diagnosed with ultrasound examination. Early diagnosis and treatment are important for the best prognosis. Therefore, every pregnant woman with history of cesarean delivery should be screened by ultrasound in first trimester of pregnancy [10].

For now, the treatment of CSP includes local injection of MTX, curettage, UAE combined with curettage and uterine repair, IIAO combined with curettage and uterine repair and HIFU combined with hysteroscopy. A systematic review of 2037 CSP patients showed that 14 different treatment methods were used, of which the success rate of laparoscopic surgery reached 97.1%, while the success rate of UAE combined with curettage or hysteroscopy was 95.4% [11, 12].

Temporary occlusion of bilateral internal iliac artery could reduce uterine blood flow by 48% with pulse pressure by 85%. Since 2006, it has been reported that the average time of internal iliac artery occlusion was 27-60 minutes [13]. In our study, the average occlusion time of 21 patients was 30 ± 12.05 minutes. We began to block bilateral internal iliac artery after separating pelvic adhesion and vesical peritoneal reflection. It could shorten the occlusion time and reduce the complications related to tissue ischemia.

UAE is typically performed as an adjunct to other medical or surgical procedures either prophylactically or therapeutically when hemorrhage occurs [14]. Several studies have reported that use of UAE prior to curettage for the treatment of CSP was helpful in controlling massive bleeding [15]. UAE should be combined with other treatments for women who want to conceive again considering it required a long follow-up period [16]. Comparing with temporary occlusion of bilateral internal iliac artery,

UAE has risks of post embolism syndrome, ovarian function and urinary system damage, intrauterine adhesion and even pulmonary embolism, sepsis, or rectal perforation [17-20]. UAE combined with hysteroscopy could not repair the existing uterine scar or reduce the risk of recurrence, especially for those who want to preserve fertility. In our study, the menstrual recovery time in UAE group was longer than that in IIAO group. One patient in UAE group underwent hysteroscopic surgery due to intrauterine adhesions after surgery. We thought that temporary occlusion of the internal iliac artery has less long-term effect on uterine blood supply than UAE.

The guidelines of SMFM 2020 suggests that once patients were diagnosed as CSP, expectant treatment is opposed (IB), and hysteroscopic, laparoscopic or ultrasound-guided aspiration of uterus is recommended to avoid aspiration alone (IIC) [11]. In our study, we repaired uterine after laparoscopic internal iliac artery temporary occlusion and then performed hysteroscopy to ensure that there was no residual pregnancy tissue in the uterine cavity. It is important for the patients who have fertility requirements.

Laparoscopic temporary occlusion of bilateral internal iliac arteries combined with uterine repair and Hysteroscopy is an effective method for the treatment of type III CSP.

Disclosure of conflict of interest

None.

Address correspondence to: Xiang Tang, Department of Minimal Invasive Gynecology, Guangzhou Women and Children's Hospital, Guangzhou Medical University, No. 9, Jinsui Road, Tianhe District, Guangzhou 510000, Guangdong, China. Tel: +86-18502072073; E-mail: jacktang14@hotmail.com

References

- [1] Lin Y, Xiong C, Dong C and Yu J. Approaches in the treatment of cesarean scar pregnancy and risk factors for intraoperative hemorrhage: a retrospective study. *Front Med (Lausanne)* 2021; 8: 682368.
- [2] Doroszewska K, Milewicz T, Bereza T, Horbaczewska A, Komenda J, Klosowicz E and Jach R. Cesarean scar pregnancy-various methods of treatment. *Folia Med Cracov* 2019; 59: 5-14.

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- [3] Rotas MA, Haberman S and Levgur M. Cesarean scar ectopic pregnancies: etiology, diagnosis, and management. *Obstet Gynecol* 2006; 107: 1373-1381.
- [4] Jayaram PM, Okunoye GO and Konje J. Cesarean scar ectopic pregnancy: diagnostic challenges and management options. *Obstetrician & Gynaecologist* 2017; 19: 13-20.
- [5] Qian ZD, Guo QY and Huang LL. Identifying risk factors for recurrent cesarean scar pregnancy: a case-control study. *Fertil Steril* 2014; 102: 129-134, e121.
- [6] Timor-Tritsch I, Buca D, Di Mascio D, Cali G, D'Amico A, Monteagudo A, Tinari S, Morlando M, Nappi L, Greco P, Rizzo G, Liberati M, Jose Palacios J and D'Antonio F. Outcome of cesarean scar pregnancy according to gestational age at diagnosis: a systematic review and meta-analysis. *Eur J Obstet Gynecol Reprod Biol* 2021; 258: 53-59.
- [7] Li H, Liu X, Xie L, Ye Z and Gan L. Diagnostic accuracy and cut-off of contrast-enhanced ultrasound in caesarean scar pregnancy. *Eur J Obstet Gynecol Reprod Biol* 2020; 246: 117-122.
- [8] Darwish HS, Habash YH and Habash MY. Ectopic pregnancies in caesarean section scars: 5 years experience. *Clin Imaging* 2020; 66: 26-34.
- [9] Reid JA, Bayer LL, Edelman AB and Colwill AC. Controversies in family planning: management of cesarean-scar ectopic pregnancy. *Contraception* 2021; 103: 208-212.
- [10] Gonzalez N and Tulandi T. Cesarean scar pregnancy: a systematic review. *J Minim Invasive Gynecol* 2017; 24: 731-738.
- [11] Society for Maternal-Fetal Medicine (SMFM); Electronic address pso, Miller R, Timor-Tritsch IE and Gyamfi-Bannerman C. Society for Maternal-Fetal Medicine (SMFM) consult series #49: cesarean scar pregnancy. *Am J Obstet Gynecol* 2020; 222: B2-B14.
- [12] Qian ZD, Huang LL and Zhu XM. Curettage or operative hysteroscopy in the treatment of cesarean scar pregnancy. *Arch Gynecol Obstet* 2015; 292: 1055-1061.
- [13] Li J, Li X, Yu H, Zhang X, Xu W and Yang J. Combined laparoscopic and hysteroscopic management of cesarean scar pregnancy with temporary occlusion of bilateral internal iliac arteries: a case report and literature review. *Medicine (Baltimore)* 2018; 97: e11811.
- [14] Kanat-Pektas M, Bodur S, Dundar O and Bakir VL. Systematic review: what is the best first-line approach for cesarean section ectopic pregnancy? *Taiwan J Obstet Gynecol* 2016; 55: 263-269.
- [15] Lou T, Gao Y, Feng Y, Lu J, Zhang Z and Bai H. Reproductive outcomes of cesarean scar pregnancies pretreated with methotrexate and uterine artery embolization prior to curettage. *Taiwan J Obstet Gynecol* 2020; 59: 381-386.
- [16] Gao L, Huang Z, Gao J, Mai H, Zhang Y and Wang X. Uterine artery embolization followed by dilation and curettage within 24 hours compared with systemic methotrexate for cesarean scar pregnancy. *Int J Gynaecol Obstet* 2014; 127: 147-151.
- [17] Xu W, Wang M, Li J, Lin X, Wu W and Yang J. Laparoscopic combined hysteroscopic management of cesarean scar pregnancy with temporary occlusion of bilateral internal iliac arteries: a retrospective cohort study. *Medicine (Baltimore)* 2019; 98: e17161.
- [18] Mallick R, Okojie A and Ajala T. Rectal perforation: an unusual complication of uterine artery embolisation. *J Obstet Gynaecol* 2016; 36: 867-868.
- [19] Qiu J, Fu Y, Huang X, Shu L, Xu J and Lu W. Acute pulmonary embolism in a patient with cesarean scar pregnancy after receiving uterine artery embolization: a case report. *Ther Clin Risk Manag* 2018; 14: 117-120.
- [20] Wang Y and Huang X. Sepsis after uterine artery embolization-assisted termination of pregnancy with complete placenta previa: a case report. *J Int Med Res* 2018; 46: 546-550.