

FIGURE 2. Interventional radiology image of a cervical pregnancy after UAE (occlusion of the uterine artery)

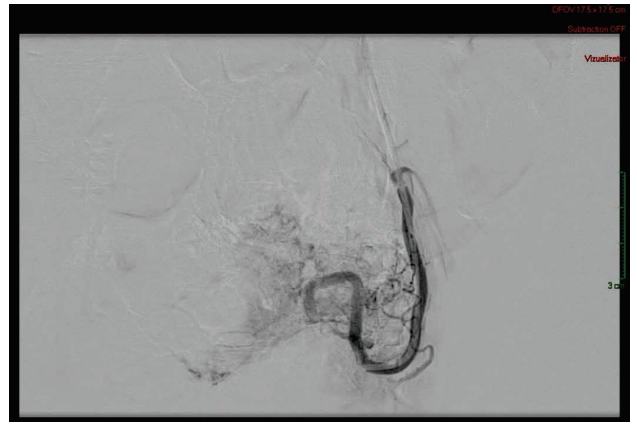


FIGURE 5. Interventional radiology image on the left side of a cesarean scar pregnancy after UAE

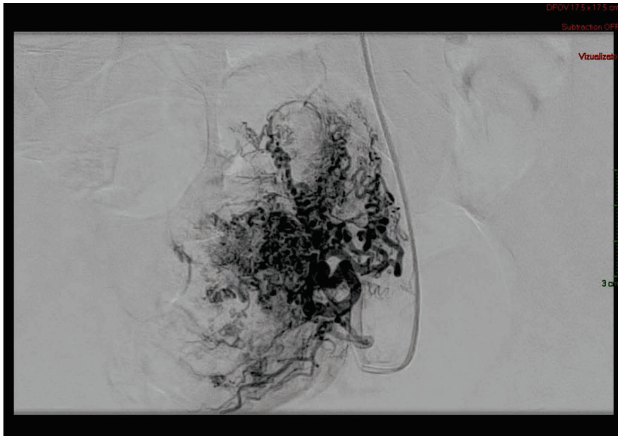


FIGURE 3. Interventional radiology image on the left side of a cesarean scar pregnancy before UAE

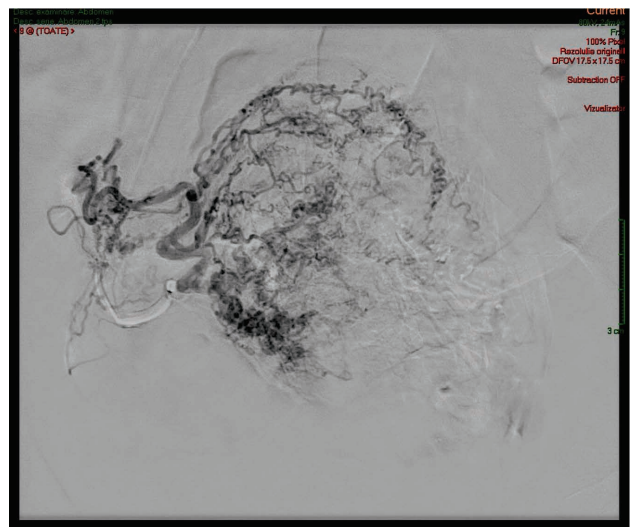


FIGURE 6. Interventional radiology image on the right side of a cesarean scar pregnancy during UAE procedure

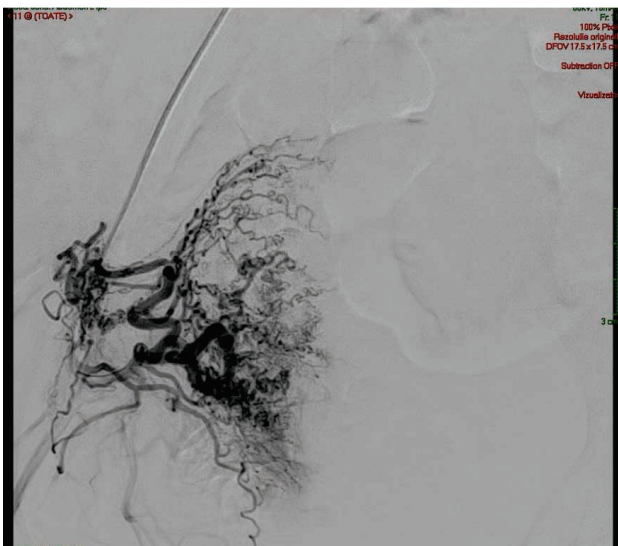


FIGURE 4. Interventional radiology image on the right side of a cesarean scar pregnancy before UAE

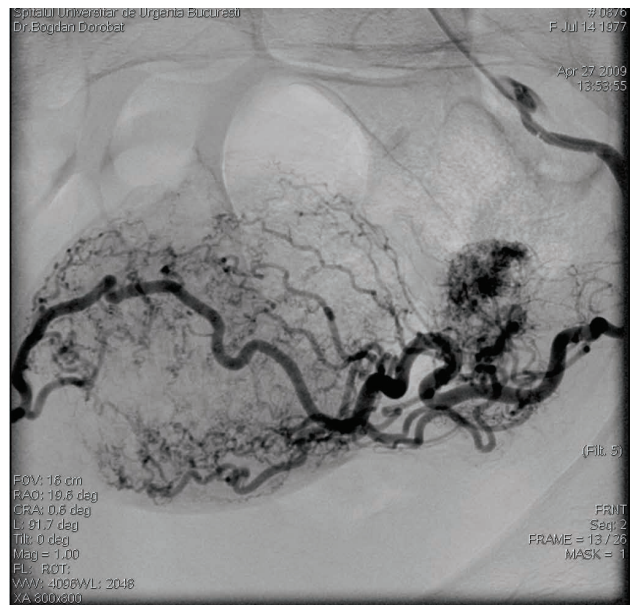


FIGURE 7. Interventional radiology image of a tubal pregnancy before UAE

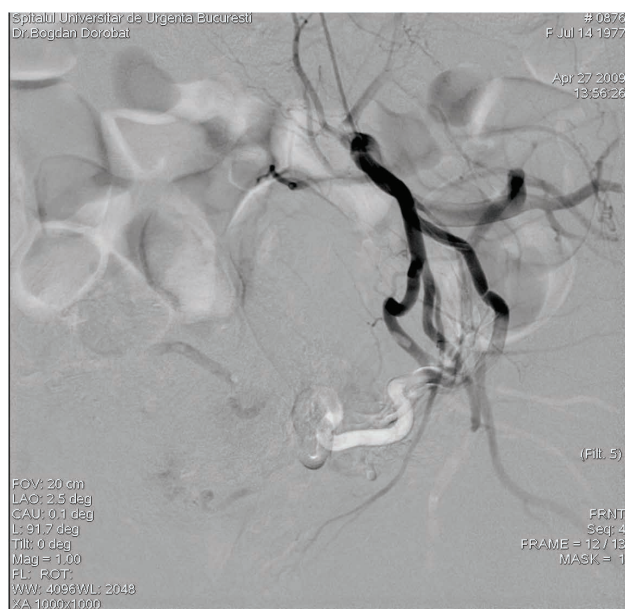


FIGURE 8. Interventional radiology image of a tubal pregnancy after UAE (occlusion of the uterine artery)

METHODS

In this paper we searched the literature using PubMed and we used the terms 'interventional radiology' and 'ectopic pregnancy' to identify the conservative treatment methods for tubal, cervical and cesarean scar pregnancy. The search included articles from 2010 until November 2021. We screened the abstracts in order to select relevant studies. We included case series, retrospective studies, prospective cohort studies, randomized control study and case reports.

RESULTS

The initial search returned a total of 56 articles. We screening the articles, removed the duplicates and selected the relevant articles to our paper. Therefore, 9 articles related to the use of interventional radiology in the treatment of ectopic pregnancies were included in our review. Our review includes a total of 415 patients treated with UAE: 155 patients with CSP, 62 with CP and 198 with TP (Figures 3 and 4). The treatment success rate was between 76.9% (30) and 100% (27,31-34). The main results are presented in Table 1.

UAE in association with MTX

256 patients were treated with MTX and UAE (30,35-37) with success rates between 76.9% and 98.76%. This therapeutic management was successful in 238 patients. There were 18 patients that required additional therapies: 4 patients needed another UAE (29, 36), 6 patients needed subsequent MTX treatment (36) and 8 patients underwent surgery due to failure of treatment (36).

UAE in association with MTX and suction and curettage

4 patients (1 case of CSP and 3 cases of CP) were treated successfully using MTX administration, followed by UAE, suction and curettage (27,33). The patient with CSP was administered iv MTX with a slight decrease in the β -hCG, followed by UAE and a curettage was performed under simultaneous laparoscopic vision. The intra-operative blood loss was estimated at 50mL (27). The 3 cases of CP received a single dose of MTX: 1 patient was administered MTX intramuscular, the second patient was administered intra-arterial MTX prior to the finalization of the UAE and the third patient was given a parametrial shot of MTX simultaneously to the UAE. The curettage was performed in the first 72 hours after UAE to have a maximum benefit of the UAE (33).

UAE followed by suction and curettage

From our total of 415 patients, 133 were treated using UAE followed by curettage (31,33,34), among which Wu et al. (33) included 25 patients treated with UAE followed by hysteroscopic curettage. The success rates between 98% and 100%. One patient with CSP needed repeated suction and curettage (31); Ou et al. (31) compared the success rate of suction and curettage in cases of CSP in two groups: the first in which suction and curettage was used as single treatment and the second in which UAE was performed prior to suction and curettage. There were 4 cases of CSP in the first group in which the treatment failed: 2 patients received subsequently systematic MTX and 2 patients repeated the curettage. In the second group one patient needed a reintervention and a second curettage was performed.

UAE used as single treatment

A study by Niola et al. (32) published in 2014 included 41 cases of postpartum hemorrhage and 22 patients diagnosed with CP. The patients with CP were treated using UAE with a success rate of 100%, after which the patients were monitored using clinical and ultrasound examination at 1 month, 6 months and at 12 months 10 patients were pregnant and there were no issues during pregnancy, with an ulterior uneventful delivery.

DISCUSSION

Our research included 415 patients with ectopic pregnancy treated with UAE as single or combined treatment. From these 415 patients, in 8 cases (1.92%) treatment failed and the patients underwent radical treatment respectively surgery. In this group of 8 patients, 2 patients received treatment with MTX and UAE (35), 4 received treatment with local infusion of 5-fluorouracil, an antimetabolism

TABLE 1. Summary of the articles included in our review and main results

Article	Study type	No patients			Patients' inclusion criteria	Successful treatment rate	Reintervention rate
		CSP	CP	TP			
Kwon et al. 2017 (30)	Retrospective study	5	6	1	– high serum β -hCG level – vaginal bleeding after systemic MTX therapy	76.9%	23.1% (2 CP+1CSP) needed another UAE
Ou et al. 2020 (31)	Prospective cohort study	65	–	–	– diagnosis of CSP – unwillingness to undergo MTX therapy, or indications against it – gestational sac <5 cm – myometrial thickness <1 cm	98% (combined with suction and curettage)	2% (1 case) needed repeated suction and curettage
Niola et al. 2014 (32)	Retrospective study	–	22	–	– patients with ectopic pregnancy – follow-up of minimum 12 months	100%	–
Radajurai et al. 2021 (27)	Case report	1	–	–	– unsuccessful MTX therapy	100%	–
Hu et al. 2016 (33)	Retrospective study	–	19	–	– CP diagnosed by transvaginal color Doppler sonography – presence of villi identified in the specimens from endocervical canal curettage	100%	–
Wu et al. 2021 (34)	Retrospective study	52	–	–	– history of amenorrhea – history of C section – high β -hCG serum level – diagnosis of CSP using ultrasound examination	100%	–
Tan et al. 2014 (35)	Prospective study	–	–	162	– patients hemodynamically stable with TP	98.76%	1.23% (2 patients) needed surgery
Gao et al. 2018 (36)	Randomized control study	25	10	35	– diagnosis of EP – high serum levels of β -hCG – refused surgical resection or desire to preserve the uterus – signed the informed consent	88%	12% (6 patients needed subsequent MTX treatment and 6 needed surgery)
Elmokadem et al. 2019 (37)	Retrospective study	7	5	–	– ultrasound criteria for CSP and CP	90.9%	9.1% (1 patient needed a second UAE)

drug, and MTX followed by UAE (36) and 2 patients who received treatment with local infusion of MTX and consecutive UAE (36).

11 patients of the 415 patients included in our paper (2.65%) needed a second approach: 6 patients needed MTX administration (36), 4 patients repeated the UAE (29,36) and 1 patient required a repeated suction and curettage (31).

Uterine artery embolization, used as single or combined treatment, was successful in 396 patients from the 415 selected for our study, result a 95.42% success rate, so we can conclude that 95.42% of women receiving this treatment had their fertility saved and did not undergo surgery, resulting in the best possible outcome.

In Romania, there are medical centers which present an interventional radiology department that make possible to form multidisciplinary teams (gynecologist, interventional radiologist, anesthesiologist) with the aim to minimally invasive treat pa-

tients with ectopic pregnancies with significant results in reducing radical treatment among women of fertile age who desire to preserve their fertility or refuse surgery or have associated pathologies that might put their life at risk during surgery.

CONCLUSIONS

Uterine artery embolization has proven its utility in managing cases of ectopic pregnancies as single line treatment or combined with methotrexate administered either local, intramuscular, or intra arterial during uterine/ovarian artery embolization, associated with suction and/or curettage or with hysteroscopic curettage, thus avoiding a major surgical intervention that compromises the female fertility (hysterectomy or salpingectomy) with additional possible surgical complications, reducing the costs of medical healthcare and the surgical stress to which the patient is subjected.



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