

# Patient-reported menstrual and obstetric outcomes following hysteroscopic adhesiolysis for Asherman syndrome

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**Objective:** Review the menstrual and obstetric outcomes among Asherman syndrome patients when stratified by disease severity.

**Design:** Retrospective cohort study.

**Setting:** A community teaching hospital affiliated with a large academic medical center.

**Patients:** A total of 355 Asherman syndrome patients stratified by March classification who underwent hysteroscopic adhesiolysis.

**Interventions:** Telephone survey, analyzed with multivariable analysis.

**Main Outcome Measures:** Return of menstruation, pregnancy, miscarriage, and live birth rate.

**Results:** A total of 355 patients underwent hysteroscopic adhesiolysis. Of these, 150 (42.3%) patients completed the telephone survey with a mean follow-up of 2.21 years. Additionally, 40.7% had mild, 52.7% had moderate, and 6.6% had severe disease. Furthermore, 25.3% of patients reported amenorrhea at presentation, with mild disease patients having the highest rate of returning menstruation (93.8%) following treatment. The cumulative pregnancy rate was 81.9%, and the cumulative live birth rate was 51.2%, with no statistical differences identified by the classification group.

**Conclusion:** Asherman syndrome disease severity predicted returning menstruation but not pregnancy or live birth rate. (Fertil Steril Rep® 2021;2:118–25. ©2021 by American Society for Reproductive Medicine.)

**Key Words:** Asherman syndrome, hysteroscopy, menstruation, obstetric outcomes

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Intrauterine adhesions were first described in 1894 by Heinrich Fritsch (1). Asherman syndrome was first coined by Joseph G. Asherman in 1948 (1) and is diagnosed when a patient presents with irregular menstruation (oligomenorrhea, amenorrhea), pelvic pain (dysmenorrhea, noncyclic pelvic pain), or subfertility (infertility, recurrent pregnancy loss) in the presence of intrauterine adhesions (2).

Asherman syndrome occurs after any act of intrauterine manipulation that damages the endometrial stratum basalis, a permanent endometrial layer that regenerates the endometrial stratum functionalis (3–6). The functional layer becomes replaced by an epithelium monolayer that is not responsive to hormonal fluctuations and results in endometrial fibrosis, synechia, calcification, defective

vascularization, and nonfunctional glands (1, 3). Intrauterine infections (1), postpartum curettage (1–3, 5–7), evacuation of hydatidiform mole (1), cesarean section (6–8), surgical trauma (9–11), and uterine artery embolization (12) have all been implicated in the development of Asherman syndrome. The incidence of intrauterine adhesion ranges from 6% to 30% after intrauterine instrumentation, with higher rates after postpartum curettage (13–22).

Treatment options for Asherman syndrome are directed at removing and preventing the recurrence of intrauterine adhesions. Hysteroscopic adhesiolysis with microscissors is currently the standard of care (1, 4, 7), and is preferred over electrosurgery to reduce the chance of uterine perforation and recurrence of adhesions (23–25).

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Hysteroscopic lysis of adhesions can be performed as an outpatient procedure with no or minimal intravenous sedation (4, 26).

After treatment of intrauterine adhesions via hysteroscopic adhesiolysis, there is a large variation in patient-reported obstetric and menstrual outcomes, likely due to the heterogeneous patient population, marked variation in clinical treatment protocols, and varying duration of follow-up in reported publications.

The purpose of our research was to characterize the menstrual pattern outcomes and obstetric outcomes following treatment of Asherman syndrome via hysteroscopic lysis of adhesions when stratified by disease severity. In our gynecologic practice, patients are categorized based on disease severity according to the March classification system that uses the percentage of uterine cavity involvement with intrauterine adhesions to classify patients (27). Although obstetric and menstrual pattern outcomes have been reported in the literature on Asherman syndrome patients, there is a paucity of data regarding these outcomes when stratified by disease severity categories in the March classification system. Additionally, from our literature review, we could not identify one publication with >12 patients with Asherman syndrome treated in the United States since the year 1988. As many technological advancements in both hysteroscopic management and assisted reproductive technology (ART) have occurred in the United States since the late 1980s, our primary objective was to review our current menstrual and obstetric outcomes following hysteroscopic management of Asherman syndrome.

## METHODS

### Study Population

Patients who underwent hysteroscopy with lysis of intrauterine adhesions at the Center for Minimally Invasive Gynecologic Surgery at Newton Wellesley Hospital from January 1, 2015 to March 1, 2019 by one of the three minimally invasive gynecologic surgical specialists were identified. Patients were identified through our institution's electronic medical records via the research patient data registry (RPDR) using the diagnosis code for Asherman syndrome, N85.6 Intrauterine synechiae (2018 ICD-10-CM Diagnosis Code), and the procedure codes for hysteroscopy, CPT Code 58555 (Hysteroscopy, diagnostic), and/or CPT Code 58559 (Hysteroscopy, with lysis of intrauterine adhesions). For validation, all outpatient records from the Department of Minimally Invasive Gynecologic Surgery also were reviewed and checked with the list produced by the RPDR search of electronic medical records to ensure no patients were missed for possible inclusion during this defined timeframe. Evaluation of distance traveled per patient was calculated to understand the efforts patients went through to seek specialized gynecologic care by using the web mapping service Google Maps (Google, Menlo Park, CA) calculating the distance from the patients documented hometown to our institution's location in Newton, Massachusetts.

## Surgical Management

Patients underwent a transvaginal pelvic ultrasound and a 5-mm (outer diameter) continuous flow therapeutic office hysteroscopy during their initial patient encounter. Intrauterine adhesions were lysed under direct visualization utilizing 5-French hysteroscopic scissors alone until normal uterine cavity anatomy was restored by 1 of 3 gynecologic surgical providers. The vast majority of these procedures (89.3% of hysteroscopic procedures) were performed in the outpatient office setting, with the operating room reserved only for patients unable to tolerate an office procedure (10.7% of hysteroscopic procedures) during the initial attempt. Hysteroscopic entry into the uterine cavity was performed using the vaginoscopic technique without any parenteral or local anesthesia. All findings and a March classification of the disease severity were documented. Patients were then started on oral estradiol 2 mg twice daily for 30 days, followed by medroxyprogesterone acetate 10 mg daily for the last 5 days of this regimen to induce a withdrawal bleed for only one cycle. Patients were then seen between 2 and 3 weeks postoperatively for repeat adhesiolysis, and then again at 6 weeks postoperatively for repeat adhesiolysis if warranted, with the goal of complete restoration of the normal uterine cavity anatomy.

## Chart Review and Survey Administration

A retrospective review of the electronic health records identified patient's perioperative characteristics. Patients were classified via the March classification system (Supplemental Fig. 1, available online) as has been the traditional practice of our clinic. Given the low incidence of any chronic medical conditions among our patient cohort, we created a dichotomous variable called a "chronic medical condition." Patients were categorized as having a "chronic medical condition" if they had  $\geq 1$  of any of the following chronic medical conditions: obesity, chronic hypertension, diabetes mellitus, thyroid disease, polycystic ovarian syndrome, asthma, smoker, chronic obstructive pulmonary disease, or inflammatory bowel disease.

Patients were contacted via telephone and invited to complete a scripted telephone survey. Verbal consent for participation was obtained, and answers were recorded in a secure electronic database, REDCap (research electronic data capture). This study was approved by the Institutional Review Board (IRB) at Newton Wellesley Hospital via the Partners Human Research Committee, the IRB of Partners HealthCare Protocol 2018P002095, obtained on February 19, 2019.

## Menstrual Outcomes

To assess menstrual outcomes following hysteroscopic lysis of adhesions for Asherman syndrome, presenting menstrual pattern variables were compared with follow-up menstrual patterns from the telephone survey. To evaluate more accurately the return of menses, we specifically looked at patients

that presented with amenorrhea and their follow-up menstrual patterns.

### Obstetric Outcomes

The three different patient-reported obstetric outcomes of the study were number of pregnancies, number of miscarriages, and number of live births, using data from the telephone survey. Each of the variables was used to construct dichotomous outcomes for pregnancy rate, miscarriage rate, and live birth rate. Patients were either classified as having 0 or  $\geq 1$  pregnancies, 0 or  $\geq 1$  miscarriages, and 0 or  $\geq 1$  live births.

For patient-reported obstetric outcomes, pregnancy was defined as any positive urine or serum evidence of pregnancy via human chorionic gonadotropin or any evidence of intrauterine pregnancy via abdominal or pelvic ultrasound. Miscarriage was defined as any pregnancy loss at  $<24$  weeks' gestational age, excluding termination of pregnancy or ectopic pregnancy. Live birth was defined as any birth at  $\geq 24$  weeks' gestational age. ART utilization was defined as either utilization of intrauterine insemination or in vitro fertilization.

### Statistical Methods

Descriptive statistics were used to summarize the characteristics of the total clinic population and patients that completed the telephone survey. Bivariate analyses were performed to examine sample differences across March classification and telephone survey completion using the ANOVA *F*-test and unpaired *t* tests for continuous variables and the  $\chi^2$  test for categorical variables.

Lastly, multivariable logistic regression analyses were performed to examine whether the severity of Asherman syndrome was an independent indicator of obstetric outcomes after controlling for patient characteristics and medical and obstetric or gynecological history. Due to the small sample size, we only focused on indicators of obstetric outcomes. In addition, we included all patient characteristics regardless of their statistical significance to ensure that observed associations were not confounded by these variables. All analyses were performed using the statistical software package SAS, version 9.4 (Cary, NC).

## RESULTS

A total of 355 patients were evaluated and treated for Asherman syndrome within the clinic during the study period. In total, 150 (42.3%) were successfully contacted and completed the telephone survey (Supplemental Fig. 2, available online). These patients presented from a total of 41 different states within the United States and from 6 different countries; 233 patients (65.6%) presented from outside our institution's home state of Massachusetts, and 6 patients (1.7%) presented from outside of the United States (Supplemental Fig. 3, available online). The mean distance traveled per patient was  $571.3 \pm 849.1$  miles (median, 205.0 miles). Of the 150 patients contacted, 61 patients (40.7%) had mild disease, 79 (52.7%) had moderate disease, and 10 (6.6%) had severe disease

(Table 1). The mean patient age was 35.2 years, and the mean gravidity was 2.1 pregnancies. Patients with moderate disease patients had the lowest mean patient age at 34.2 years ( $P < .05$ ). The most common indications for the evaluation and treatment of Asherman syndrome were infertility and menstrual irregularities at 68.7% and 19.3%, respectively, for all classification groups. There were no significant differences in the presenting menstrual pattern when evaluating patients by their classification group, with a total of 38 (25.3%) of the 150 patients initially presenting with amenorrhea. "D&C/D&E-Early Pregnancy Loss or Elective Termination" was identified as being the most common presumed etiology for both mild and moderate Asherman syndrome at 52.5% and 45.6%, respectively, whereas "D&C/D&E-Postpartum" accounted for the most common presumed etiology for severe Asherman syndrome at 30.0% ( $P < .001$ ). There was no difference among the classification groups in the follow-up period calculated as the time from initial patient encounter to the date of the telephone survey, with a mean follow-up period of 807.6 days, or 2.21 years. Of the patients contacted, 127 (84.7%) were attempting conception, with a significantly lower proportion of patients with severe disease attempting conception compared with patients with mild and moderate disease ( $P = .045$ ). Among those patients attempting conception, there was no statistical difference among utilization of ART when stratified by classification group, with 51.9% utilizing ART while attempting conception.

The only significant difference in patient characteristics between those who completed the telephone survey and those who did not complete it was a higher percentage of patients presenting with infertility (68.7% vs. 62.9%) as their primary chief complaint among those that completed the telephone survey (Supplemental Table 1, available online). Patients who completed the telephone survey were thus overall representative of the entire clinic population.

### Menstrual Results

The most common presenting menstrual pattern for the mild disease was normal flow at 37.7%; for moderate disease, light flow at 44.3%; and for severe disease, light flow at 70.0%. There was no difference in the rate of amenorrhea when stratified by classification group (Table 1). Upon follow-up examination of all patients who initially presented with amenorrhea (38 patients), those with mild disease had a significantly higher rate of returning menstruation (93.8%;  $P < .05$ ) (Table 2).

### Obstetric Results

Among the 127 patients who attempted conception, 43.3% had mild, 52.0% had moderate, and 4.7% had severe Asherman syndrome (Table 3). Of the 127 patients, 104 reported  $\geq 1$  pregnancy following hysteroscopic treatment at our institution, for a 81.9% cumulative pregnancy rate. Although not statistically significant, there was a decreasing trend in pregnancy rate with increasing severity ( $P = .47$ ). The miscarriage rate was highest in the severe Asherman syndrome

**TABLE 1**

**Patient characteristics (completed telephone survey) by March classification.**

	March Classification			Total (n = 150)	P value
	Mild (n = 61)	Moderate (n = 79)	Severe (n = 10)		
Age <sup>a</sup>	36.2 (5.3)	34.2 (4.2)	36.0 (4.3)	35.2 (4.8)	< .05
Gravidity <sup>a</sup>	1.8 (1.4)	2.2 (1.9)	2.8 (2.0)	2.1 (1.8)	.14
Parity <sup>a</sup>	0.6 (0.9)	1.0 (1.2)	1.9 (2.4)	0.9 (1.2)	< .05
<b>Chief Complaint<sup>b</sup></b>					.632
Infertility	43 (70.5%)	52 (65.8%)	8 (80.0%)	103 (68.7%)	
Recurrent Pregnancy Loss	3 (4.9%)	5 (6.3%)	0	8 (5.3%)	
Menstrual Irregularity	12 (19.7%)	16 (20.3%)	1 (10.0%)	29 (19.3%)	
Dysmenorrhea	1 (1.6%)	1 (1.3%)	1 (10.0%)	3 (2.0%)	
Noncyclic pelvic pain	2 (3.3%)	5 (6.3%)	0	7 (4.7%)	
<b>Presenting Menstrual Pattern<sup>b</sup></b>					.29
Normal	23 (37.7%)	22 (27.9%)	1 (10.0%)	46 (30.7%)	
Light	19 (31.2%)	35 (44.3%)	7 (70.0%)	61 (40.7%)	
Absent	16 (26.2%)	20 (25.3%)	2 (20.0%)	38 (25.3%)	
Heavy	3 (4.9%)	2 (2.5%)	0	5 (3.3%)	
<b>Presumed Etiology<sup>b</sup></b>					< .001
D&C/D&E: Early Pregnancy Loss or Elective Termination	32 (52.5%)	36 (45.6%)	2 (20.0%)	70 (46.7%)	
D&C/D&E: Postpartum	15 (24.6%)	24 (30.4%)	3 (30.0%)	42 (28.0%)	
Hysteroscopic Polypectomy	3 (4.9%)	1 (1.3%)	0	4 (2.7%)	
Hysteroscopic Metroplasty	1 (1.6%)	0	0	1 (0.7%)	
Hysteroscopic Myomectomy	1 (1.6%)	1 (1.3%)	1 (10.0%)	3 (2.0%)	
Laparoscopic Myomectomy	1 (1.6%)	1 (1.3%)	0	2 (1.3%)	
Abdominal Myomectomy	3 (4.9%)	3 (3.8%)	1 (10.0%)	7 (4.7%)	
Cesarean Section	1 (1.6%)	10 (12.7%)	1 (10.0%)	12 (8.0%)	
Endometrial Ablation	0	1 (1.3%)	2 (20.0%)	3 (2.0%)	
Unclear	4 (6.6%)	2 (2.5%)	0	6 (4.0%)	
<b>Medical History<sup>b</sup></b>					.55
Yes	9 (14.8%)	8 (10.1%)	2 (20.0%)	19 (12.7%)	
No	52 (85.3%)	71 (89.9%)	8 (80.0%)	131 (87.3%)	
<b>Previous Miscarriages<sup>a</sup></b>	1.0 (1.0)	1.1 (1.3)	0.6 (0.7)	1.0 (1.1)	.39
<b>D&amp;C/D&amp;E-Early Pregnancy Loss or Elective Termination<sup>a</sup></b>	0.8 (0.8)	0.8 (1.0)	0.6 (1.0)	0.8 (0.9)	.75
<b>D&amp;C/D&amp;E-Postpartum<sup>a</sup></b>	0.3 (0.6)	0.3 (0.5)	0.3 (0.5)	0.3 (0.5)	.96
<b>Follow-Up Period (Days)<sup>a</sup></b>	769.7 (439.0)	815.9 (428.3)	974.2 (666.0)	807.6 (455.0)	.888
<b>Attempting Conception<sup>a</sup></b>	55 (90.2%)	66 (83.5%)	6 (60.0%)	127 (84.7%)	.045
<b>ART Utilization<sup>a</sup></b>	29 (52.7%)	35 (53.0%)	2 (33.3%)	66 (51.9%)	.269

Note: Percentages may not add to 100% because of rounding. ART = assisted reproductive technology; D&C = dilation and curettage; D&E = dilation and evacuation.

<sup>a</sup> F-test (ANOVA), all groups based on March classification system were compared (mild, moderate, and severe).

<sup>b</sup>  $\chi^2$  test, all groups based on March classification system were compared (mild, moderate, and severe).

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**TABLE 2**

**Follow-up menstrual pattern for patients who presented with amenorrhea by March classification.**

**Absent Presenting Menstrual Pattern**

**N = 38 patients**

Follow-Up Menstrual Pattern	March Classification			P value
	Mild	Moderate	Severe	
Normal	8 (50.0)	12 (60.0)	0 (0.0)	< .05
Light	7 (43.8)	1 (5.0)	1 (50.0)	
Absent	1 (6.3)	3 (15.0)	1 (50.0)	
Heavy	0 (0.0)	4 (20.0)	0 (0.0)	

Note: Values are expressed as the number (percentage) of patients.

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patient group ( $P < .05$ ). Sixty-five patients reported  $\geq 1$  live births, for a 51.2% cumulative live birth rate. There was no statistically significant difference in live birth rate when

stratified by classification group ( $P = .21$ ). Additionally, 22 patients were actively pregnant at the time of the telephone survey. Of these patients, 6 had already reported  $\geq 1$  previous live birth since hysteroscopic treatment for their Asherman syndrome at our institution, whereas 16 patients had reported no previous live births since hysteroscopic treatment for their Asherman syndrome at our institution.

A total of 149 pregnancies were reported among the 104 patients who had reported  $\geq 1$  pregnancy after hysteroscopic treatment at our institution (Table 3). Sixty-nine (46.3%) pregnancies were “Preterm & Full-Term Births,” 58 (38.9%) were “SAB/TAB/Ectopic,” and 22 (14.8%) were “Active Pregnancies.” “Preterm & Full-Term Births” referred to any pregnancy resulting in delivery at  $\geq 24$  weeks’ gestational age. “SAB/TAB/Ectopic” referred to any pregnancy resulting in a pregnancy loss at  $< 24$  weeks’ gestational age, termination of pregnancy at any gestational age, or an ectopic pregnancy at any gestational age. Complete survey results are available in Supplemental Table 2 (available online).

TABLE 3

## Patient-reported pregnancy outcomes.

## Patient Outcomes

All Patients Attempting Conception (N = 127)	Mild (n = 55)	Moderate (n = 66)	Severe (n = 6)	Total (n = 127)	P value
≥ 1 Pregnancy	47 (85.5)	53 (80.3)	4 (66.7)	104 (81.9)	.47
≥ 1 Miscarriage	20 (36.4)	12 (18.2)	3 (50.0%)	35 (27.6)	< .05
≥ 1 Live Birth	28 (50.9)	36 (54.6)	1 (16.7%)	65 (51.2)	.21

## Pregnancy Outcomes

All Pregnancies (N = 149)	Mild (n = 70)	Moderate (n = 72)	Severe (n = 7)	Total (n = 149)
Preterm & Full-Term Births	29 (41.4)	39 (54.2)	1 (14.3%)	69 (46.3)
SAB/TAB/Ectopic	32 (45.7)	21 (29.2)	5 (71.4%)	58 (38.9)
Active Pregnancies	9 (12.9)	12 (16.7)	1 (14.3%)	22 (14.8)

  

Trimester of Active Pregnancies (N = 22)	Mild (n = 9)	Moderate (n = 12)	Severe (n = 1)	Total (n = 22)
First	5 (55.6)	3 (25.0)	0 (0.0%)	8 (36.4)
Second	4 (44.4)	4 (33.3)	1 (100.0%)	9 (40.9)
Third	0 (0.0)	5 (41.7)	0 (0.0%)	5 (22.7)

Note: Values are expressed as the number (percentage) of patients. SAB = spontaneous abortion; TAB = therapeutic abortion.

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### Multivariable Analysis

We assessed Asherman syndrome disease severity as an independent risk factor for pregnancy outcomes using multivariable analysis to control for several potential confounding variables, such as patient age, gravidity, parity, presenting menstrual pattern, chronic medical condition, previous miscarriages, previous uterine instrumentation, and use of in vitro fertilization (Table 4). Asherman syndrome disease severity was not a predictor for  $\geq 1$  pregnancy or  $\geq 1$  live births when adjusted for potential confounders. It was a predictor of  $\geq 1$  miscarriage, and patients with moderate Asherman syndrome demonstrated the lowest rate of miscarriages ( $P < .05$ ).

### DISCUSSION

We characterized the menstrual pattern and obstetric outcomes following hysteroscopic adhesiolysis among Asherman syndrome patients when stratified by disease severity. We discovered that disease severity predicted returning menstruation but did not accurately predict pregnancy rate or live birth rate following treatment at a mean follow-up period of 2.21 years.

The rate of amenorrhea reported among all patients with Asherman syndrome presenting initially for care has been described from 0.0%–100.0% (24, 28–39), with only one paper reporting amenorrhea rate by disease severity via the American Fertility Society classification at 0%, 2.6%, and 32.1% for mild, moderate, and severe disease, respectively (30). Resolution of amenorrhea following treatment has been reported from 29.0%–100.0% (7, 23, 24, 28–30, 32–36, 39–43). In our study, there was no significant difference in

patients presenting with amenorrhea when stratified by March classification. This is potentially because the menstrual history is not incorporated within the March classification system, unlike the American Fertility Society classification system, which does give significant weight to patient-reported amenorrhea when calculating the disease severity. Thus, with the March classification, it is possible for two patients both to report amenorrhea at the initial consultation, even if one patient has mild disease with only focal adhesions forming an outlet obstruction and the other patient has severe disease with a significant percentage of adhesions with little functioning endometrium. Our study validates this concept, as we identified a much higher rate of return of menses after hysteroscopic lysis of adhesions among patients with mild disease compared with those with severe disease.

The majority of our patients present with a chief complaint of infertility, making it essential to understand obstetric outcomes after hysteroscopic adhesiolysis. The pregnancy rate among all Asherman syndrome patients attempting conception after hysteroscopic treatment varies in the reported literature from 32.1%–85.0%, with a cumulative pregnancy rate of 56.2% (1467/2609 patients) (Supplemental Table 3, available online), although the definition of pregnancy is absent in a many of these studies (7, 23, 24, 28, 30–37, 39–42, 44–58). Additionally, the definition of live birth rate varies among the published literature, but when defined as the total number of patients with  $\geq 1$  live birth divided by the total number of patients attempting conception following treatment of Asherman syndrome, the live birth rate ranges from 14.3% to 78.0% with a cumulative rate of 36.8% (960/2609 patients) (Supplemental

TABLE 4

Multivariable analysis for patient-reported pregnancy outcomes.

Characteristic	Patient-Reported Pregnancy Outcomes					
	Having ≥1 pregnancies		Having ≥1 miscarriages		Having ≥1 live births	
	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
<b>March Classification</b>						
Mild	Ref.	-	Ref.	-	Ref.	-
Moderate	0.3 (0.1, 1.1)	.06	0.3 (0.1, 0.8)	<.05	1.0 (0.4, 2.1)	.95
Severe	0.3 (0.02, 3.4)	.31	1.8 (0.3, 11.2)	.51	0.1 (0.01, 1.2)	.06
<b>Age</b>	0.8 (0.6, 0.9)	<.001	1.0 (0.9, 1.1)	.69	0.9 (0.8, 0.9)	<.05
<b>Gravidity</b>	1.4 (0.3, 7.7)	.71	1.5 (0.6, 3.6)	.38	1.1 (0.4, 3.0)	.71
<b>Parity</b>	0.6 (0.1, 3.7)	.59	0.6 (0.2, 1.6)	.33	1.2 (0.5, 3.2)	.84
<b>Presenting Menstrual Pattern</b>						
Normal	Ref.	-	Ref.	-	Ref.	-
Light	2.3 (0.6, 8.6)	.21	1.7 (0.6, 4.7)	.31	0.6 (0.2, 1.5)	.19
Absent	1.2 (0.2, 6.3)	.8	1.4 (0.4, 4.8)	.6	0.7 (0.2, 1.9)	.28
Heavy	3.2 (0.2, 65.6)	.45	2.2 (0.3, 17.0)	.47	0.5 (0.1, 4.3)	.58
<b>Chronic Medical Condition</b>	0.6 (0.1, 2.6)	.48	0.8 (0.2, 3.1)	.79	0.7 (0.2, 2.4)	.63
<b>Previous Miscarriages (Reported at time of clinic)</b>	0.7 (0.1, 3.9)	.67	1.0 (0.4, 2.4)	.98	0.6 (0.3, 1.6)	.4
<b>D&amp;C/D&amp;E–Early Pregnancy Loss or Elective Termination</b>	3.2 (1.0, 10.8)	.06	0.7 (0.4, 1.5)	.4	1.8 (0.9, 3.6)	.12
<b>D&amp;C/D&amp;E–Postpartum ART Utilization</b>	1.4 (0.3, 6.3)	.67	2.2 (0.7, 6.7)	.15	0.7 (0.3, 1.9)	.41
	0.7 (0.2, 2.4)	.6	1.3 (0.5, 3.4)	.54	0.6 (0.2, 1.3)	.19

Note: ART = assisted reproductive technology; D&C = dilation and curettage; D&E = dilation and evacuation.

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Table 3, available online). In our practice, both cumulative pregnancy rate and live birth rate were higher than the cumulative averages calculated from our literature review.

We identified no significant difference in the pregnancy rate with increasing disease severity. We hypothesize this may be due to two factors: the similar pregnancy rates among both the mild and moderate Asherman syndrome patients (85.5% vs. 80.3%, respectively) and the low number of patients in the cohort completing the telephone survey with severe disease. The multivariable analysis performed demonstrated that the disease severity was not able to predict pregnancy rate effectively, even after accounting for confounding factors.

We identified a significant decrease in miscarriages among patients with moderate Asherman syndrome compared with those with mild Asherman syndrome after hysteroscopic adhesiolysis. This may be due to an increase in underlying conditions (i.e., old age, chronic medical conditions, endometriosis, oocyte quality) that may exist with a greater incidence among patients with mild Asherman syndrome experiencing these first trimester miscarriages. Among completed telephone survey patients, there was both a higher mean age (36.2 vs. 34.2 years old) and a higher unadjusted rate of chronic medical conditions (14.8% vs. 10.1%) among patients with mild Asherman syndrome compared with those with moderate Asherman syndrome; however, specific chronic medical conditions and their impact on miscarriages were not subanalyzed in this study design.

We also demonstrated no statistically significant difference in live birth rate when stratified by disease severity; again, we believe this is because of the similar live birth rates between patients with mild and moderate Asherman syndrome (50.9% vs. 54.6%, respectively) and the low number of patients with severe Asherman attempting conception. Although not statistically significant, patients with severe Asherman syndrome did have the lowest pregnancy rate and live birth rates at 66.7% and 16.7%, respectively.

We encourage further research into identifying additional patient characteristics that may impact the menstrual and obstetric outcomes among patients with Asherman syndrome, so we may better guide prognostic counseling and follow-up plans after hysteroscopic adhesiolysis.

The strengths of our study include the large cohort of patients with Asherman syndrome treated within the United States. We are the first group to investigate the impact of disease severity via the March classification system on menstrual and obstetric outcomes while utilizing multivariable analysis to investigate the impact of confounding variables. Some limitations of this study include its retrospective nature, with only 42.3% of all clinic patients completing the telephone survey leaving room for possible sampling error with our results to be interpreted with this caution. Additionally, as we serve largely as a referral center for specialized gynecologic surgical intervention, with patients returning to their original providers (often remote from our location, as described in the Results) for complete fertility management, we were unable to

assess in our analysis other factors that may impact fertility such as tubal patency and semen analysis. Lastly, we assessed menstrual outcomes using subjective questions and without quantitative measurements of menstrual bleeding.

In conclusion, our study demonstrated that overall menstrual and obstetric outcomes are very promising after hysteroscopic management of Asherman syndrome. However, the development of a more comprehensive prognostic tool is necessary to counsel patients better on pregnancy and live birth rates following hysteroscopic adhesiolysis, as disease severity alone is not a strong predictor of pregnancy outcomes.

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