Available online at www.sciencedirect.com

ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology 52 (2013) 505–511

www.tjog-online.com

Original Article

Low-lying-implantation ectopic pregnancy: A cluster of cesarean scar, cervico-isthmus, and cervical ectopic pregnancies in the first trimester

Shih-Wei Tsai [a], Kuan-Hui Huang [a], Yu-Che Ou [a], Te-Yao Hsu [a], Chen-Bin Wang [b], Ming-Shan Chang [a], Ko-Hsin Li [a], Fu-Tsai Kung [a,*]

[a] *Department of Obstetrics and Gynecology, Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, Taiwan*
[b] *Department of Obstetrics and Gynecology, Chang Gung Memorial Hospital, Chia Yi, Chang Gung University College of Medicine, Taiwan*

Accepted 24 January 2013

Abstract

Objective: To describe the treatment outcomes of aberrant ectopic implantations in the lower segment of the uterus in a cohort population and to evaluate whether or not low-lying-implantation ectopic pregnancy (LLIEP), a new term, is appropriate to include in the traditional diagnoses of cervical pregnancy (CP), cesarean scar pregnancy (CSP), and other unusual aberrant implantations in the lower segment of the uterus in the first trimester, in terms of clinical characteristics, treatment, and prognosis.

Materials and methods: Forty-two women with ectopic pregnancies of <12 weeks' gestational age from July 2003 to December 2008 were prospectively studied. Each patient underwent an ultrasound evaluation by an experienced consultation team and was grouped into the CP, CSP, or cervico-isthmic pregnancy (CIP) group. Patients underwent either suction dilatation and curettage (D and C) alone, or laparoscopic uterine artery blockage followed by suction D and C, to remove the aberrant trophoblasts without other adjuvant treatments. Clinical characteristics and biochemical factors, including obstetric history, patient age, body mass index (BMI), gestational age, serum hematocrit and β-hCG level, operation method, operation time, and intraoperative blood loss were evaluated.

Results: There were no significant differences in patient age (mean = 34.1 ± 6.4 years), previous number of cesarean deliveries (mean = 1.5 ± 0.8), gestational age (mean = 6.9 ± 1.2 weeks), serum β-hCG (mean = 35,384.3 ± 41,726.9 mIU/mL), operation time (mean = 60.3 ± 46.6 minutes), and surgical blood loss (mean = 124.7 ± 191.5 mL) among the three patient groups. The uterus was successfully preserved in all patients after treatment.

Conclusion: The prognosis of surgical management for ectopic implantations in the lower segment of the uterus is good. The new term LLIEP seems appropriate to cover all forms of aberrant ectopic implantations in the lower segment of the uterus in the first trimester, in terms of treatment efficacy. The use of LLIEP for preoperative ultrasound diagnosis would enable the clinician to diagnose unusual cases more easily, without the need to change the current treatment policy.

Keywords: cervical pregnancy; cesarean scar pregnancy; low-lying-implantation ectopic pregnancy; ultrasound

Introduction

Aberrant implantation in the lower segment of the human uterus can occur in the cervix, cervico-isthmus (close to internal *os* of the uterine cervix), and previous cesarean scars. Cervical pregnancy (CP) is a rare form of ectopic pregnancy and its incidence is about 1 in 1000 to 1 in 18,000 live births [1]. Previous therapeutic abortion, Asherman's syndrome, previous cesarean delivery, diethylstilbestrol exposure, presence of intrauterine devices, leiomyoma, structural abnormalities, and *in vitro* fertilization are risk factors for CP [2]. Ectopic cervical pregnancy was first diagnosed using ultrasound in 1978 [3]. With advances in ultrasound resolution and wide use in clinical practice, CP can be detected in the early stage. However, the definitive clinical diagnosis of CP was

* Corresponding author. Department of Obstetrics and Gynecology, Kaohsiung Chang Gung Memorial Hospital, Kaohsiung, 123, Ta-Pei Road, Niao Sung District, Kaohsiung 833, Taiwan.
E-mail address: ftkung@adm.cgmh.org.tw (F.-T. Kung).

1028-4559/$ - see front matter
http://dx.doi.org/10.1016/j.tjog.2013.10.009

considered difficult and commonly delayed [1,4]. In some circumstances, CP has a high potential for morbidity, because of the risk of catastrophic hemorrhage [5–7]. Management options for the treatment of cervical ectopic pregnancy vary from conservative medical therapies to radical surgical procedures [7,8]. Recently, mortality has dramatically decreased because of early diagnosis and effective treatment options to prevent life-threatening bleeding [5]. Nevertheless, the most effective treatment methods for CP remain unclear.

Cesarean scar pregnancy (CSP) is another rare form of abnormal pregnancy, with an incidence of 1/1800, which could be life threatening and cause maternal morbidity [9]. Risk analysis showed that 54% of these patients have undergone multiple cesarean deliveries [10,11]. Catastrophic hemorrhage may occur during surgical evacuation, because of the abnormally high vascularity and varicosity in the anterior lower segment of the uterus, especially with advancing gestation [10]. The lower segment is less capable of fibromuscular contraction to control bleeding [10]. Treatments for CSP include simple suction dilatation and curettage (D and C), systemic or local methotrexate (MTX) chemotherapy, transcervical hysteroscopic resection, hysterotomy, uterine artery ligation, and uterine artery embolization [11–16]. The diagnosis is often difficult and a false-negative diagnosis may result in major complications [13]. There is still no consensus on the method of choice for managing CSP [17]. Diagnosing and treating CSP earlier rather than later shows a trend toward an improved outcome [11,14,16].

Both CP and CSP were similar in incidence rarity, carried the potential for life threatening bleeding, and had diverse treatment options. Previously published studies are case reports, which were with limited patient numbers [6,12,18]. In clinical practice, the majority of clinicians have very limited experience and confidence in the differential diagnosis and treatment of these pregnancies and treatment is at the physicians' discretion. In this study, we described the treatment outcomes of aberrant ectopic implantations in the lower segment of the uterus, whether in the cervix, cervico-isthmus, or a previous cesarean scar in a cohort population at a tertiary referral hospital. Furthermore, we would like to introduce a new term of low-lying-implantation ectopic pregnancy (LLIEP), which includes all types of aberrant implantation in the lower segment of the human uterus. Patient characteristics, hematologic and serologic markers, operation parameters, and prognosis after treatment were assessed in each group and compared among the groups.

Materials and methods

Patient recruitment

Patients who were referred by local medical departments due to suspicion of CP and CSP based on ultrasound examinations and refusal to maintain the pregnancy were recruited for further screening from 2003 to 2008. Previously, our earlier results regarding the accuracy of ultrasound diagnosis and the effectiveness of newly developed one-stage laparoscopic management of cervical pregnancies were published in 2004 [19]. In that report, we found that team consultation effectively avoided ultrasound overdiagnosis and a one-stage endoscopic treatment could give a promising surgical prognosis in CP.

Initial evaluation of CP and CSP

Enrolled patients were reevaluated according to our established protocol. Each pregnancy was reconfirmed by qualitative detection of urinary β-hCG and secondarily by quantitative measurement of serum β-hCG. The obstetrical history of each patient was reviewed by the care-providing physicians. Gestational age, calculated based on the last menstrual period, was adjusted according to the previous menstrual pattern, or estimated by ultrasound dating, as appropriate. The uterine cervix was inspected with a bivalve speculum on gynecological examination at the initial visit.

Ultrasound diagnostic criteria of CP

Transabdominal ultrasound was performed with a well-distended bladder, to establish the diagnosis of CP using the following criteria: (1) the presence of the gestational sac or placental texture dominantly within the cervix; (2) no evidence of intrauterine pregnancy; (3) visualization of an endometrial stripe; (4) hourglass uterine shape with ballooned cervical canal (for gestational age $\geq$ 7 weeks) as suggested by Hofmann et al [20]; and (5) a gestational sac with active cardiac motion, indicating a viable pregnancy below the internal os, as suggested by Timor-Tritsch et al [21]. Fig. 1A shows a typical case of CP by transabdominal ultrasound. Transvaginal ultrasound was alternatively or complementarily used in the same examination. Transvaginal ultrasound with an empty bladder was also used to localize and measure the gestational mass and/or sac, if present.

During vaginal scanning, gentle pressure was applied on the cervix using an ultrasound probe to rule out "abortion in progression with abortus retained by a resistant external *os*," also referred to as the "sliding sign." Additionally, we used the presence or absence of fetal cardiac activity, shape of the gestational sac, color Doppler flow mapping around the gestational sac, and gentle movement of the cervix by using an ultrasound probe to help differentiate abortion in progress from CP.

Ultrasound diagnosis of CSP

The diagnosis of CSP by ultrasonography requires the presence of the following criteria: (1) an empty uterus, with a clearly demonstrated endometrium; (2) an empty cervical canal; (3) a gestational sac located in the anterior part of the uterine isthmus; and (4) a gestational sac, with or without cardiac activity, embedded in and surrounded by the myometrium and the fibrous tissue of a previous cesarean scar, separate from the endometrial cavity or fallopian tube [13,22].

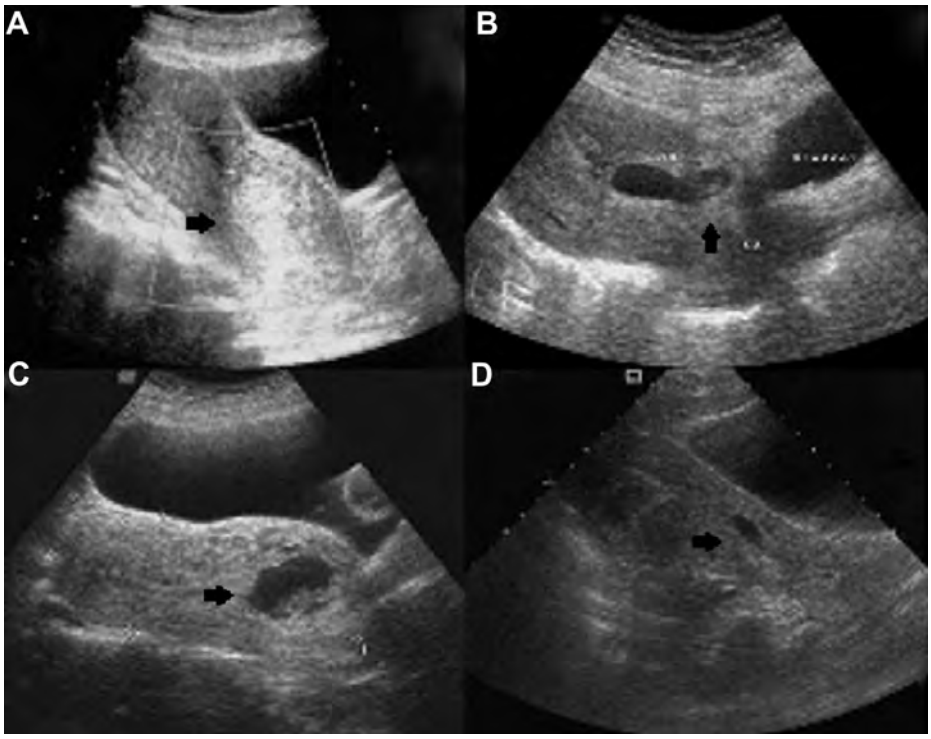

Fig. 1. Transabdominal ultrasound images showing: (A) An 8-week-1-day cervical pregnancy in which the uterus is hourglass-shaped, with an empty endometrial cavity and peripheral hypervascularity around the intracervical mass (increased vessel flows, Doppler imaging, arrow). No fetus is visible. (B) A 7-week-6-day cesarean scar pregnancy with the sac embedded in the scar (arrow), protruding into the uterine cavity, with upward bulging toward the posterior wall of the urinary bladder. (C) An 8-week-3-day cesarean scar pregnancy with cervico-isthmus involvement, with the sac (arrow) between the lower segment and the upper cervix and a viable fetus inside the sac. (D) An 8-week (based on last menstrual period) undifferentiated lower segment pregnancy with an elongated, collapsed sac, without an embryo (arrow), located between the lower segment and the uterine cervix.

Fig. 1B shows a typical case of CSP and Fig. 1C shows CSP with cervico-isthmus involvement.

Color Doppler imaging was optionally applied for blood velocimetry of the gestational mass and surrounding tissues. The need for differentiation of the four types of abnormal implantation low on the uterine corpus and cervix, including CSP, abortion in progress, low-lying implantation/cervico-isthmic pregnancy (CIP), and CP was kept in mind during the ultrasound examination. To eliminate the care providers' personal prejudices, minimize interobserver variations, and enhance the interpretative accuracy, the final diagnosis of CP, CSP, undifferentiated diagnosis, and abortion in progression was made only if both the first author and at least one of the coauthors agreed, based on evaluation of the β-hCG measurements and ultrasound images.

For patients who did not meet the ultrasound criteria for diagnosis of CP or CSP, or had a controversial diagnosis, but had implantation between CP and CSP, or patients for whom abortion in progress was excluded, the diagnosis of CIP was made. Fig. 1D shows a gestational sac without an embryo, located between the lower segment and the uterine cervix, which was categorized as CIP.

Clinical management

Each patient was informed of the treatment methods, including conservative treatment with MTX chemotherapy and surgical intervention. The benefit of MTX chemotherapy is that it precludes the need for anesthesia and surgery; however, MTX therapy carries the risk of failure, or requires possible use of additional procedures, and a long time of outpatient follow-up, based on previous experiences [14,23]. By contrast, the one-stage minimally invasive surgery included: (1) gentle suction D and C without vigorous curettage on the lower segment of the uterus, with the assistance of transabdominal ultrasound guidance; and (2) laparoscopic uterine artery blockage followed by suction D and C [19]. The rationale for laparoscopic uterine blockage in the treatment of LLIEP was to reduce uterine perfusion and to achieve venous stasis in the uterus. A suction D and C under laparoscopically direct visualization was subsequently performed to remove the gestational tissue [19]. Preoperative informed consent was obtained about the possible need for conversion to laparoscopic uterine artery ligation, or even hysterectomy during D and C in the case of uncontrollable massive hemorrhage.

Most patients agreed to take one-stage minimally invasive surgery after the explanation. The definition of successful treatment was complete preservation of the uterus, without additional surgical procedures.

After surgical management, we subdivided LLIEP patients into simple and complicated groups. Those patients who received suction D and C alone were grouped as simple, and those who underwent a combination of laparoscopic uterine blockage and suction D and C were grouped as complicated.

Table 1
Clinical characteristics in patients with cervical pregnancy (CP), cesarean scar pregnancy (CSP), and cervico-isthmic pregnancy (CIP).

	CP ($n = 8$)	CSP ($n = 30$)	CIP ($n = 4$)	Total ($n = 42$)	p
Age (y)	30.4	35.1	34	34.1 ± 6.4	0.149
Gravida	2.7	4.1	3.3	3.8 ± 1.9	0.427
Parity	1.1	1.8	1.3	1.7 ± 0.8	0.506
Previous abortions (n)	1.5	2.1	2.0	2.0 ± 1.5	0.485
Previous cesarean deliveries	1.1	1.7	1.5	1.5 ± 0.8	0.378
Body height (cm)	161.1	157.6	161	158.6 ± 4.9	0.643
Body weight (kg)	52.1	54.7	65.3	55.3 ± 9.2	0.057
Body mass index	20.1	21.8	25.3	21.8 ± 3.3	0.015
Gestational age (wk)	6.6	6.8	8	6.9 ± 1.2	0.867
Fetal heart beat (n)					
Yes	1	11	1	13	
No	7	19	3	29	
Serum β-hCG (mIU/mL)	11,913.2	43,046.1	22,486.8	35,384.3 ± 41,726.9	0.142
Surgical method					
D and C alone (n)	4	22	4	30	
Uterine artery blockade[a] with or without D and C (n)	3	8	0	11	
Systemic MTX injection (n)	1	0	0	1	
Operation time (min)	42.7	67.1	28.7	60.3 ± 46.6	0.821
Blood loss (mL)	162	125	70	124.7 ± 191.5	0.740

Total = sum of CP, CSP, and CIP groups.
Data are presented as mean, mean ± SD or value.
D and C = dilatation and curettage; MTX = methotrexate.
[a] Uterine artery blockade: 10 with laparoscopic uterine artery ligation and one with radiologic uterine artery angioembolization.

Data analysis

All data were analyzed using SPSS software (version 13; SAS Institute, Cary, NC, USA). A one-way analysis of variance was conducted to evaluate the relationship between clinical characteristics in patients, and treatments (CP, CSP, CIP, and total). Data were expressed as means ± standard deviations or percentages. A p value of ≤ 0.05 was considered statistically significant.

Results

A total of 47 patients were transferred to our hospital from seven private clinics and six community hospitals during the 5-year study period. Eight patients (17.0%) fulfilled the ultrasound-based criteria for CP, 30 patients (63.8%) for CSP, four patients (8.5%) for undifferentiated diagnoses, and five patients (10.6%) for abortion in progress. After exclusion of the five patients with abortion in progress, 42 patients met our criteria for LLIEP. Most of them presented with painless vaginal spotting/bleeding. Of the 42 patients, 30 underwent suction D and C alone as the treatment modality, after being informed about the treatment options and discussion with patients and/or their families. Eleven of the 42 patients underwent uterine artery blockade with or without suction D and C. Only 1 of the 42 patients received systemic MTX treatment.

Table 1 shows the clinical characteristics of the patients, including patient age, gestational age, body mass index (BMI), body height, obstetric history, operation time, operation method, amount of operative blood loss, and serum β-hCG level at diagnosis. Thirty patients, including four patients with cervical pregnancies, 22 with CSP, and four with CIP, underwent suction D and C alone. By contrast, 11 patients, including three patients with cervical pregnancies and eight patients with CSP, underwent uterine artery blockade with or without suction D and C. The mean operation time for patients undergoing surgical intervention was 60.3 (±46.6) minutes and their mean blood loss was 124.7 (±191.5) mL. There were no statistically significant differences in all variables among the CP, CSP, and CIP groups.

Table 2 shows a comparison of the clinical characteristics and prognostic parameters between the 15 patients with definite fetal heartbeats (viable) and the 29 without fetal heartbeats (non-viable). There were no statistically significant differences in variables except for the serum β-hCG level

Table 2
Comparison of clinical characteristics and prognostic indicators between viable and non-viable "low-lying-implantation ectopic pregnancy" groups. Viable: presence of fetal heart beats.

	Viable ($n = 13$)	Non-viable ($n = 29$)	p
Age (y)	35.8 ± 7.0	33.1 ± 6.5	0.144
Gravida	3.7 ± 1.9	4.1 ± 2.2	0.292
Parity	1.9 ± 0.5	1.6 ± 0.9	0.138
Previous abortions	1.6 ± 1.9	2.4 ± 1.4	0.129
Previous cesarean sections	1.6 ± 0.6	1.5 ± 1.0	0.385
Body height (cm)	157.0 ± 5.6	159.2 ± 4.8	0.141
Body weight (kg)	53.1 ± 10.9	56.7 ± 7.8	0.167
Body mass index	21.5 ± 4.1	22.1 ± 2.6	0.346
Gestational age	7.1 ± 1.0	6.8 ± 1.2	0.216
Serum β-hCG (mIU/mL)	52,180 ± 45186.7	19,469.2 ± 23341.5	0.021
Operation time (min)	55.9 ± 29.6	75.1 ± 60.1	0.123
Blood loss (mL)	123.3 ± 217.9	135.5 ± 207.2	0.439

Non-viable: absence of fetal heart beats.
Data are presented as mean ± SD or value.

Table 3
Comparison of clinical characteristics and prognostic indicators between simple and complicated low-lying-implantation ectopic pregnancy (LLIEP) groups.

	Simple LLIEP ($n = 30$)	Complicated LLIEP ($n = 11$)	p
Age (y)	35.7 ± 5.2	31.6 ± 6.9	0.038
Gravida	3.6 ± 1.8	4.2 ± 2.2	0.229
Parity	1.6 ± 0.8	1.8 ± 0.8	0.202
Previous abortions	2.1 ± 1.4	2.0 ± 1.6	0.428
Previous cesarean sections	1.6 ± 0.7	1.5 ± 0.8	0.312
Body height (cm)	158.7 ± 3.8	158.5 ± 6.8	0.458
Body weight (kg)	56.1 ± 9.4	54.3 ± 8.7	0.276
Body mass index	22.1 ± 3.5	21.5 ± 3.1	0.305
Gestational age	6.6 ± 1.0	7.5 ± 1.3	0.056
Serum β-hCG (mIU/mL)	72,798.7 ± 39,594.9	41,932.3 ± 48,478.7	0.296
Operation time (min)	39.2 ± 17.9	105.8 ± 57.1	0.001
Blood loss (mL)	96.2 ± 168.9	186.1 ± 227.2	0.112

between the two patient groups. The serum β-hCG level was higher in the viable fetus group.

Table 3 shows a comparison of clinical characteristics and operation parameters between simple and complicated LLIEP groups. There were significant differences in age (35.7 ± 5.2 vs. 31.6 ± 6.9 years) and operation time (39.2 ± 17.9 vs. 105.8 ± 57.1 minutes). Those patients with complicated LLIEP were younger and had a longer operation time.

Discussion

In this prospective study, aberrant gestation in the lower segment of the uterus occurred mostly on previous cesarean scars (63%, 30/47) and secondly in the cervix (17%, 8/47), based on our ultrasound diagnosis. The incidence of CSP was higher than that of CP at our institution, which is compatible with previous studies [14,24]. With increases in the numbers of cesarean deliveries, the likelihood of CSP is expected to continue [11].

In the past few decades, the diagnosis of aberrant gestation in the lower segment of the uterus is based almost solely on ultrasound findings rather than surgical and anatomic examinations. CSP were often misdiagnosed as low intrauterine pregnancies, CP, or miscarriage in progress [11,18]. In clinical practice, the ultrasound-based term of LLIEP is probably suitable for use in terms of clinical characteristics, response to treatment, and the final outcome after treatment. LLIEP represents a cluster of diagnoses, including CSP, CIP, and CP (Fig. 2).

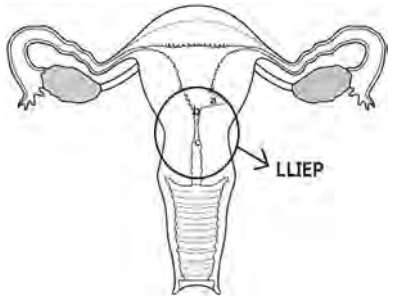

Fig. 2. The circled area with the letters a, b, and c inside indicate various low-lying-implantation ectopic pregnancy (LLIEP) anatomic locations: a = cesarean scar pregnancy; b = cervical-isthmus pregnancy; c = cervical pregnancy.

From the embryonic and anatomic points of view, the cervix and lower segment of the uterus originate from the distal paramesonephric ducts in the development. Upon maturation, the muscular content of the myometrium in this anatomic part becomes less, compared to the corpus of uterus, but receives the same blood supply, mainly from the uterine arteries, and has similar innervation. In establishment of human gestation, embryo nidation can occur on any location along the lower uterine cavity and endocervical canal. From the clinical manifestation point of view, most LLIEP during the first trimester present as abnormal painless vaginal bleeding, but carry the potential risk of uncontrollable bleeding, with less capability of muscular contraction, and require time-consuming resolution of the lesion with a prolonged recovery time. Zhang et al found that 82% patients of CSP presented with light vaginal bleeding, which agrees with our finding [12]. A cluster of abnormal gestations are suitable for a diagnosis of LLIEP.

With its preciseness in determining implantation location and size and in visualizing surrounding tissue and organs, conventional two-dimensional ultrasound imaging with alternate use of abdominal and/or vaginal approaches to diagnose LLIEP was suitable for the vast majority of the cases. Transabdominal ultrasound with a well-distended urinary bladder provides good visualization of the uterus and cervix in one single plane. Transvaginal ultrasound with an empty bladder allows detailed imaging by adjusting ultrasonic frequencies in cases of early or small LLIEP. Placental implantation in LLIEP along the low segment, isthmus, internal *os*, and endocervical canal can be identified. Doppler ultrasound can demonstrate vascular communications between the uterine stroma and placenta, and is helpful to differentiate abortion in progress from LLIEP. Power Doppler and/or three-dimensional ultrasound examination provides additional information for monitoring and quantifying neovascularization change for the initial diagnosis and during the follow-up period [25,26], but are not essential in most cases for the initial diagnosis [19].

Clinically, both CP and CSP are usually misdiagnosed [1,2,12,18]. CP is sometimes mistaken as threatened abortion if the patient's presenting symptom is mild to moderate vaginal bleeding [1,6]. Only heavy vaginal bleeding arouses clinical suspicion of CP [1]. Unfamiliarity with these types of pregnancies among physicians in the community often results in misdiagnosis and inadequate management [27]. If the delayed diagnosis of CSP and CP are grouped to noncomplicated LLIEP, the prognosis might not be poorly affected. However, if these ectopic pregnancies are grouped into the complicated type of LLIEP, morbidity and prognosis could be worse when the diagnosis is delayed.

Despite many treatment choices, there is still no consensus on which treatment is the most effective, especially for LLIEP during the first trimester. Literature reviews showed that both conservative treatment and aggressive treatment provide good prognoses [3,6,8,18,23,27]. Conservative medical treatment, such as systemic MTX or systemic MTX with local KCl injection, are reported and proved to be a feasible management option for CP or CSP [27]. In the present study, we used suction D and C as the first-line treatment for patients with CSP, CP, or ULSP, because most of the gestational ages fell within the first trimester, and the ectopic mass was small and simple. A gentle suction D and C procedure was effective and safe. For those patients with complicated cases, laparoscopic blockade of the uterine artery in conjunction with D and C under laparoscopic visualization was needed to avoid intraoperative D and C-related heavy bleeding. Both of the above methods gave the advantage of *en bloc* removal of trophoblastic tissues in one procedure, without the need for further MTX chemotherapy [19].

The uterus was successfully preserved after treatment in all patients. Furthermore, we found no statistically significant differences between patients with (viable) and without (nonviable) fetal heartbeats (Table 2); thus, fetal heart activity might not affect patient prognosis in the first trimester. However, because the case number is small due to the rarity of LLIEP, confirmation of this observation is needed.

Fifteen (35%) of 42 patients with an original presumptive diagnosis from the local clinics and community hospitals were inconsistent with the diagnosis made in our department. In our previous study [19], only six (22%) of 27 patients referred for suspicion of CP had a final diagnosis of the condition on review by an experienced ultrasound consultation team. In a study by Shavell et al, 75% patients with CP were initially misdiagnosed [1]. In a study by Vela and Tulandi, initial diagnosis of CP was correct in five of 12 patients [6]. In a review by Timor-Tritsch and Monteagudo, the diagnosis of CSP was missed in 107 of 751 cases [11]. By contrast, in reality, a single diagnosis of CSP, CP, or CIP could overlap with, or involve the others in various degrees. Taking into account the above observations, the clinical application of LLIEP can be convenient to cover all of the aberrant ectopic implantation situations in the lower segment of the uterus in the first trimester.

The 42 study participants in this report were in the first trimester of their pregnancies. The sample size was small; therefore, comparison between or among the groups should be made with caution, due to the lack of statistical power. Efforts should be made to collect more cases to avoid bias and to have other researchers from different institutions examine the appropriateness in the manner of cooperation. Nonetheless, LLIEP appears to be a useful and practical term covering all forms of aberrant embryo implantation in the lower segment of the uterus diagnosed with ultrasound. LLIEP is also useful when applied to treatment method selection, without deteriorating efficacy, and in prediction of posttreatment recovery. The use of LLIEP would help clinicians: (1) diagnose the rare forms of lower segment ectopic pregnancies by ultrasound in a simple manner; (2) communicate with colleagues easily; (3) explain the condition to patients in a simple and friendly manner; and (4) choose the appropriate treatment plan without the need to alter existing policies and procedures.

References

[1] Shavell VI, Abdallah ME, Zakaria MA, Berman JM, Diamond MP, Puscheck EE. Misdiagnosis of cervical ectopic pregnancy. Arch Gynecol Obstet 2012;285:423–6.
[2] Modayil V, Ash A, Raio C. Cervical ectopic pregnancy diagnosed by point-of-care emergency department ultrasound. J Emerg Med 2011;41:655–7.
[3] Kirk E, Condous G, Haider Z, Syed A, Ojha K, Bourne T. The conservative management of cervical ectopic pregnancies. Ultrasound Obstet Gynecol 2006;27:430–7.
[4] Ushakov FB, Elchalal U, Aceman PJ, Schenker JG. Cervical pregnancy: past and future. Obstet Gynecol Surv 1997;52:45–59.
[5] Ben Farhat L, Ben Salah Y, Askri A, Dali N, Hendaoui L. Conservative treatment of a cervical twin pregnancy with uterine artery embolization. Diagn Interv Radiol 2010;16:248–50.
[6] Vela G, Tulandi T. Cervical pregnancy: the importance of early diagnosis and treatment. J Minim Invasive Gynecol 2007;14:481–4.
[7] Bianchi P, Salvatori MM, Torcia F, Cozza G, Mossa B. Cervical pregnancy. Fertil Steril 2011;95:2123. e3–4.
[8] Wang Y, Xu B, Dai S, Zhang Y, Duan Y, Sun C. An efficient conservative treatment modality for cervical pregnancy: angiographic uterine artery embolization followed by immediate curettage. Am J Obstet Gynecol 2011;204:31. e1–7.
[9] Jurkovic D, Hillaby K, Woelfer B, Lawrence A, Salim R, Elson CJ. First-trimester diagnosis and management of pregnancies implanted into the lower uterine segment Cesarean section scar. Ultrasound Obstet Gynecol 2003;21:220–7.
[10] Kung FT, Huang TL, Chen CW, Cheng YF. Image in reproductive medicine. Cesarean scar ectopic pregnancy. Fertil Steril 2006;85:1508–9.
[11] Timor-Tritsch IE, Monteagudo A. Unforeseen consequences of the increasing rate of cesarean deliveries: early placenta accreta and cesarean scar pregnancy. A review. Am J Obstet Gynecol 2012;207:14–29.
[12] Zhang Y, Gu Y, Wang JM, Li Y. Analysis of cases with cesarean scar pregnancy. J Obstet Gynaecol Res 2013 January;39:195–202.
[13] Timor-Tritsch IE, Monteagudo A, Santos R, Tsymbal T, Pineda G, Arslan AA. The diagnosis, treatment, and follow-up of cesarean scar pregnancy. Am J Obstet Gynecol 2012;207:44. e1–13.
[14] Litwicka K, Greco E. Caesarean scar pregnancy: a review of management options. Curr Opin Obstet Gynecol 2011;23:415–21.
[15] Li C, Li C, Feng D, Jia C, Liu B, Zhan X. Transcatheter arterial chemoembolization versus systemic methotrexate for the management of cesarean scar pregnancy. Int J Gynaecol Obstet 2011;113:178–82.
[16] Arslan M, Pata O, Dilek TU, Aktas A, Aban M, Dilek S. Treatment of viable cesarean scar ectopic pregnancy with suction curettage. Int J Gynaecol Obstet 2005;89:163–6.
[17] Bignardi T, Condous G. Transrectal ultrasound-guided surgical evacuation of Cesarean scar ectopic pregnancy. Ultrasound Obstet Gynecol 2010;35:481–5.
[18] Jiao LZ, Zhao J, Wan XR, Liu XY, Feng FZ, Ren T, et al. Diagnosis and treatment of cesarean scar pregnancy. Chin Med Sci J 2008;23:10–5.
[19] Kung FT, Lin H, Hsu TY, Chang CY, Huang HW, Huang LY, et al. Differential diagnosis of suspected cervical pregnancy and conservative treatment with the combination of laparoscopy-assisted uterine artery ligation and hysteroscopic endocervical resection. Fertil Steril 2004;81:1642–9.
[20] Hofmann HM, Urdl W, Hofler H, Honigl W, Tamussino K. Cervical pregnancy: case reports and current concepts in diagnosis and treatment. Arch Gynecol Obstet 1987;241:63–9.
[21] Timor-Tritsch IE, Monteagudo A, Mandeville EO, Peisner DB, Anaya GP, Pirrone EC. Successful management of viable cervical

pregnancy by local injection of methotrexate guided by transvaginal ultrasonography. Am J Obstet Gynecol 1994;170:737–9.

[22] Zhuang Y, Huang L. Uterine artery embolization compared with methotrexate for the management of pregnancy implanted within a cesarean scar. Am J Obstet Gynecol 2009;201:152. e1–3.

[23] Kung FT, Chang SY. Efficacy of methotrexate treatment in viable and nonviable cervical pregnancies. Am J Obstet Gynecol 1999;181: 1438–44.

[24] Rotas MA, Haberman S, Levgur M. Cesarean scar ectopic pregnancies: etiology, diagnosis, and management. Obstet Gynecol 2006;107:1373–81.

[25] Su YN, Shih JC, Chiu WH, Lee CN, Cheng WF, Hsieh FJ. Cervical pregnancy: assessment with three-dimensional power Doppler imaging and successful management with selective uterine artery embolization. Ultrasound Obstet Gynecol 1999;14:284–7.

[26] Chou MM, Hwang JI, Tseng JJ, Huang YF, Ho ES. Cesarean scar pregnancy: quantitative assessment of uterine neovascularization with 3-dimensional color power Doppler imaging and successful treatment with uterine artery embolization. Am J Obstet Gynecol 2004;190:866–8.

[27] Verma U, English D, Brookfield K. Conservative management of non-tubal ectopic pregnancies. Fertil Steril 2011;96:1391–5. e1.