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ORIGINAL ARTICLE

Hysteroscopic adhesiolysis for patients with Asherman's syndrome: menstrual and fertility outcomes

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Abstract
Purpose Most patients with Asherman's syndrome present with infertility and menstrual problems. In this retrospective clinical study, we analyzed patients with Asherman's syndrome who underwent hysteroscopic adhesiolysis to examine their associated symptoms, disease etiologies, and fertility outcomes.
Methods Twenty-seven patients with Asherman's syndrome that were diagnosed using hysteroscopy were recruited. The chief complaints were infertility, hypomenorrhea, and amenorrhea. Each case of Asherman's syndrome was classified according to the American Fertility Society classification. Hysteroscopic adhesiolysis was performed in all cases and concomitant transabdominal ultrasonography was conducted in cases with extensive and dense adhesions.
Results There were no complications associated with the hysteroscopic procedure. Normal menstrual cycles resumed in all cases. Of the 16 infertile patients, 9 conceived. Three patients achieved term deliveries and one patient is currently pregnant. None of the patients had obstetric complications. Two patients had spontaneous abortions, one had an ectopic pregnancy, one had an abortion at 16 weeks' gestation due to cervical incompetence, and one had a molar pregnancy and required uterine artery embolization for uncontrolled hemorrhaging during a dilatation and curettage procedure.
Conclusions Hysteroscopic adhesiolysis with transabdominal ultrasonography is a suitable treatment method for Asherman's syndrome. Subfertile patients with Asherman's syndrome undergoing adhesiolysis should be appropriately informed about the risk of associated life-threatening complications and preterm delivery.

Keywords Asherman's syndrome · Hysteroscopic adhesiolysis · Infertility · Intrauterine adhesion · Menstrual disorders

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Introduction

Intrauterine adhesions (IUAs) causing amenorrhea after curettage for the treatment of postpartum hemorrhage were first described by Heinrich Fritsch in 1894 [1]. The Israeli gynecologist Joseph Asherman described the cases of 29 women with amenorrhea due to stenosis of the internal cervical os in 1948 [2]. Two years later, he described partial or complete obliteration of the uterine cavity secondary to uterine body trauma [3], and the term Asherman's syndrome was then attributed to this condition. Asherman's syndrome occurs most frequently after dilatation and curettage (D&C) for incomplete abortion (50 %), postpartum hemorrhage (24 %), and elective abortion (17.5 %). Other less common etiologic factors including myomectomy, hysterectomy, diagnostic curettage, cesarean section (C/S), tuberculosis, caustic abortifacients, and uterine packing have also been reported [4]. Most patients with Asherman's syndrome present with infertility and menstrual problems [5]. The exact prevalence of the condition is difficult to determine, but the incidence has been increasing over the past few decades, probably due to increases in iatrogenic endometrial trauma as well as better diagnostic techniques including

transvaginal ultrasonography and hysteroscopy [6, 7]. The treatment of Asherman's syndrome improved dramatically with the emergence of hysteroscopy [1]. Hysteroscopy has evolved from a diagnostic procedure to a therapeutic approach, and it plays an important role in the management of Asherman's syndrome as a standard surgical resolution [8].

This retrospective clinical study analyzed 27 patients with Asherman's syndrome that was diagnosed using hysteroscopy who underwent hysteroscopic adhesiolysis from April 1997 to April 2012 and aimed to evaluate the symptoms, etiology, and the correlation between IUA extent and fertility outcomes.

Materials and methods

Twenty-seven patients with Asherman's syndrome that was diagnosed using hysteroscopy between April 1997 and April 2012 were recruited for this study. Diagnostic hysteroscopy was conducted using a 3-mm serial flexible office hysteroscope (OLYMPUS HYF TYPE V; OLYMPUS, Tokyo, Japan). Saline was used as a distending medium. The chief complaints in these patients were infertility, hypomenorrhea, and amenorrhea. Each case of Asherman's syndrome was classified according to the American Fertility Society (AFS) classification of IUA [9].

Hysteroscopic adhesiolysis was performed under general anesthesia in all patients. The cervix was initially dilated to "12" using Hegar's dilators. An 8-mm 12° rigid telescope (OLYMPUS) equipped with a hysteroscopic loop monopolar (OLYMPUS) knife at power settings of 70 W of pure cutting current and 40 W of coagulation current (Sabre 2400; CONMED, New York, NY, USA) was introduced into the uterine cavity. A 3 % sorbitol solution (UromaticS®; BAXTER, Deerfield, IL, USA) was used as a distending medium through an automated hysteroscopic distension pump. To guide the extent of adhesiolysis and prevent a uterine perforation, concomitant transabdominal ultrasonography was performed in patients with extensive and dense adhesions diagnosed using office hysteroscopy. Cefazolin sodium (1 g) was administered to all patients during the operation. An intrauterine device (IUD) or cyclical hormonal treatment (21-day combination of norgestrel and ethinyl estradiol) was initiated after the surgery in all patients except for those with an AFS classification of mild IUA or occluding adhesions only in the region of the internal cervical os. Cyclical hormonal treatment was continued for 2 months. The IUD was inserted into the uterine cavity at the end of the procedure and kept in situ for 2 cycles. The menstrual pattern, conception rate, time interval to conception, and reproductive outcome after hysteroscopic adhesiolysis were retrospectively analyzed.

Results

The mean patient age of the patients was 35.4 ± 5.0 years (range 27–45 years) (Table 1). In terms of etiology, we found the following: 9 patients had undergone D&C once; 10 patients had undergone a D&C twice; one patient had undergone D&C 3 times; 2 patients had undergone abdominal myomectomy once; one patient had undergone abdominal myomectomy and hysteroscopic myomectomy once; one patient had undergone abdominal myomectomy, D&C, and C/S once; and one patient had undergone C/S once. We did not find any obvious cause of the Asherman's syndrome in 2 patients.

In terms of symptoms, 9 patients presented with hypomenorrhea, 4 patients presented with secondary amenorrhea, and 14 patients had normal menstruation. A total of 24 of the 27 patients presented with infertility.

Table 1 Demographic details and the etiologies, symptoms, and intrauterine adhesion stages of 27 women with Asherman's syndrome

Age	35.4 ± 5.0
Parity	
Nulliparous	17
Primiparous	9
Multiparous	1
Etiology	
D&C × 1	9
D&C × 2	10
D&C × 3	1
Abd MM × 1	2
Abd MM × 1, Hyst MM × 1	1
Abd MM × 1, D&C × 1, C/S × 1	1
C/S × 1	1
Unknown	2
Menstrual status	
Hypomenorrhea	9
Amenorrhea	4
Normal menses	14
Infertility	
(+)	24
(−)	3
Stage of AFS classification	
Mild	4
Moderate	19
Severe	4
Recurrence	
(+)	4
(−)	23

D&C dilatation and curettage, *Abd MM* abdominal myomectomy, *Hyst MM* hysteroscopic myomectomy, *C/S* cesarean section, *AFS classification* American Fertility Society classification of intrauterine adhesions

Hysteroscopic findings in 27 patients showed dense adhesions in 24 patients and filmy adhesions in 3 patients. Adhesions were seen in the following: uterine body, 16 patients; uterine fundus, 8 patients; cervical canal, 2 patients; and internal os, one patient. As per AFS classification, mild IUA was seen in 4 patients, moderate IUA was seen in 19 patients, and severe IUA was seen in 4 patients.

There were no complications associated with the hysteroscopic procedure in any of the patients. Four patients experienced IUA recurrence. The mean interval from the first hysteroscopic adhesiolysis to recurrence was 9.5 ± 7 months (range 2–18 months). All 4 patients required a second hysteroscopic adhesiolysis procedure. Normal menstrual cycles resumed in all 13 patients after hysteroscopic adhesiolysis.

Of the 24 patients with infertility symptoms, 16 patients were followed up, 7 patients were not followed up, and one patient was histologically diagnosed with endometrial cancer after the hysteroscopic adhesiolysis procedure. The patient who was histologically diagnosed with endometrial cancer was a 36-year-old nulliparous woman who visited our hospital with the chief complaint of infertility. She had regular menstrual cycles and normal follicle stimulating hormone, luteinizing hormone, prolactin, and estradiol levels. She tested positive for chlamydia immunoglobulin A. Using hysterosalpingography (HSG), only the center part of the uterine cavity and both fallopian tubes were visualized. Therefore, a diagnostic hysteroscopy was performed, during which mild adhesions of the uterine cavity and polypoid lesions were observed. Because she had no history of uterine body trauma, we suspected genital tuberculosis. She underwent hysteroscopic adhesiolysis and polypectomy. The endometrial tuberculosis polymerase chain reaction (PCR) and endometrial histopathology tests were performed. The endometrial tuberculosis PCR was negative and the endometrial histopathology was endometrioid adenocarcinoma, Grade 1. Two weeks after hysteroscopic adhesiolysis, she transferred to another hospital for detailed examinations and treatment for endometrial cancer.

Among the 16 patients affected by infertility, one patient had mild, 14 patients had moderate, and one patient had severe IUA according to the AFS classification (Tables 2, 3). Of the 16 patients, 9 conceived; as such, the overall conception rate was 56.2 %. The mean interval from the first hysteroscopic adhesiolysis to the first conception was 8.7 ± 4.9 months (range 4–18 months). The mean age of the 9 patients who conceived and the 7 patients who had not conceived was 35.7 ± 4.0 and 39.4 ± 5.8, respectively (Table 4). Statistical significance was tested using the *t* test with Welch's correction. The difference of mean age was not statistically significant ($P = 0.16$). Of the 9 patients who conceived, the mean endometrial thickness of 6 patients was 8.0 ± 1.2 mm (range 7–10 mm), while that of the other 3 patients was unknown. The mean endometrial thickness of the 7 patients who had not conceived was 7.1 ± 3.3 mm (range 1–11 mm). The difference of endometrial thickness was not statistically significant ($P = 0.52$). Of those 9 patients, 8 had moderate and 1 had severe IUA according to the AFS classification.

Table 2 Demographic details and the etiologies, menstrual status, intrauterine adhesion stages, and reproductive outcomes of 16 infertile patients

Age	37.3 ± 5.0
Parity	
Nulliparous	9
Primiparous	7
Menstrual status	
Hypomenorrhea	5
Amenorrhea	1
Normal menses	10
AFS classification	
Mild	1
Moderate	14
Severe	1
Recurrence	
(+)	3
(−)	13
Reproductive outcome	
Conception	9
Not conceived	7

AFS American Fertility Society classification of intrauterine adhesions

Of the 9 patients who conceived, 5 conceived spontaneously, 2 patients conceived using artificial insemination of husband, and 2 patients conceived with in vitro fertilization (IVF) (Table 5). Of the 9 patients who conceived, 3 had term deliveries and one continues pregnancy at present. Among the 3 patients who gave birth, 2 patients did so vaginally and one patient underwent an elective C/S due to a history of abdominal myomectomy. None of the patients had obstetric complications. Of the other 6 patients, 2 had spontaneous abortions, one patient had an ectopic pregnancy, one had cervical incompetence that resulted in abortion at 16 weeks' gestation, and one required uterine artery embolization (UAE) for an uncontrolled hemorrhage during D&C to treat a hydatidiform mole. None of 6 patients underwent chromosomal analysis of the abortus or placenta.

The patient in case 6 (Table 3) was a 38-year-old nulliparous woman who visited our hospital with a chief complaint of infertility. She conceived spontaneously and underwent an elective D&C abortion at the age of 32 years. One year later, she conceived spontaneously and

Table 3 Age, parity, etiology, menstrual status, endometrial thickness, intrauterine adhesion stage, recurrence, fertility factor, and reproductive outcomes of 16 infertile patients

Case	Age	Gestation/ parity	Etiology	Menstrual status	EM thickness (mm)	AFS classification	Recurrence	Fertility factors	Reproductive outcome
1	29	G3P0	D&C × 3	Normal	Unknown	Moderate	(−)	Unknown	Spontaneous pregnancy after 6 months; missed abortion
2	40	G2P0	D&C × 2	Hypomenorrhea	9	Moderate	(−)	EM polyp	Pregnancy by AIH after 4 months; spontaneous delivery at 40 weeks
3	31	G1P1	D&C × 1	Hypomenorrhea	7.5	Moderate	(−)	PCOS Endometriosis	Pregnancy by AIH after 18 months; spontaneous delivery at 39 weeks
4	37	G3P1	D&C × 1	Normal	Unknown	Moderate	(−)	Unknown	Spontaneous pregnancy after 8 months; ectopic pregnancy
5	33	G0P0	Abd MM × 1	Normal	Unknown	Moderate	6 months	None	Spontaneous pregnancy after 4 months of secondary hysteroscopic adhesiolysis; missed abortion
6	38	G2P0	D&C × 2	Normal	7	Moderate	(−)	None	Pregnancy by IVF after 16 months; cervical incompetence and abortion at 16 weeks
7	37	G2P1	D&C × 1	Amenorrhea	7	Severe	18 months	None	Spontaneous pregnancy after 6 months of secondary hysteroscopic adhesiolysis; ongoing pregnancy
8	36	G1P1	C/S × 1	Normal	10	Moderate	(−)	Tubal obstruction EM polyp	Spontaneous pregnancy after 9 months diagnosed as molar gestation
9	41	G0P0	Hyst MM × 1, Abd MM × 1	Normal	8	Moderate	(−)	None	Pregnancy by IVF after 8 months; C/S at 37 weeks
10	27	G1P0	D&C × 1	Hypomenorrhea	8	Moderate	(−)	Ovulatory dysfunction	Has not conceived for 2 years
11	45	G0P0	Abd MM × 1	Normal	8	Moderate	12 months	DOR (FSH, 13.7 mIU/mL)	Did not conceive and quit treatment due to high age
12	43	G2P1	D&C × 2, Hyst MM × 1	Normal	10	Moderate	(−)	DOR (FSH, 71.9 mIU/ml)	Did not conceive for one year and quit the treatment due to high age
13	41	G2P0	D&C × 2	Normal	7	Mild	(−)	Hypothyroidism	Did not conceive and quit the treatment due to high age

Table 3 continued

Case	Age	Gestation/ parity	Etiology	Menstrual status	EM thickness (mm)	AFS classification	Recurrence	Fertility factors	Reproductive outcome
14	41	G2P1	Abd MM × 1, C/S × 1, D&C × 1	Hypomenorrhea	1	Moderate	(−)	Tubal obstruction	Did not conceive and quit the treatment due to a thin endometrium
15	40	G0P0	Unknown	Normal	11	Moderate	(−)	EM polyp	Trying to conceive
16	39	G1P0	D&C × 1	Hypomenorrhea	5	Moderate	(−)	None	Trying to conceive

Abd MM abdominal myomectomy, *AFS classification* The American Fertility Society classification of intrauterine adhesions, *AIH* artificial insemination with husband's semen, *C/S* cesarean section, *D&C* dilatation and curettage, *DOR* diminished ovarian reserve, *EM thickness* endometrial thickness, *Hyst MM* hysteroscopic myomectomy, *IVF* in vitro fertilization

Table 4 Age, endometrial thickness, menstrual status, and intrauterine adhesion stages and recurrence in 9 patients who conceived and 7 patients who did not conceive

	Conceived ($n = 9$)	Did not conceive ($n = 7$)
Age	35.7 ± 4.0	39.4 ± 5.8
EM thickness	8.0 ± 1.2 mm*	7.1 ± 3.3 mm
Menstrual status		
Amenorrhea	1	0
Hypomenorrhea	2	3
Normal	6	4
AFS classification		
Mild	0	1
Moderate	8	6
Severe	1	0
Recurrence		
(+)	2	1
(−)	7	6

EM thickness endometrial thickness, *AFS* American Fertility Society classification of intrauterine adhesions

* The mean endometrial thickness of 6 patients who were followed and did conceive

Table 5 Conception methods and reproductive outcomes of 9 pregnant patients

Procedure	
Spontaneous	5
AIH	2
IVF	2
Reproductive outcome	
Term delivery, live birth	3
Ongoing pregnancy	1
Spontaneous abortion	2
Ectopic pregnancy	1
Cervical incompetence, stillbirth	1
Hydatidiform mole, UAE	1

AIH artificial insemination with husband's semen, *IVF* in vitro fertilization, *UAE* uterine artery embolization

underwent a D&C for an incomplete abortion at the age of 33 years. She had regular menstrual cycles. Using HSG, only the center part of the uterine cavity and both fallopian tubes were visualized. Therefore, a diagnostic hysteroscopy was performed during which moderate adhesions in the uterine fundus were observed. The patient underwent hysteroscopic adhesiolysis and conceived with IVF treatment 16 months after the surgery. However, she had cervical incompetence at 9 weeks' gestation and was transferred to another hospital for a cervical cerclage. Despite the cerclage, rupture of the membrane occurred and resulted in a abortion at 16 weeks' gestation.

The patient in case 8 (Table 3) was a 36-year-old woman who visited our hospital with the chief complaint of infertility. She conceived with IVF treatment and underwent a C/S for placenta previa at the age of 31 years. She had regular menstrual cycles. According to the findings of HSG, only the right part of the uterine cavity was visualized. A diagnostic hysteroscopy was performed. Moderate adhesions of the uterine cavity and polypoid lesions were observed. She then underwent hysteroscopic adhesiolysis and polypectomy. She conceived spontaneously 9 months after the surgery. At 6 weeks' gestation, ultrasonography findings revealed a gestational sac and heterogeneous mass with anechoic spaces of varying sizes and shapes. Serum β-human chorionic gonadotropin (β-HCG) levels were 69,775 IU/L. She underwent a D&C for a presumed molar gestation. During the D&C, active bleeding from the uterus occurred, with a total blood loss of 500 mL. She ultimately required a UAE for the uncontrolled hemorrhage. One week later, she underwent chemotherapy with methotrexate for a clinically invasive mole.

Discussion

The management of Asherman's syndrome initially involved the performance of a simple D&C. After an

unsuccessful simple D&C, a laparotomy and an anterior hysterotomy were employed to allow for surgical division of the adhesions [1]. However, blind adhesiolysis can increase the raw area within the uterine cavity, thereby worsening the condition and further distorting the cavity [8]. The treatment of Asherman's syndrome improved dramatically with the emergence of the hysteroscopy procedure [1]. Hysteroscopy is the current method of choice for diagnosing, treating, and following patients with Asherman's syndrome [10]. Hysteroscopic adhesiolysis is performed directly or under fluoroscopic guidance [1], laparoscopic guidance [11, 12], or ultrasonographic guidance [13].

Roy et al., reported on 89 infertile patients with Asherman's syndrome who underwent hysteroscopic adhesiolysis with concomitant laparoscopy [12]. No abnormalities were detected in any of the patients in a comprehensive infertility workup (tubal patency test, pelvic ultrasonography, husband's semen analysis, and serum hormone measurements). Amenorrhea and hypomenorrhea improved in 70.6 % of the patients and the conception rate was 40.4 %. They reported that concurrent laparoscopy is helpful for confirming tubal patency and ruling out other pelvic pathologies to elucidate the boundaries of adhesiolysis by observing the transillumination. However, they encountered 2 cases of uterine perforation during the procedure.

Thomson et al., reported on 30 patients with Asherman's syndrome who underwent hysteroscopic adhesiolysis under fluoroscopic guidance and repeated the procedure monthly until the endometrial cavity was reestablished [1]. Amenorrhea and hypomenorrhea were improved in 81.5 % of these patients and the conception rate was 53 %. They reported no cases of uterine perforation and mentioned that the benefits of combination hysteroscopy and fluoroscopic control include the early detection of a passage into the myometrium and the assessment of tubal patency. On the other hand, the limitation of this technique is that it involves the use of an image intensifier and requires the presence of a radiographer.

In our series, all patients underwent hysteroscopic adhesiolysis without concurrent laparoscopy or fluoroscopic guidance. In our series, concomitant transabdominal ultrasonography was performed in cases with extensive and dense adhesions diagnosed using office hysteroscopy to guide the adhesiolysis extent. Amenorrhea and hypomenorrhea improved in all patients and the conception rate was 52.9 %. The menstrual improvement and conception rates were similar to those reported by Roy [12] and Thomson [1]. We suggest that hysteroscopic adhesiolysis with no concomitant assistance is sufficient for the treatment of Asherman's syndrome, especially in mild and moderate cases. Roy et al. [12] reported that the use of concurrent laparoscopy is helpful for determining the boundaries of the adhesiolysis, but they encountered 2 cases of uterine perforation during the procedure. Hysteroscopic adhesiolysis under laparoscopic or fluoroscopic guidance is not necessary to reduce the risk of uterine perforation [14]. There were no cases of uterine perforation in our series. The use of real-time transabdominal ultrasonography can be helpful for detecting any false-passage formations into the myometrium. We suspect that hysteroscopic adhesiolysis under ultrasonographic guidance is sufficient and reduces the risk of uterine perforation.

Resectoscopes have been widely used to treat Asherman's syndrome. The bipolar electrosurgical system (Versapoint) was introduced in recent years to treat IUA. Zikopoulos et al. [15] reported that the live delivery rate in 11 subfertile women with Asherman's syndrome after hysteroscopic adhesiolysis using the Versapoint system was 63.6 %. They also reported that the saline solution used with the Versapoint as a distension medium is isoosmolar and, therefore, safer than the non-electrolyte solution used in a monopolar electrosurgical system. They also reported that the Versapoint might be safer than the resectoscope if uterine perforation occurs since the activated Versapoint tip must be bathed in a saline-filled environment to complete the circuit. However, the cost of the Versapoint is relatively high. Their report, while limited by its small number, appears to indicate that the Versapoint is effective and safe. Hence, more trials to evaluate the different devices used to manage Asherman's syndrome are necessary.

Various factors that may affect conception rates after hysteroscopic adhesiolysis have been reported, including adhesion severity [11], menstrual patterns after surgery [16], and adhesion reformation after surgery [12, 16]. Valle et al. [11] reported that 81 infertile patients with Asherman's syndrome who were treated with hysteroscopic adhesiolysis had the following conception rates: severe IUA, 53 %; moderate IUA, 78.3 %; and mild IUA, 93.0 %. They mentioned that adhesion severity influenced conception rates after hysteroscopic adhesiolysis; however, they classified Asherman's syndrome severity according to their original classification (filmy, fibromuscular, dense connective tissue). Thomson et al. [1] reported that 30 patients with Asherman's syndrome underwent hysteroscopic adhesiolysis under fluoroscopic guidance. Their reported conception rates were as follows: mild IUA, 66 %; moderate IUA, 43 %; and severe IUA, 57 %. They also mentioned that adhesion severity did not affect conception rates after hysteroscopic adhesiolysis. This was difficult to evaluate in our series because few patients had severe IUA. However, the patient with severe IUA in our series conceived. It suggests that adhesion severity may not affect the conception rate after hysteroscopic adhesiolysis.

The current classification of IUA is primarily based on adhesion extent and may not reflect endometrial injury severity. Dan Yu et al. [16] reported that 109 patients with Asherman's syndrome who presented with a history of infertility or recurrent pregnancy loss underwent hysteroscopic adhesiolysis. In their series, the conception rate in patients who continued to experience amenorrhea after surgery was 18.2 %, which was significantly lower than that of patients who continued to menstruate (50 %). At second-look hysteroscopy, the conception rate of patients who experienced reformation of the intrauterine adhesions was 11.8 %, which was significantly lower than that of patients who had a normal cavity (59.1 %). They mentioned that the reproductive outcome of hysteroscopic adhesiolysis for Asherman's syndrome was significantly affected by menstrual status after surgery and intrauterine adhesion recurrence. Roy et al. reported a lack of conception in patients who required repeat adhesiolysis. This lack of conception could be explained by the fact of intrauterine adhesion reformation and concomitant endometrial atrophy. These are potential problems that may limit the success of hysteroscopic adhesiolysis [12].

All of these reports indicate that preventing adhesion reformation is important in the treatment of Asherman's syndrome. According to the literature, postoperative adhesions occur in almost 50 % of severe cases and 21.6 % of moderate cases of Asherman's syndrome [17]. To reduce the likelihood of adhesion reformation, all patients in our series received antibiotics since infection and subacute endometritis were implicated in adhesion formation [18].

The proposed methods for preventing the postoperative formation of intrauterine adhesions and improving the surgical repair outcomes of patients with Asherman's syndrome have included a number of hormonal and mechanical techniques. Farhi et al. [19] found that estrogen–progestin therapy significantly increases endometrial thickness and volume. Hormonal treatment (estrogen–progestin therapy or estrogen therapy alone) is commonly administered to stimulate endometrial growth [5, 11]. However, controversy persists regarding the optimal dosage and duration of hormonal treatment. It has been suggested that the combination of hormonal treatment with drugs, such as low-dose aspirin, nitroglycerine, or sildenafil citrate, improves postoperative vascular perfusion to the endometrium [20].

In our series, the mean endometrial thickness did not differ significantly between patients who had conceived and those who had not. However, the high mean-age of patients in our series may have affected the results; therefore, further trials are necessary to confirm these results. The insertion of an IUD has been advocated by various authors as an effective and widely used method to prevent adhesion reformation [11, 21]. However, it has also been shown that the use of an IUD offered no advantage over hormonal treatment alone [22]. Robinson et al. [4] studied 24 patients treated with primary hysteroscopic adhesiolysis followed by hormonal treatment and serial flexible office hysteroscopy. Serial postoperative office hysteroscopy was used to perform blunt adhesiolysis of newly forming recurrent synechiae. Improved menstrual flow occurred in 95 % of the patients and 70 % of the patients became pregnant. According to their report, this method presumably diminishes the risk of an inflammatory response associated with the placement of a foreign body in the uterus and it has the benefits of providing early and ongoing feedback to patients on their progress and decreasing the interval between primary hysteroscopic surgery and the resumption of normal function. Postoperative office hysteroscopy does not take more time than a routine postoperative examination and has been well tolerated without the use of medication. Their report, while limited by its small number, indicates that this method is effective and convenient. Hence, a well-designed trial to evaluate the different postoperative approaches to managing Asherman's syndrome is necessary.

When treating women with Asherman's syndrome, it is also important to improve both the conception rate and the live birth rate. It is reported that the live birth rate after hysteroscopic adhesiolysis ranges from 64 [16] to 79 % [11]. The live birth rate of 33.3 % in our series is lower than those of earlier reports. It is due to the high miscarriage rate of the high mean age of patients. Fernandez et al. [23] reported that patients with multiple hysteroscopic adhesiolysis experienced second trimester fetal loss after cervical cerclage; therefore, they recommended that cervical cerclage be discussed with patients who undergo multiple surgical procedures. In our series, the patient who conceived by IVF after hysteroscopic adhesiolysis experienced cervical incompetence at 9 weeks' gestation and required a cervical cerclage. She ultimately experienced membrane rupture and abortion at 16 weeks' gestation. Zikopoulos et al., reported a preterm delivery rate of 50 % after hysteroscopic adhesiolysis [15] and Roy et al. [12] reported a higher risk of preterm delivery in patients with moderate and severe Asherman's syndrome after surgery. We should always consider that the risk of preterm delivery is high in patients after hysteroscopic adhesiolysis and the awareness of the risk will contribute to improving the live birth rate.

Severe obstetric complications in subsequent pregnancies have been described by many authors. Placenta accreta, the most severe complication reported after IUA treatment, has an incidence of approximately 8 % [24]. Its occurrence might be associated with a defective lamina basalis after adhesiolysis that allows for abnormal

placentation [15]. Deaton et al. [25] reported spontaneous uterine rupture during pregnancy after hysteroscopic treatment of Asherman's syndrome complicated by fundal perforation. In our series, there were no cases of placenta accreta or uterine rupture, but 1 patient did require UAE for massive uterine bleeding during D&C to treat a hydatidiform mole. Subfertile patients with IUA who are undergoing adhesiolysis should be appropriately informed about the possibility of life-threatening complications and the risk of preterm delivery if they become pregnant.

In conclusion, hysteroscopic adhesiolysis concomitant with transabdominal ultrasonography is a suitable method for treating Asherman's syndrome. There is a high rate of menstrual resumption, and the conception rate in this series was comparable to that in other published series. Subfertile patients with Asherman's syndrome who are undergoing adhesiolysis should be appropriately informed about the possibility of life-threatening complications during and after the surgery.

Conflict of interest We have no conflict of interest.

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