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An Efficient Conservative Treatment Option for Cervical Pregnancy: Transcatheter Intra-Arterial Methotrexate Infusion Combined with Uterine Artery Embolization Followed by Curettage

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Data Interpretation D
Manuscript Preparation E
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Background: The aim of this study was to assess the clinical outcomes of conservative treatments for cervical ectopic pregnancy (CEP).

Material/Methods: The series of CEP cases at our hospital between 2009 and 2016 were reviewed retrospectively. The patients were treated using systemic methotrexate infusion (MTX group, n=9), angiographic uterine artery embolization (UAE group, n=11), or transcatheter intra-artery methotrexate infusion combined with UAE (UAE+MTX group, n=13). Clinical outcomes, complications, and fertility were evaluated.

Results: The median serum β-hCG was 6449 mIU/mL for MTX group, 17384 mIU/mL for UAE group, and 21361 mIU/mL for UAE+MTX group. The difference was statistically significant. In the MTX group, 1 patient developed hepatotoxicity and 2 patients occurred continuous vaginal bleeding during curettage. These 3 patients were successfully treated with emergency UAE. In the UAE group, 2 patients had vaginal re-bleeding on postoperative day 17 and 26, respectively, and received a second UAE procedure. In the UAE+MTX group, no patients developed severe complications. Moreover, a quick regression of serum β-hCG level, shortened recovery of normal menstruation, rapid cervical mass elimination, and a short hospital stay were observed in patients of the UAE+MTX group.

Conclusions: The triple therapy of transcatheter intra-arterial methotrexate infusion combined with UAE followed by immediate curettage is feasible and advantageous in treating CEP.

MeSH Keywords: Methotrexate • Pregnancy, Ectopic • Uterine Artery Embolization

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Background

In cervical ectopic pregnancy (CEP), the blastocyst implants and grows within the cervical canal. It is an extremely rare form of ectopic pregnancy, representing less than 1% of all ectopic gestations [1]. The etiology of CEP is unknown. Uterine curettage [2], Asherman's syndrome, cesarean section, use of intrauterine device [3], previous induced abortion, cervical surgery, myomectomy, and *in vitro* fertilization [4] are known risk factors.

In the past, CEP was usually diagnosed at an advanced stage in which profuse life-threatening hemorrhage occurred, often resulting in an emergency hysterectomy and loss of fertility. At present, the widespread use of transvaginal ultrasound has enabled the early diagnosis of CEP, thereby allowing the application of nonsurgical managements to preserve the uterus and maintain fertility [1,5]. Various conservative modalities for CEP have been reported, including systemic or local administration of MTX alone or combined with additional dilatation and curettage [6], Foley catheter tamponade [7], placement of Shirodkar cerclage [8], hysteroscopic resection [9], and angiographic uterine artery embolization (UAE) [10,11]. Because of limited evidence derived from large series of clinical cases, there is no consensus on the preferred treatment for CEP.

In this report, we reviewed 33 cases of CEP treated with systemic MTX injection, or angiographic UAE, or transcatheter intra-arterial MTX infusion combined with UAE, all followed by a dilatation and curettage. The purpose was to assess the feasibility, efficacy, and safety of different conservative treatment procedures.

Material and Methods

This retrospective case series study was carried out in Tianjin Central Hospital of Gynecology Obstetrics, from January 2009 to December 2016. The study was approved by the ethics committee of the hospital and we obtained informed consent of all patients. Data were collected through review of electronic medical records and telephone interviews.

In addition to a positive pregnancy test, CEP was diagnosed by transvaginal ultrasound according to the criteria described by Timor-Tritsch [12], including: (1) presence of gestational sac or placental texture dominantly within the cervix; (2) absence of intrauterine pregnancy; (3) visualization of an endometrial stripe; (4) enlargement of the cervix. Pretreatment serum β-hCG level was detected by chemiluminescent immunoassay on the day of admission.

Systemic MTX therapy is a multi-dose protocol, including 1 mg/kg intramuscular MTX injection on days 1, 3, 5, and 7, alternated with calcium foliate for detoxication on days 2, 4, 6, and 8. When β-hCG level declined by 30% of pretreatment value and ultrasound showed low blood flow around the gestational sac or the mass, ultrasound-guided curettage was performed. Blood products, hysterectomy instrument, and UAE were made ready for emergency massive bleeding. According to our hospital protocol, systemic MTX treatment is only applicable to patients who have no life-threatening hemorrhage, no contraindications for systemic MTX administration, and no sonographic presentation of pregnancy rupture or fetal heart activity. Otherwise, patients were advised to undergo the UAE procedure.

From January 2009 to May 2012, we used the UAE procedure to treat CEP. The UAE procedure was carried out in a digital subtraction angiography unit. After percutaneous puncture of a single femoral artery with Seldinger technique, a 5-F or 6-F catheter was inserted into one side of the internal iliac artery. The uterine artery was selectively cannulated with a 2.0-F-tipped microcatheter, and uterine angiographic examination confirmed the position of the cervical pregnancy and feeding vessels. Then, 100 mg absorbable gelatin sponge (Alicon, Jinling Pharma Co Ltd., Jiangsu, China) were injected into the horizontal portion of the uterine artery to occlude the vessel. The procedure was repeated on the opposite side. After bilateral uterine arteries were embolized, transabdominal sonography-guided curettage was immediately performed by a qualified gynecologist (Figure 1).

Since June 2012, prior to UAE, 1 mg/kg body weight of MTX was infused into bilateral uterine arteries via the microcatheter as close as possible to the branches supplying the cervical pregnancy. Then, immediate curettage was performed.

Risks and benefits of these therapies were explained in detail to the patients. Informed consent was obtained from all patients. According to the initial treatment the patients received, they were divided into 3 groups: MTX group, UAE group, and UAE+MTX group.

Serum β-hCG levels were determined on 1, 3, and 7 days in the first week and then weekly until levels fell back to normal range. Transvaginal ultrasound was used to monitor the cervical mass weekly until it completely disappeared. Data on hospital stay, recovery of menses, pregnancy, and outcome were collected through a review of medical records and telephone interviews.

Technical failure of the initial treatment was defined in case of complications, such as significant vaginal re-bleeding (blood loss ≥200 mL), serum β-hCG level continuing to rise or decreasing by less than 50% one week after the treatment, or the cervical mass reappearing or becoming larger.

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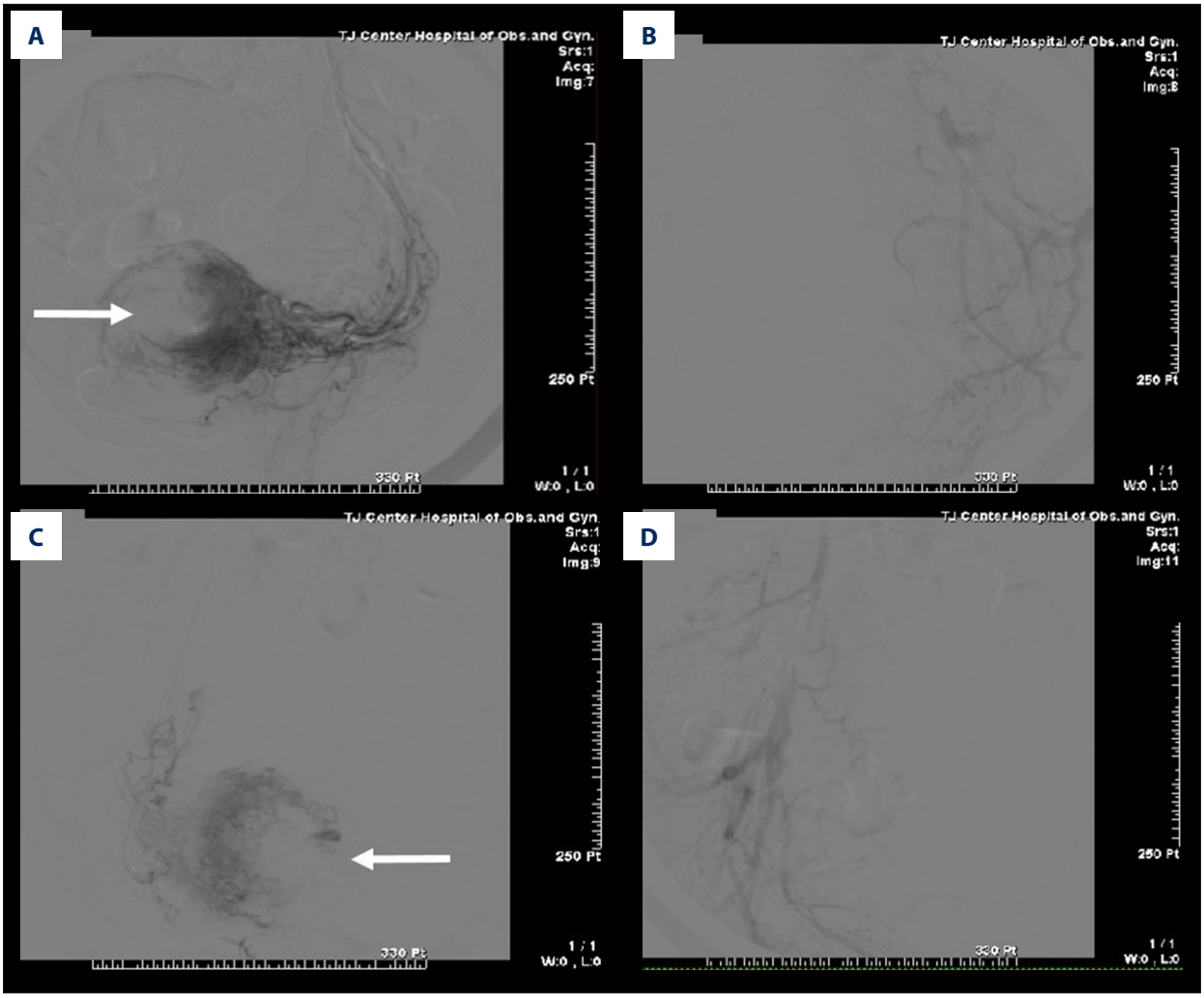

Figure 1. DSA findings of a 39-year-old patient with 52 days' cervical ectopic pregnancy (case 11 in UAE+MTX group). (**A, C**) Uterine arteriograms obtained before UAE show expansion of bilateral uterine artery and its branches, and increased blood supply to cervical mass (white arrow). (**B, D**) Bilateral UAE was performed with gelatin sponge particles and the flow of cervical mass was occluded completely.

Data were analyzed using SPSS 18.0 software (SPSS, Chicago, IL). Fisher's exact test was used to analyze demographic and laboratory data, and median values were assessed with Kruskal-Wallis nonparametric analysis of variance and Mann-Whitney tests for statistical significance. $P<0.05$ was considered significant.

Results

A total of 33 patients were diagnosed with CEP and treated in our hospital. All complained of abnormal uterine bleeding. The average bleeding time was 10.5 days (2–23 days), and 3 cases suffered from heavy bleeding (more than 200ml). Thirteen patients experienced mild abdominal pain, and 32 women had risk factors for CEP, including previous cesarean section (11/32), artificial abortion (19/32), intrauterine device (4/32), myomectomy (1/32), uterine septum section (1/32), and *in vitro* fertilization (1/32). The average gestational age was 47.2 days (33–79 days). The average serum β-hCG level was 22 069 mIU/mL (1329–75 126 mIU/mL). All patients desired to obviate hysterectomy. Clinical characteristics of the patients are summarized in Table 1.

For the original grouping, 9 patients requested systemic MTX treatment (MTX group), 11 patients received UAE therapy (UAE group), and 13 patients underwent UAE combined with transcatheter intra-arterial MTX infusion (UAE+MTX group). There was no significant difference in age, parity, and risk factors among the 3 groups. However, the gestational age of patients in the UAE group and UAE+MTX group was statistically greater compared with the MTX group (UAE group *vs.* MTX group, 48.3±7.0 days *vs.* 39.3±3.7 days, $P=0.045$; and UAE+MTX group *vs.* MTX group, 49.3±9.8 days *vs.* 39.3±3.7 days, $P=0.018$). The difference between the

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Table 1. Clinical characteristic of patients with CEP.

Treatment group	Case no.	Patient age (years)	Gravida, Para	Gestational age (days)	Size of gestational sac (mm)	Fetal activity seen on sonography	β-hCG level (mIU/ml)	Status of vaginal bleeding before UAE
Systemic MTX group	1	43	3/1	36	13*10*8	N	6449	Nonemergency
	2	29	3/0	39	19*18*17	N	5634	Nonemergency
	3	30	1/0	38	12*12*9	N	4421	Nonemergency
	4	23	2/1	44	19*18*14	N	7851	Nonemergency
	5	34	2/1	41	33*37*23	N	8176	Nonemergency
	6	32	2/0	43	25*21*19	N	11857	Nonemergency
	7	29	2/0	33	12*8*5	N	1329	Nonemergency
	8	30	2/0	43	11*9*8	N	4327	Nonemergency
	9	33	7/2	37	24*17*21	N	8646	Nonemergency
UAE group	1	33	3/1	53	32*21*19	Y	46679	Nonemergency
	2	40	2/1	59	61*37*39	Y	61166	Nonemergency
	3	30	3/0	46	45*32*41	N	9335	Emergengcy
	4	32	4/1	47	N/A	N	28695	Nonemergency
	5	29	3/0	57	53*49*48	Y	37184	Nonemergency
	6	39	5/2	44	26*17*14	N	12339	Emergency
	7	28	1/0	43	23*18*18	N	8430	Nonemergency
	8	31	4/1	61	51*38*32	Y	42071	Nonemergency
	9	27	3/1	42	32*23*26	N	15342	Nonemergency
	10	33	2/1	39	29*24*27	N	11645	Nonemergency
	11	29	2/1	40	31*27*29	N	17384	Nonemergency
UAE+MTX group	1	40	2/1	45	40*35*29	Y	19822	Nonemergency
	2	41	4/1	53	34*19*17	Y	73459	Nonemergency
	3	30	3/1	47	32*27*23	Y	21361	Nonemergency
	4	42	3/0	41	27*22*20	N	23800	Nonemergency
	5	35	4/0	53	28*19*13	Y	25511	Nonemergency
	6	37	4/1	48	54*45*48	Y	18931	Nonemergency
	7	45	3/0	46	N/A	N	22661	Nonemergency
	8	35	2/1	43	23*21*13	N	8832	Emergency
	9	42	5/1	47	29*17*15	N	17563	Nonemergency
	10	23	2/0	41	33*23*21	N	14235	Nonemergency
	11	39	4/1	52	33*32*19	Y	45403	Nonemergency
	12	41	5/1	46	N/A	N	12620	Nonemergency
	13	31	2/1	79	35*26*21	Y	75126	Nonemergency

N/A – not available.

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Table 2. Clinical outcomes of patients with CEP after treatment by systemic MTX, UAE, and UAE+intra-arterial MTX injection.

Treatment group	Case no.	Percentage of β-hCG declined to initial level (100%) on the 3rd day	β-hCG declined to undetectable (days)	Normal menstrual cycle resumed (days)	Complete regression of cervical mass (days)	Duration of hospitalization (days)	Follow-up (months)
Systemic MTX group	1	71.4	39	35	28	7	42
	3	38.2	43	42	42	14	69
	4	52.4	47	30	42	15	31
	7	68.3	28	28	22	9	55
	8	65.4	35	42	28	7	80
	9	50.7	49	35	42	23	25
UAE group	1	43.8	45	37	28	8	73
	2	31.6	49	42	28	10	81
	4	38.5	42	35	33	7	57
	6	56.4	30	40	35	6	65
	7	36.6	35	35	56	7	94
	8	29.8	49	42	50	10	62
	9	42.9	42	42	35	9	87
	10	36.2	42	35	32	9	83
	11	57.5	28	33	39	9	77
UAE+MTX group	1	70.7	45	28	21	5	29
	2	60.5	35	38	35	9	47
	3	54.9	42	30	35	7	19
	4	50.2	42	32	28	7	51
	5	63.8	35	35	30	8	27
	6	62.0	35	30	21	6	41
	7	58.7	28	42	28	7	7
	8	85.0	30	28	21	5	35
	9	60.2	35	30	21	7	10
	10	38.6	42	32	28	8	13
	11	74.2	28	39	42	9	33
	12	63.3	42	35	35	6	24
	13	71.1	39	30	42	10	40

UAE group and UAE+MTX group was not statistically significant (P=0.946). The median pretreatment β-hCG levels were greater for patients in the UAE group and UAE+MTX group: 17384 IU/mL for the UAE group and 21361 IU/mL for the UAE+MTX group, compared with 6449 IU/mL for the MTX group (UAE group *vs.* MTX group, P=0.002; and UAE+MTX group *vs.* MTX group, P<0.001). However, the difference between the UAE group and UAE+MTX group was not significant (P=0.99).

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Table 3. Comparison of operation time, operative blood loss, percentage of β-hCG declined to initial level (100%) on the 3rd day, days of β-hCG declined to undetectable, days until normal menstrual cycle resumed, days of complete regression of cervical mass, and duration of hospitalization after therapy in patients treated for CEP.

	MTX group (n=6)	UAE group (n=9)	UAE+MTX group (n=13)
Median operation time (min)		55	50
Median operative blood loss (ml)		17	23
Mean percentage of β-hCG declined to initial level (100%) on the 3rd day	57.7±12.8%*	41.5±9.9%*,**	62.6±11.5%**
Mean days of β-hCG declined to undetectable	40.2±7.9	42.2±6.3	35.9±6.2
Mean days until normal menstrual cycle resumed	35.3±5.9	37.9±3.6	33.0±4.5
Mean days of complete regression of cervical mass	34.0±9.0	37.3±9.6	29.8±7.6
Mean duration of hospitalization (days)	12.5±6.2#,##	8.3±1.4#	7.2±1.5##

* P=0.003; ** P=0.0006; # P=0.0418; ## P=0.0051.

In the MTX group, 4 patients received a second cycle of MTX therapy due to inconspicuous fall in β-hCG level and/or no significant decline in blood flow around the gestational sac or mass. During the curettage procedure, 2 patients had continuous vaginal bleeding, and both were successfully treated with UAE emergency therapy. One patient developed hepatotoxicity to MTX after one cycle of MTX treatment, and she was also successfully treated with UAE. The other 6 patients were fully cured without complications. Two cases in the UAE group had vaginal re-bleeding on postoperative days 17 and 26, respectively, and both presented a mass with blood flow in the cervical tube on ultrasound. A second UAE followed by immediate curettage was performed, and the bleeding quickly stopped. Pathological examination of the recurrent specimens found chorionic villi and trophoblastic tissues. In the UAE+MTX group, none of the patients experienced postoperative bleeding or other severe adverse events. The success rate of the MTX group, UAE group, and UAE+MTX group were 66.7% (6/9), 81.8% (9/11), and 100% (13/13), respectively.

The mean decline in β-hCG levels 3 days after therapy, calculated as a ratio of pretreatment β-hCG level minus posttreatment level divided by pretreatment level, were 62.6±11.5% for the UAE+MTX group and 57.7±12.8% for the MTX group, which were significantly greater than that of the UAE group (41.5±9.9%; UAE+MTX group *vs.* UAE group, P<0.001; MTX group *vs.* UAE group, P=0.003). There was no significant difference between the UAE+MTX group and MTX group (P=0.67) (Tables 2, 3).

There was no significant difference in the median operation time between the UAE group and UAE+MTX group. Likewise, no statistically significant difference was found in operative blood loss. The average hospital stay of the MTX group was 12.5±6.2 days, longer than in the UAE group (8.3±1.4 days, P=0.042) and UAE+MTX group (7.2±1.5 days, P=0.005), but the difference between the UAE group and UAE+MTX group was not statistically significant (P=0.690).

The mean duration of follow-up after treatment was 48.5 months (7–89 months). The time for β-hCG normalization and regular menstrual cycle recovery was shorter in the UAE+MTX group compared with the MTX group and UAE group, but no statistically significant difference was found among the 3 groups. Likewise, no statistically significant difference was found in the time for complete regression of cervical mass.

Of the 9 patients in the MTX group, 4 had normal pregnancies and delivered full-term healthy babies 11–80 months after treatment. In the UAE group, 7 had a natural intrauterine pregnancy during months 19–86, and one patient had a spontaneous miscarriage in early pregnancy, while the other 6 delivered full-term healthy babies. Of the 13 patients in the UAE+MTX group who were followed up for 7–43 months, 5 subsequently had normal pregnancies, and they all delivered full-term babies without any complications.

Discussion

Recent widespread use of transvaginal ultrasound for early diagnosis of CEP makes conservative treatment possible. Multiple options are reported. Because of limited clinical data, the most potent therapy remains uncertain. In our case series of 33 patients diagnosed with CEP, we found that the triple therapy of transcatheter intra-arterial MTX infusion combined UAE and curettage has not only a 100% success rate in treating CEP, but also has great advantages over systemic MTX and UAE therapy alone in reducing adverse effects and improving patient recovery.

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During MTX treatment, the risk of massive bleeding remains; unpredictable rupture of the cervical mass or uncontrolled vaginal bleeding may occur at any moment, especially during the curettage procedure. Additional medical treatment must be provided to stop bleeding, such as cervical cerclage [13], or using a Foley catheter balloon for compression. Besides, the reduction of serum β-hCG may take a long time. Its success rate varied among different studies with small cohorts [14,15]. A meta-analysis reported that the failure rate of systemic MTX in cervical pregnancy is 13–43%, much higher than that in tubal ectopic pregnancy [16]. In our study, 2 cases had continuous vaginal bleeding during the curettage, and reviewing the clinical characteristics, they both had larger gestational sacs. Therefore, we advise use of systemic MTX therapy for low-risk patients who had low serum β-hCG levels, small gestational sac, and no signs of severe hemorrhage or fetal heart activity.

UAE, which was initially used as a nonsurgical treatment for fibroids, has demonstrated safety, efficacy, and low morbidity rates [17]. Using UAE to treat CEP was first reported in 1990 [18]. After that, it was widely accepted that UAE can control and prevent acute cervical bleeding. In the emergency of cervical pregnancy rupture, UAE can quickly localize the corresponding artery and embolize it immediately. Additionally, due to occlusion of supplying arteries, subsequent curettage becomes safer, with substantially reduced risk of excessive hemorrhage. However, some studies reported that UAE followed by immediate curettage was probably insufficient to remove the implanted gestational tissue completely. In Wang's study, a case with CEP had intermittent vaginal bleeding 23 days after the UAE and curettage treatment, and had to receive a second UAE procedure [19]. Xu reviewed 8 CEP patients who received UAE as primary treatment, and found 2 had vaginal bleeding at 25 and 65 days, respectively [20]. In our study, recurrent vaginal bleeding happened in 2 patients, at 17 and 26 days after the initial treatment. These results indicated that risk of late re-bleeding might be a major concern for UAE therapy. Recently, magnetic resonance imaging (MRI) techniques have been used to visualize the proliferating chorionic villi implanting into the fibromuscular layer of the uterine cervix in CEP [21]. Ozawa observed a fine tract between the gestational sac and cervical canal using this technology [22]. Thus, if the gestational tissue is implanted deeply into the fibromuscular layer of cervix, complete elimination by curettage alone is almost impossible. When collateral circulation is established and uterine arteries are recanalized, the residual gestational tissue in the cervix may continue to grow. Therefore, patients undergoing UAE should closely monitor β-hCG levels and regularly review ultrasound, ruling out the possibility of pregnancy tissue recurrence.

Considering the limitations of UAE single therapy, a combination of these 2 methods may be an option. Mark first described the use of multi-dose MTX intramuscular injection in conjunction with UAE for treating CEP, and no patient had abnormal vaginal bleeding [23]. In addition, these patients had shorter hospital stays and β-hCG resolution times compared with those receiving UAE therapy alone. Gradually, in consideration of complications caused by MTX intramuscular injection, transcatheter intra-arterial MTX infusion combined with UAE has been developed. This process reduces the total MTX dose, thus lowering the overall rate of adverse effects.

Some potential factors could explain the superiority of the therapy. First, direct injection of MTX into the supplying artery for cervical pregnancy leads to a higher MTX concentration around the gestational sac. Second, embolism results in acute ischemic degeneration of the cervical gestational sac, and simultaneously further prevents MTX wash-out, and strengthens the embryocide effects of MTX. Third, embolization of the uterine artery greatly reduces the risk of massive bleeding during curettage and allows the gynecologist to eliminate as much as needed during the curettage. Hence, there are synergistic actions among transcatheter intra-arterial MTX infusion, UAE, and curettage.

The long-term impact of UAE on patient fertility and perinatal outcome has not yet been sufficiently determined. Some reports found that, in patients with uterine fibroids, UAE therapy was associated with lower pregnancy rates, higher miscarriage rates, and more adverse pregnancy outcomes than with myomectomy [24]. For cases with CEP, there are reports of viable pregnancies after embolotherapy [25]. Because of the small sample size and short follow-up period of our study, it is difficult to accurately assess the impact of UAE on future fertility. With the application of this technology and the extension of the follow-up period, we expect to have a better answer to this question.

Although treatment using UAE+MTX has a higher success rate, its economic cost is also high. For patients with no risk factors, including life-threatening hemorrhage, serum β-hCG level more than 10 000 IU/mL, large gestational sac, signs of sonographic presentation of pregnancy rupture, and a fetal heart activity, systemic MTX therapy alone may be effective enough. However, for patients with one or more risk factors, systemic MTX therapy may fail. For instance, 2 patients with large gestational sacs had continuous vaginal bleeding during curettage in the MTX group. Therefore, UAE+MTX treatment is first recommended when the patient has one or more risk factors mentioned above. Refining the criteria for these risk factors is a challenging problem.

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Conclusions

Research suggests that the combination of transvaginal ultrasonography and pelvic MRI is a promising technique for preoperative evaluation of CEP. In the future, with the help of new techniques, large-sample clinical studies may develop a standard scoring system, which will help to discern high-risk patients and ensure precision medical care is provided to all patients. Additional studies are also required to identify standard effective doses of MTX to reduce adverse effects in UAE+MTX therapy.

Conflicts of interest

None.

References:

1. Kirk E, Condous G, Haider Z et al: The conservative management of cervical ectopic pregnancies. Ultrasound Obstet Gynecol, 2006; 27: 430–37
2. Jeng CJ, Ko ML, Shen J: Transvaginal ultrasound-guided treatment of cervical pregnancy. Obstet Gynecol, 2007; 109: 1076–82
3. Yu B, Douglas NC, Guarnaccia MM et al: Uterine artery embolization as an adjunctive measure to decrease blood loss prior to evacuating a cervical pregnancy. Arch Gynecol Obstet, 2009; 279: 721–24
4. Tsakos E, Tsagias N, Dafopoulos K: Suggested method for the management of heterotopic cervical pregnancy leading to term delivery of the intrauterine pregnancy: Case report and literature review. J Minim Invasive Gynecol, 2015; 22: 896–901
5. Vela G, Tulandi T: Cervical pregnancy: The importance of early diagnosis and treatment. J Minim Invasive Gynecol, 2007; 14: 481–84
6. Taylor JE, Yalcinkaya TM, Akar ME: Successful conservative management of cervical ectopic pregnancy: A case series. Arch Gynecol Obstet, 2011; 283: 1215–17
7. Sherer DM, Lysikiewicz A, Abulafia O: Viable cervical pregnancy managed with systemic Methotrexate, uterine artery embolization, and local tamponade with inflated Foley catheter balloon. Am J Perinatol, 2003; 20: 263–67
8. Mashiach S, Admon D, Oelsner G et al: Cervical Shirodkar cerclage may be the treatment modality of choice for cervical pregnancy. Hum Reprod, 2002; 17: 493–96
9. Matteo M, Nappi L, Rosenberg P et al: Combined medical-hysteroscopic conservative treatment of a viable cervical pregnancy: A case report. J Minim Invasive Gynecol, 2006; 13: 345–47
10. Hansch E, Chitkara U, McAlpine J et al: Pelvic arterial embolization for control of obstetric hemorrhage: A five-year experience. Am J Obstet Gynecol, 1999; 180: 1454–60
11. Trambert JJ, Einstein MH, Banks E et al: Uterine artery embolization in the management of vaginal bleeding from cervical pregnancy: A case series. J Reprod Med, 2005; 50: 844–50
12. Timor-Tritsch IE, Monteagudo A, Mandeville EO et al: Successful management of viable cervical pregnancy by local injection of methotrexate guided by transvaginal ultrasonography. Am J Obstet Gynecol, 1994; 170: 737–39
13. De La Vega GA, Avery C, Nemiroff R et al: Treatment of early cervical pregnancy with cerclage, carboprost, curettage, and balloon tamponade. Obstet Gynecol, 2007; 109: 505–7
14. Hung TH, Shau WY, Hsieh TT et al: Prognostic factors for an unsatisfactory primary methotrexate treatment of cervical pregnancy: A quantitative review. Hum Reprod, 1998; 13: 2636–42
15. Bai SW, Lee JS, Park JH et al: Failed methotrexate treatment of cervical pregnancy. Predictive factors. J Repord Med, 2002; 47: 483–88
16. Kung FT, Chang SY: Efficacy of methotrexate treatment in viable and nonviable cervical pregnancies. Am J Obstet Gynecol, 1999; 181: 1438–44
17. Abulafia O, Sherer DM: Transcatheter uterine artery embolization for the management of symptomatic uterine leiomyomas. Obstet Gynecol Surv, 1999; 54: 745–53
18. Lobel SM, Meyerovitz MF, Benson CC et al: Preoperative angiographic uterine artery embolization in the management of cervical pregnancy. Obstet Gynecol, 1990; 76: 938–41
19. Wang Y, Xu B, Dai S et al: An efficient conservative treatment modality for cervical pregnancy: Angiographic uterine artery embolization followed by immediate curettage. Am J Obstet Gynecol, 2011; 204: 31
20. Xu B, Wang YK, Zhang YH et al: Angiographic uterine artery embolization followed by immediate curettage: An efficient treatment for controlling heavy bleeding and avoiding recurrent bleeding in cervical pregnancy. J Obstet Gynaecol Res, 2007; 33: 190–94
21. Jung SE, Byun JY, Lee JM et al: Characteristic MR findings of cervical pregnancy. J Magn Reson Imaging, 2001; 13: 918–22
22. Ozawa N, Takamatsu K, Fujii E et al: Pregnancy implanted in the fibromuscular layer of the cervix: A case report. J Reprod Med, 2006; 51: 325–28
23. Zakaria MA, Abdallah ME, Shavell VI et al: Conservative management of cervical ectopic pregnancy: Utility of uterine artery embolization. Fertil Steril, 2011; 95: 872–76
24. Carranza-Mamane B, Havelock J, Hemmings R: The management of uterine fibroids in women with otherwise unexplained infertility. J Obstet Gynaecol Can, 2015; 37: 277–85
25. Krissi H, Hiersch L, Stolovitch N et al: Outcome, complications and future fertility in women treated with uterine artery embolization and methotrexate for non-tubal ectopic pregnancy. Eur J Obstet Gynecol Reprod Biol, 2014; 182: 172–76

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