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Therapeutic Outcomes of Patients with Cervical and Incisional Ectopic Pregnancies and Venous and Arterial Malformations Treated with Uterine Artery Embolization, Methotrexate, and Curettage: A Descriptive Cross-Sectional Study

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ABSTRACT

Background & Objective: One of the leading causes of death for women of reproductive age is blastocyst implantation outside the uterus, an Ectopic Pregnancy (EP). This study describes and investigates the therapeutic outcomes of patients with cervical and incisional EP and arteriovenous malformation treated with Uterine Artery Embolization (UAE), methotrexate, and curettage.

Materials & Methods: In this descriptive cross-sectional study, 166 patients aged 18 to 45 with cervical and incisional EP and Arteriovenous Malformation (AVM) were treated with UAE, methotrexate systemic administration, and curettage. To perform uterine embolization, non-absorbable particles of trisacryl gelatin (Embosphere) with a diameter between 300 and 900 micrometers were used to close the ascending branch of the uterine artery wholly and partially keep the main branch and its cervical branch open.

Results: Most patients had ectopic and incisional pregnancies (77.1%). The frequencies of cervical ectopic pregnancy and uterine arterial-venous malformation were 16.3% and 6.6%, respectively. The UAE and curettage frequencies were 49.4% and 63.3%, respectively. The frequency of hysterectomy was reported in only two patients (1.2%). The frequency of wedge resection was also reported in 33 patients (19.9%).

Conclusion: This study emphasizes the need for improving the quality of the subsequent pregnancy along with side treatments for incisional and cervical ectopic pregnancies with AVM and suggests that UAE can be a promising method.

Keywords: Pregnancy ectopic, Pregnancy interstitial, Arteriovenous malformations, Menstrual cycle, Uterine artery embolization

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1. Introduction

Ectopic Pregnancy (EP), a blastocyst implantation outside the uterine cavity (1), is considered one of the important causes of morbidity and mortality in women of reproductive age; if the fetus implants in the endocervical canal, it is called a cervical pregnancy, and if it implants in the site of a cesarean scar in mothers with a history of cesarean section, it is called an incisional pregnancy (1,2). Cervical pregnancy is an uncommon disease that occurs in one case in every 9000 pregnancies. This disease is significant because it can cause severe and life-threatening bleeding (3). Incisional EP is one of the rarest types of EP, usually occurring at the site of a previous cesarean scar (4). Despite the low prevalence, this type of pregnancy has a high risk of uterine rupture and extensive bleeding (5). The use of ultrasound in recent years has led to the diagnosis of these diseases in the early stages of pregnancy, which has resulted in more conservative treatment options such as medical treatment (such as the use of MTX) and curettage along with Uterine Artery Embolization (UAE) (6,7).

Uterine Arteriovenous Malformations (AVM) occur when an abnormal anastomosis between an artery and a vein bypasses the capillary network **(8)**. Despite their low prevalence, they are not an exception to this rule and may cause life-threatening bleeding **(9)**. If we want to treat uterine AVM, we must block all the arterial communication paths with it. Methods such as UAE, MTX, curettage, or Wedge Resection have been used recently **(10)**. UAE has been very popular as a less invasive method for treating diseases such as uterine fibroids **(11)**. In UAE, the doctor injects small particles known as vessel-blocking agents into the uterus arteries with a flexible and narrow tube called a catheter or catheter. This method was first proposed in 1990 as a treatment for cervical pregnancy **(12)**. Researchers also found that this method and curettage are safe and effective in controlling bleeding and preserving the uterus **(13)**. However, the effects of this method on fertility are debated among researchers, as it has been shown in many studies that the UAE has been associated with a decrease in ovarian reserve and adverse effects on fertility **(14-16)**. In other studies, it has been shown that this procedure has no negative impact on the fertility of patients in reducing the complications of the disease **(17,18)**. Therefore, due to the constant need for more information and literature to improve the quality of the subsequent pregnancy, we decided to investigate and describe the therapeutic outcomes of patients with cervical and incisional EP and AVM treated with UAE, methotrexate, and curettage in this study.

2. Materials and Methods

Participants and Design

This study is a Retrospective Cohort that was conducted on women under 45 seeking pregnancy who were referred to Al-Zahra Hospital between 2016 and 2021 and suffering from cervical and incisional EP and AVM. Women with cervical and incisional EP and AVM were treated with UAE and other methods and planned to get pregnant in the next year after treatment. Criteria for diagnosing EP based on evidence and clinical symptoms, BHCG levels, a transvaginal ultrasound, and pregnancy sac visualization include an absence of intrauterine pregnancy, an approved mass EP, an increase in free fluid around the uterus, and consent to choose any treatment, including UAE, use of methotrexate, and curettage. Patients with a lack of desire for future pregnancy, lack of consent to participate in the study, having contraindications for embolization treatment such as uterine infection and sensitivity to the contrast material used in angiography, malignancy, and hyperthyroidism were excluded from the study.

Sample Size

The formula associated with comparable research was used to determine the sample size; determining the sample size according to Hemti's article **(19)**, taking into account 56% of abortion variables in embolization patients with a 95% confidence interval, taking into account five factors affecting primary and secondary outcomes, and taking into account 10% dropout, at least 98 people were estimated.

Data Collection

The information is extracted based on the files of patients hospitalized between 2016 and 2021 (demographic and obstetrical characteristics of the patient from reading the patient's file). Questions related to pregnancy and the type of menstruation after treatment will be obtained from the patient through a telephone interview. The primary outcomes of pregnancy include the evaluation of the rate of pregnancy, abortion, repeat EP, the need to use assisted reproductive techniques for pregnancy, and the time interval from the time of surgery to pregnancy, and the secondary outcomes of pregnancy also include the rate of premature birth, the rate of cesarean section for termination of pregnancy, complications of breech pregnancy, uterine rupture, placenta previa, postpartum hemorrhage, preeclampsia, small-for-gestational-age, and intrauterine growth restriction, which are collected in a pre-prepared checklist.

The pregnancy outcomes were investigated in two embolization and non-embolization groups. The cervical and incisional EP and AVM diagnosis was based on the ultrasound report and the pregnancy sac view. Non-absorbable trisacryl gelatin (Embosphere) particles with a diameter between 300 and 900 micrometers were used to perform uterine embolization. This operation was very selective in closing the ascending branch of the uterine artery and keeping the part of the main branch and its cervical branch open. This procedure was performed unilaterally for significant anastomoses between the uterine and ovarian arteries observed in angiography.

Ultrasound findings are primarily used to diagnose cervical and incisive pregnancy. The sonographic criteria for detecting a cervical pregnancy are as follows: 1) the placenta or gestational sac within the cervix. It is necessary to monitor either the blood flow to the gestational sac or the heart activity in the embryo to differentiate between a cervical pregnancy and an abortion in the process. A live cervical pregnancy will have both, even if they might only be present momentarily during an abortion. Because the sac will eventually pass, like other nonviable pregnancies, the difference between a cervical pregnancy that has ceased to be viable, and an ongoing abortion is minimal. 2) No indication of an intrauterine pregnancy exists. 3) A visual of an endometrial stripe emerges. 4) The uterus has an hourglass shape and a ballooned cervical canal.

Other characteristics of cervical pregnancy include 1) the gestational sac has normal contours. In contrast, an incomplete abortion sac may exhibit irregular shapes, appear flattened, or change form during the

ultrasound. 2) An echogenic rim may be seen in the gestational sac; in incomplete abortion, this rim may be absent or minimal. 3) The absence of movement in the intracervical sac, known as a negative sliding sac sign, when gentle pressure is applied to the cervix with a vaginal transducer, indicates a cervical pregnancy rather than an incomplete abortion. 4) An incomplete abortion that has been ejected to the level of the uterine arteries or internal cervical os may reveal the gestational sac to be below those structures. 5) A closed internal cervical os.

When a pregnancy is identified on or within a prior hysterotomy scar or niche through Transvaginal Ultrasonography (TVUS) during the first trimester, it is classified as a cesarean scar pregnancy. This diagnosis is subsequently validated through surgical histological findings that align with the Placenta Accreta Spectrum (PAS) condition.

Data Analysis

Using SPSS 22, the gathered data was coded and examined. For quantitative variables having a normal distribution, the mean and standard deviation (95% confidence intervals) were utilized, whereas the median and interquartile range were employed for non-normally distributed data. Furthermore, percentage- and number-based definitions of qualitative variables were used. The Q-Q plot, Shapiro-Wilk, and Kurtosis and Skewness tests were used to determine whether the quantitative data had a normal distribution.

Ethics Statement

All stages of research were based on the Declaration of Helsinki. The ethics committee of Gilan University of Medical Sciences approved it under the code IR.GUMS.REC.1400.450. After the ethics of the study were approved, patients were informed about the research protocol, and the possible questions were thoroughly explained. Finally, a written consent form was received from the subjects. Also, they were assured that all their information was confidential and that their names and addresses were never mentioned. The research subjects were free to enter the project and could withdraw from the project at any time.

3. Results

A total of, 166 female patients that referred to Al-Zahra Hospital were included in the analysis that. The mean±SD age of subjects was 33.62±5.12 years (ranging from 19 to 45 years). Most patients had ectopic incisional pregnancies (77.1%). The cervical EP and uterine AVM frequencies were 16.3% and 6.6%, respectively.

One hundred four patients (62.7%) received methotrexate. The UAE and curettage frequencies were 49.4% and 63.3%, respectively. The frequency of hysterectomy was reported in only two patients (1.2%). The frequency of wedge resection by Gynecologist decisionwas also reported in 33 patients (19.9%). The frequency of the embolization treatment method was reported in 82 patients (49.4%), and the frequency of the non-embolization treatment method was reported in 84 patients (50.6%) (Table 1).

After interventions, 38 patients (22.9%) became pregnant, and 128 patients (77.1%) did not get pregnant again, of which 22 patients (26.8%) were in the embolization group, and 16 patients (19.04%) were reported in the non-embolization group (Table 2).

The studied patients' average time interval from surgery to pregnancy was 1.89±1.10 years. Five patients (13.2%) experienced abortion in pregnancy again after treatment; 2 patients (9.09%) in the embolization group and three patients (3.57%) in the non-embolization group were reported (Table 2).

Patients were divided into two groups according to the incidence of pregnancy complications: 15 patients (83.3%) had normal conditions, and only three patients (16.6%) had PTL, who were in the embolization group, and no PTL was reported in the non-embolization group (Table 2).

In addition, examining the distribution of the frequency of need for ART in re-pregnancy after treatment showed that only one patient (1.2%) received ART, who was in the embolization group (Table 2).

Also, by examining the frequency distribution of EP recurrence in patients after treatment, three patients (1.8%) had an EP, two patients (9.09%) in the embolization group, and one patient (1.19%) in the non-embolization group (Table 3).

According to the results of our study, 28 patients (93%) had a cesarean delivery, and two patients (6.6%) had a natural delivery. In the embolization group, 16 patients (88.8%) had a cesarean delivery. Two patients (11.11%) delivered by the natural method, and in the non-embolization group, 12 patients (100%) had a cesarean delivery (Table 3).

Furthermore, the distribution of the frequency of changes in the menstrual cycle after treatment in patients was investigated. The results showed that 140 patients (85.3%) had a regular menstrual cycle, 56 patients (70%) in the embolization group and 83 patients (98.8%) in the non-embolization group, and the frequency of oligomenorrhea, menometrorrhagia, and amenorrhea in the studied patients was 11.4%, 2.4%, and 0.6% respectively. In the embolization group, the frequency of oligomenorrhea was 19 patients (23.75%), menometrorrhagia in three patients (3.75%), and amenorrhea in one patient (1.25%). In the non-embolization group, the frequency of menometrorrhagia was one patient (1.19%), and oligomenorrhea and amenorrhea were not reported (Table 4).

Table 1. Frequency distribution of each treatment method.

Treatment method	Distribution
Methotrexate	
+	104(62.7%)
-	62(37.3%)
Uterine artery embolisation	
+	82(49.4%)
-	84(50.6%)
Curettage	
+	105(63.3%)
-	61(36.7%)
Hysterectomy	
+	2(1.2%)
-	164(98.8%)
Wedge resection	
+	33(19.9%)
-	133(80.1%)

Table 2. Frequency distribution of re-pregnancy, abortion in re-pregnancy, complications in pregnancy and the need for ART in re-pregnancy recurrence after treatment in patients.

Re-pregnancy	Distribution
Embolisation	22(26.8%)
Non-embolisation	16(19.04%)
Abortion	
Embolisation	2(9.09%)
Non-embolisation	3(3.57%)
Pregnancy disorders (embolisation group)	
Normal conditions	15(83.3%)
PTL	3(16.6%)
ART	
Embolisation	1(1.2%)
Non-embolisation	0(0.0%)

Table 3. Frequency distribution of the ectopic pregnancy recurrence and the type of delivery method in patients.

Ectopic pregnancy	Distribution
Embolisation	2(9.09%)
Non-embolisation	1(1.19%)
Method of delivery in the embolisation group	
Cesarean	16(88.8%)
Natural delivery	2(11.11%)
Method of delivery in the non-embolisation group	
Cesarean	12(100%)
Natural delivery	0(0%)

Table 4. Frequency distribution of menstrual cycle type changes after treatment.

Type of menstrual cycle in the embolisation group	Distribution
Normal menstrual cycle	56(70%)
Oligomenorrhea	19(23.75%)
Menometrorrhagia	3(3.75%)
Amenorrhea	1(1.25%)
Type of menstrual cycle in the non-embolisation group	**Distribution**
Normal menstrual cycle	83(98.8%)
Oligomenorrhea	0(0.0%)
Menometrorrhagia	1(1.19%)
Amenorrhea	0(0.0%)

4. Discussion

EP is when the fertilized egg implants and begins to develop somewhere other than the inner wall of the uterus **(20)**. It is a critical condition that requires prompt diagnosis and treatment **(21)**. Moreover, it is one of the primary contributors to maternal mortality, especially in the first trimester of pregnancy, responsible for 10-15% of all deaths, particularly in developing countries **(22)**. Its occurrence has risen in recent years due to improved diagnostic methods, advancements in infertility treatments, and a rise in elective cesarean deliveries. It affects approximately 1.3 to 2% of pregnancies **(23)**, and a successful pregnancy chance in the future is reduced **(24)**. EP can be treated using medical or surgical methods. EP occurs in different areas, the high-risk types being cervical and incisional, which are treated with embolization, curettage, and MTX. In the incisional type, these methods are used together with wedge resection. However, the success rate of systemic methotrexate treatment in cervical EP and cesarean scar EP is shallow. This failure rate was 57% in cesarean scar EP and 13-43% in cervical EP **(25)**. In cases where conservative methods do not control bleeding, a hysterectomy may be necessary **(26)**.

Another treatment option for ectopic pregnancy that has gained attention recently is Uterine Artery Embolization (UAE), which can help prevent significant uterine bleeding **(2, 27)**. Nevertheless, this method is still not frequently used, and few studies have been conducted. A 2017 study conducted in South Korea demonstrated that Uterine Artery Embolization (UAE) can serve as an effective and safe treatment for ectopic pregnancy **(28)**. Another study performed in the United States in 2015 suggested that Uterine Artery Embolization (UAE) could be employed as a treatment option after successfully attaining a stable condition **(29)**. There have been limited studies on the use of UAE in treating EP. This study has been conducted in Iran to investigate and describe treatment with UAE along with systemic injection of methotrexate and curettage in patients with incisional and cervical EP. The census sampling method was used since all patients were examined during the above period. Finally, 166 female patients under 45 who wanted to get pregnant the following year after the treatment suffered from cervical and incisional EP and AVM and were being treated with UAE and other methods were included in the study. Patient data were gathered by examining medical records. Information regarding postoperative complications was collected one day after the embolization treatment and following the administration of methotrexate. Specific surgical complications included coil abnormalities, uterine artery rupture, dissection, false aneurysm, fistula, and vasospasm during surgery, while non-specific complications encompassed inflammation, infection, and localized pain. Local pain hematoma, posterior peritoneal hematoma, was not observed. The treatment

was considered successful if the uterus could be preserved.

In this study, no specific complications were observed in the patients, the results of which are like the study by Hemti et al., and Krissi et al., **(19,25)**. In this study, most patients had an EP (77.1%). The frequency of cervical EP and uterine arterial-venous malformation was 16.3% and 6.6%, respectively. One hundred four patients (62.7%) received methotrexate. The UAE and curettage frequencies were 49.4% (82 patients) and 63.3% (105 patients). The frequency of hysterectomy was reported only in 1.2% (2 patients). The frequency of wedge resection was also reported in 19.9% (33 patients). In the present study, the frequency of UAE was 50%, the success of the UAE method was 97.5%, and only 2 cases (1.2%) led to hysterectomy when these patients underwent embolization. In the study of An X et al., this rate was reported as 17% **(30)**. Kwon and his colleagues found the method's reported success rate was 76.9% **(2)**. In a Chinese study, 26 patients with EP were investigated; Fourteen patients received Uterine Artery Embolization (UAE) along with an intrauterine injection of methotrexate (UAE group), while twelve patients were given a single dose of methotrexate followed by uterine curettage (non-UAE group). All 14 patients in the UAE group were successfully treated, resulting in a treatment success rate of 100% **(28)**. In the study conducted by Gerardo et al., approximately 33% of cervical ectopic pregnancies led to hysterectomy **(31)**. Yang et al., investigated 66 women with ectopic pregnancies in a previous cesarean scar. The treatment success rate was substantially higher in the Uterine Artery Embolization (UAE) group (89.5%) compared to the systemic methotrexate (58.8%) and dilation and curettage groups (27.3%) **(32)**. In the study by Krissi et al., of 25 patients undergoing UAE, 24 (96%) were successfully treated **(25)** (Table 5).

Table 5. Frequency of treatment success rate of UAE of mentioned studies.

Studies	Success of the UAE treatment(percentage)
Present study	97.5%
An X et al.	17%
Kwon et al.	76.9%
Zang S et al. Chinese study)	100%
Gerardo et al.	67%
Yang et al.	higher than 89.5%
Krissi et al.	96%

In our study, 38 patients (22.9%) became pregnant after treatment, and re-pregnancies were reported in both embolization and non-embolization groups. The rate of re-pregnancy in the present study was 22.9%, which in Krissi et al.'s study was 83.3%. Maybe this difference is due to the small number of investigated cases (12 cases) and the ten-year investigation duration for a pregnancy.

We explained that uterine Arteriovenous Malformations (AVM) are congenital or acquired abnormal vascular shunts between myometrial vessels and that AVM affected approximately 16.3 percent of our patients. Acquired Arteriovenous Malformations (AVMs) frequently arise as a consequence of uterine procedures like Dilation and Curettage (D&C) or cesarean delivery **(33)**. The global prevalence of cesarean section has steadily increased, resulting in an increase in subsequent obstetric complications such as Cesarean Scar Pregnancy (CSP) and adherent placental pathologies **(34)**. AVM has traditionally been diagnosed via laparotomy or uterine examination following hysterectomy. Colour Doppler US and digital subtraction angiography, on the other hand, can now be used to detect **(35,36)**. If future fertility is desired, uterine artery embolization is an effective AVM treatment mode that complicates CSP **(37)**.

UAE has shown efficacy in treating cervical ectopic pregnancies with the goal of preserving fertility **(38)**. If methotrexate therapy is contraindicated, such as coexisting hepatic disease, the sole use of UAE has been shown to be effective **(39)**. Notably, concurrent methotrexate and UAE therapy have been shown to be more effective than UAE alone. In terms of post-treatment duration, adjunctive therapy with embolization is significantly shorter than methotrexate alone. Methotrexate should be given before embolization, if possible, to decrease blood flow to the uterine tissue, thereby enhancing the therapeutic efficacy of embolization **(27,40)**.

All to say, UAE is successful when combined with other procedures; however, complications can render the procedure ineffective and affect the pregnancy prognosis. Uterine ischemia, necrosis, and subsequent amenorrhea from endometrial ischemia are all potential complications of uterine artery embolization for ectopic pregnancy **(41)**.

5. Conclusion

In this study, we focused on the need for improving the quality of the subsequent pregnancy along with side treatments for incisional and cervical ectopic pregnancies with AVM and suggested UAE as an effective method; to do so, we described and investigated the therapeutic outcomes of patients with cervical and incisional EP and arteriovenous malformation treated with Uterine Artery Embolization (UAE), methotrexate, and curettage. The limitation of the present study is the type and method of the study. Therefore, it is suggested that studies be conducted with an interventional and comparative method over an extended period to investigate re-pregnancy. There is a need for more RCT studies to confirm embolization as a definitive treatment while maintaining the ability of the uterus to be considered in the subsequent pregnancy. In addition, due to the absence of specific complications, it can serve as a safe and effective intervention for treating ectopic

pregnancies, particularly when performed by vascular surgeons.

6. Declarations

Acknowledgments

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Ethical Considerations

Guilan University of Medical Sciences Ethical Committee approved the study under the ethical code IR.GUMS.REC.1400.450. Consent for publication was obtained from all participants.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Authors' Contributions

Conceptualization: M.N.M.; Data curation: F.F.; Formal analysis: Z.D.; Funding acquisition: Z.D.; Investigation: F.F.; Methodology: M.N.M.; Project administration: Z.H.M.; Resources: Z.H.M.; Supervision: H.E.; Validation: H.E.; Visualization: M.S.; Writing - original draft: M.S.; Writing - review & Editing: K.J.R.

Conflict of Interest

The authors declare no conflict of interest.

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References

1. Elmokadem AH, Abdel-Wahab RM, El-Zayadi AA, Elrakhawy MM. Uterine artery embolization and methotrexate infusion as sole management for caesarean scar and cervical ectopic pregnancies: a single-center experience and literature review. Can Assoc Radiol J. 2019;70(3):307-16. [DOI:10.1016/j.carj.2018.12.002]
2. Kwon JH, Kim GM, Han K, Kim MD, Won JY, Lee DY. Safety and efficacy of uterine artery embolization in ectopic pregnancies refractory to systemic methotrexate treatment: a single-center study. Cardiovasc Intervent Radiol. 2017;40(9):1351-7. [DOI:10.1007/s00270-017-1664-7]
3. Tang J, Sobel ML, Murji A. Arteriovenous malformation following conservative management of cervical pregnancy. J Obstet Gynaecol Can. 2018;40(9):1186-9. [DOI:10.1016/j.jogc.2018.02.018]
4. Sugawara J, Senoo M, Chisaka H, Yaegashi N, Okamura K. Successful conservative treatment of a cesarean scar pregnancy with uterine artery embolization. Tohoku J Exp Med. 2005;206(3):261-5. [DOI:10.1620/tjem.206.261]
5. Gupta T, Wahi S. A rare case report of caesarean scar ectopic pregnancy. J Clin Diagn Res. 2017;11(8):QD10-QD11. [DOI:10.7860/jcdr/2017/24611.10523]
6. Cosin JA, Bean M, Grow D, Wiczyk H. The use of methotrexate and arterial embolization to avoid surgery in a case of cervical pregnancy. Fertil Steril. 1997;67(6):1169-71. [DOI:10.1016/s0015-0282(97)81459-8]
7. Glenn TL, Bembry J, Findley AD, Yaklic JL, Bhagavath B, Gagneux P, et al. Cesarean scar ectopic pregnancy: current management strategies. Obstet Gynecol Surv. 2018;73(5):293-302. [DOI:10.1097/ogx.0000000000000561]
8. Grivell RM, Reid KM, Mellor A. Uterine arteriovenous malformations: a review of the current literature. Obstet Gynecol Surv. 2005;60(11):761-7. [DOI:10.1097/01.ogx.0000183684.67656.ba]
9. Yoon DJ, Jones M, Al Taani J, Buhimschi C, Dowell JD. A systematic review of acquired uterine arteriovenous malformations: pathophysiology, diagnosis, and transcatheter treatment. AJP Rep. 2016;6(01):e6-e14. [DOI:10.1055/s-0035-1563721]
10. Peitsidis P, Manolakos E, Tsekoura V, Kreienberg R, Schwentner L. Uterine arteriovenous malformations induced after diagnostic curettage: a systematic review. Arch

Gynecol Obstet. 2011;284(5):1137-51. [DOI:10.1007/s00404-011-2067-7]
11. Gupta JK, Sinha A, Lumsden MA, Hickey M. Uterine artery embolization for symptomatic uterine fibroids. Cochrane Database Syst Rev. 2014(12):CD005073. [DOI:10.1002/14651858.cd005073.pub4]
12. Lobel SM, Meyerovitz MF, Benson CC, Goff B, Bengtson JM. Preoperative angiographic uterine artery embolization in the management of cervical pregnancy. Obstet Gynecol. 1990;76(5 Pt 2):938-41. [PMID:2216260]
13. Yu B, Douglas NC, Guarnaccia MM, Sauer MV. Uterine artery embolization as an adjunctive measure to decrease blood loss prior to evacuating a cervical pregnancy. Arch Gynecol Obstet. 2009;279(5):721-4. [DOI:10.1007/s00404-008-0775-4]
14. Gonzalez N, Tulandi T. Cesarean scar pregnancy: a systematic review. J Minim Invasive Gynecol. 2017;24(5):731-8. [DOI:10.1016/j.jmig.2017.02.020]
15. Yamaguchi M, Honda R, Uchino K, Tashiro H, Ohba T, Katabuchi H. Transvaginal methotrexate injection for the treatment of cesarean scar pregnancy: efficacy and subsequent fecundity. J Minim Invasive Gynecol. 2014;21(5):877-83. [DOI:10.1016/j.jmig.2014.03.024]
16. Chen H, Zhou J, Wang H, Tan W, Yao M, Wang X. The treatment of cesarean scar pregnancy with uterine artery embolization and curettage as compared to transvaginal hysterotomy. Eur J Obstet Gynecol Reprod Biol. 2017;214:44-9. [DOI:10.1016/j.ejogrb.2017.04.032]
17. Tumenjargal A, Tokue H, Kishi H, Hirasawa H, Taketomi-Takahashi A, Tsushima Y. Uterine artery embolization combined with dilation and curettage for the treatment of cesarean scar pregnancy: efficacy and future fertility. Cardiovasc Intervent Radiol. 2018;41(8):1165-73. [DOI:10.1007/s00270-018-1934-z]
18. Liu W, Shen L, Wang Q, Wang W, Sun Z. Uterine artery embolization combined with curettage vs. methotrexate plus curettage for cesarean scar pregnancy. Arch Gynecol Obstet. 2016;294(1):71-6. [DOI:10.1007/s00404-015-3952-2]
19. Hemmati H, Zahiri Z, Rezaee V, Mousavi S, Esmaeili M, Hemmati G, et al. Outcomes and complications of uterine artery embolization in patients with cervical ectopic pregnancy and ectopic pregnancies caused by surgical incision. Iran J Vasc Surg Endovasc Ther. 2021;1(1):40-4. [DOI:10.52547/ijvset.1.1.8]
20. Brady PC. New evidence to guide ectopic pregnancy diagnosis and management. Obstet Gynecol Surv. 2017;72(10):618-25. [DOI:10.1097/ogx.0000000000000492]
21. Madan A, Nitin K, Kaur A, Neki N. Ectopic Pregnancy: A life threatening emergency. Int J Curr Res Med Sci. 2017;3(7):144-51.
22. Lawani OL, Anozie OB, Ezeonu PO. Ectopic pregnancy: a life-threatening gynecological emergency. Int J Women's Health. 2013;5:515. [DOI:10.2147/ijwh.s49672]
23. Gao J, Li X, Chen J, Gong W, Yue K, Wu Z. Uterine artery embolization combined with local infusion of methotrexate and 5-fluorouracil in treating ectopic pregnancy: A CONSORT-compliant article. Medicine (Baltimore). 2018;97(5):e9722. [DOI:10.1097/md.0000000000009722]
24. Shen L, Tan A, Zhu H, Guo C, Liu D, Huang W. Bilateral uterine artery chemoembolization with methotrexate for cesarean scar pregnancy. Am J Obstet Gynecol. 2012;207(5):386.e1-.e6. [DOI:10.1016/j.ajog.2012.09.012]
25. Krissi H, Hiersch L, Stolovitch N, Nitke S, Wiznitzer A, Peled Y. 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;182:172-6. [DOI:10.1016/j.ejogrb.2014.09.026]
26. Monteagudo A, Minior V, Stephenson C, Monda S, Timor-Tritsch I. Non-surgical management of live ectopic pregnancy with ultrasound-guided local injection: a case series. Ultrasound Obstet Gynecol. 2005;25(3):282-8. [DOI:10.1002/uog.1822]
27. Zhou Q, Young D, Vingan H. Uterine artery embolization for cervical ectopic pregnancy. Radiol Case Rep. 2015;10(4):72-5. [DOI:10.1016/j.radcr.2015.08.004]
28. Zhang S, Yan H, Ji W-t. Uterine artery embolization combined with intra-arterial MTX infusion: its application in treatment of cervical pregnancy. Arch Gynecol Obstet. 2016;293(5):1043-7. [DOI:10.1007/s00404-015-3929-1]
29. Dragusin R, Cernea N, Constantin C, Hertzog D, Deaconu A. Indications and outcome of Uterine Artery Embolization (UAE) in gynaecological conditions: up-to-date and results of our

experience. Emergency Med. 2016;6(6):2-6. [DOI:10.4172/2165-7548.1000342]
30. An X, Ming X, Li K, Wang J. The analysis of efficacy and failure factors of uterine artery methotrexate infusion and embolization in treatment of cesarean scar pregnancy. ScientificWorldJournal. 2013;2013:213603. [DOI:10.1155/2013/213603]
31. Vela G, Tulandi T. Cervical pregnancy: the importance of early diagnosis and treatment. J Minim Invasive Gynecol. 2007;14(4):481-4. [DOI:10.1016/j.jmig.2006.11.012]
32. Yang XY, Yu H, Li KM, Chu YX, Zheng A. Uterine artery embolisation combined with local methotrexate for treatment of caesarean scar pregnancy. BJOG. 2010;117(8):990-6. [DOI:10.1111/j.1471-0528.2010.02578.x]
33. Timor-Tritsch IE, Haynes MC, Monteagudo A, Khatib N, Kovács S. Ultrasound diagnosis and management of acquired uterine enhanced myometrial vascularity/arteriovenous malformations. Am J Obstet Gynecol. 2016;214(6):731.e1-.e10. [DOI:10.1016/j.ajog.2015.12.024]
34. Obstetric Care Consensus No. 7: Placenta Accreta Spectrum. Obstet Gynecol. 2018;132(6):e259-e75. [DOI:10.1097/aog.0000000000002983]
35. Grivell RM, Reid KM, Mellor A. Uterine arteriovenous malformations: a review of the current literature. Obstet Gynecol Surv. 2005;60(11):761-7. [DOI:10.1097/01.ogx.0000183684.67656.ba].
36. Visvalingam G, Lee RWK, Tan TY, Tan HH. An unusual case of acquired uterine arteriovenous malformation with persistent scar ectopic pregnancy successfully managed with uterine artery embolization. J Med Cases. 2016;7(4):143-7. [DOI:10.14740/jmc2458w]
37. Hashim H, Nawawi O. Uterine arteriovenous malformation. Malays J Med Sci. 2013;20(2):76-80. [PMID:23983582]
38. Gun M, Mavrogiorgis M. Cervical ectopic pregnancy: a case report and literature review. Ultrasound Obstet Gynecol. 2002;19(3):297-301. [DOI:10.1046/j.1469-0705.2002.00559.x]
39. Takano M, Hasegawa Y, Matsuda H, Kikuchi Y. Successful management of cervical pregnancy by selective uterine artery embolization: a case report. J Reprod Med. 2004;49(12):986-8. [PMID:15656217]
40. Zakaria MA, Abdallah ME, Shavell VI, Berman JM, Diamond MP, Kmak DC. Conservative management of cervical ectopic pregnancy: utility of uterine artery embolization. Fertil Steril. 2011;95(3):872-6. [DOI:10.1016/j.fertnstert.2010.12.024]
41. Godfrey CD, Zbella EA. Uterine necrosis after uterine artery embolization for leiomyoma. Obstet Gynecol. 2001;98(5 Pt 2):950-2. [DOI:10.1016/s0029-7844(01)01483-1]

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