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Cesarean Scar Pregnancies and Reproductive Outcomes: A Single Center Experience

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ABSTRACT Objective: The rising rate of cesarean delivery increases the occurrence of cesarean scar pregnancies (CSP). Early diagnosis and treatment of CSP have become the subject of considerable interest in recent years because of the risk of life-threatening uterine bleeding and rupture. The aim of this study was to share the results of ultrasonography (USG)-guided dilation and curettage (D&C) and hysterotomy in treating early CSP and the long-term reproductive results in these cases. **Material and Methods:** Patients diagnosed with CSP admitted to the perinatology clinic between January 2016 and April 2020 were included in this study. USG-guided D&C was recommended for all patients diagnosed with CSP in the first trimester (≤12 gestational weeks). Hysterotomy was recommended for patients who could not undergo D&C. All patients' demographic data and procedure results were retrieved retrospectively from electronic records, and reproductive anamneses after the procedure were obtained from patient files and telephone calls. **Results:** Sixty-three patients who underwent USG-guided D&C and hysterotomy were included in the study. While D&C was successful in 93.65% (n=59) of these patients, 6.35% (n=4) underwent hysterotomy. In the USG-guided D&C group, the infertility rate was 15.78% (n=6), the rate of the recurrent scars was 9.3% (n=3), and the rate of placenta accreta spectrum was 6.25% (n=2). The term healthy pregnancy rate was 64%. **Conclusion:** In experienced hands, USG-guided D&C can be considered the first choice in early scar pregnancies. We believe that similar reproductive results would be obtained when D&C and other treatment modalities were compared in CSP treatment.

Keywords: Pregnancy, ectopic; cesarean section; dilatation and curettage; hysterotomy; reproductive health

The rising rate of cesarean delivery increases the occurrence of cesarean scar pregnancies (CSP) as well. The incidence of CSP is reported to be 1/1,800-1/23,226.[1] This condition is a result of blastocyst implantation into the fibrous tissue of a previous cesarean scar. Early diagnosis and treatment of CSP have drawn much interest in recent years due to the risk of life-threatening uterine bleeding and rupture.

Since there is no definitive treatment modality for CSP pregnancies, early diagnosis with ultrasonography (USG) and fertility-preserving treatment options with minimal complications are targeted.[2] In addition to medical treatments such as systemic methotrexate (MTX) and local and systemic MTX, and surgical options such as dilation and curettage (D&C), hysteroscopy, transvaginal CSP resection, uterine artery embolization (UAE), laparotomy, laparoscopy, high-intensity focus ultrasound (HIFU) are also performed. Each treatment modality has its advantages and disadvantages. Expectant management is not recommended due to its high rate of adverse effects on pregnancy. Although medical treatments are low-cost and less traumatic, they have such disadvantages as prolonged resolution, continued bleeding, and uterine rupture risk during treatment.[3] Even though there are a number of treatment options, a limited number of studies have used only D&C as treatment in their settings. USG-guided D&C increases the success and safety rate of the procedure in determining the risk of the procedure, ensuring that all pregnancy tissue is removed, shortening the operation time and reducing surgical perforation risks.[4]

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Researchers have reported that term intrauterine pregnancies were achieved after all CSP treatment modalities. Following CSP pregnancies, recurrent CSP pregnancies, missed abortion, placenta previa or accreta, life-threatening bleeding, or hysterectomy may occur.[5] Data regarding short-term and long-term reproductive outcomes are limited due to the low number of CSPs.

The aim of this study was to evaluate the obstetric characteristics and long-term reproductive results of patients who underwent USG-guided D&C as well as hysterotomy in first-trimester cesarean section scar pregnancies.

MATERIAL AND METHODS

Patients diagnosed with CSP admitted to the Perinatology Clinic of Necmettin Erbakan University Medical School's Meram Hospital between January 2016 and April 2020 were included in this study. All patients signed an informed consent form stating they accepted the procedure prior to the start of the study. The research involving human subjects complied with all relevant national regulations and institutional policies, was in accordance with the tenets of the Helsinki Declaration (as revised in 2013) and has been approved by the Necmettin Erbakan University Ethics Committee (no: 2022/3777, date: May 13, 2022). All pregnant women were evaluated with a GE Voluson E8 imaging machine (General Electric Co., USA) with a 5.0-9.0 MHz transvaginal transducer to diagnose CSP. The study included pregnancies at ≤12 weeks in the isthmic region where the uterus and cervical canal were empty, the myometrial thickness was absent or decreased (1-3 mm) between the bladder and gestational sac, the trophoblastic Doppler vascular blood flow around the sac was high and myometrial integrity was impaired (Figure 1). The first day of the last menstrual period, the first beta-human chorionic gonadotropin (β-HCG), or the first crown-rump length measurement by USG were considered to determine the gestational week. Vaginal USG was used to ascertain the gestational week for those with irregular menstrual cycles. Only cases within the year the study data were collected were enrolled, while those within the last two years were excluded from the study to evaluate the reproductive results accurately. Hemodynamically unstable cases, those who received additional treatment at another center, whose sac integrity was disrupted, pregnancies with cervical implantation, incomplete abortion, missed abortion, and intrauterine pregnancy and CSP coexistence were also excluded from the study. According to our clinic's protocol, USG-guided D&C is recommended for all patients diagnosed with CSP in the first trimester regardless of the type of CSP and residual myometrial thickness, while no other treatment is performed on any patient before the procedure. After providing information about the procedure to all patients, consent is obtained for laparotomy, hysterotomy, and hysterectomy in case of procedure failure. The D&C procedure is performed under mask anesthesia in the lithotomy position, under the guidance of transabdominal USG, after 4-10 mm dilation with a gentle Hegar dilator and Carmen cannula insertion numbered 6-7-8. If suction cannot be provided with a Carmen cannula or the pouch size is greater than 2 cm, vacuum suction is applied after fetal tissue and appendages are removed with Winter forceps. Hysterotomy is performed if the ultrasound-guided procedure fails (excessive bleeding ≥200 mL, uterine rupture suspected, or suction failure). With hysterotomy, the gestational sac located in the scar area is removed under general anesthesia, and the incision line is repaired with primary suturing following the resection of the scar area. After the procedure, all pa-

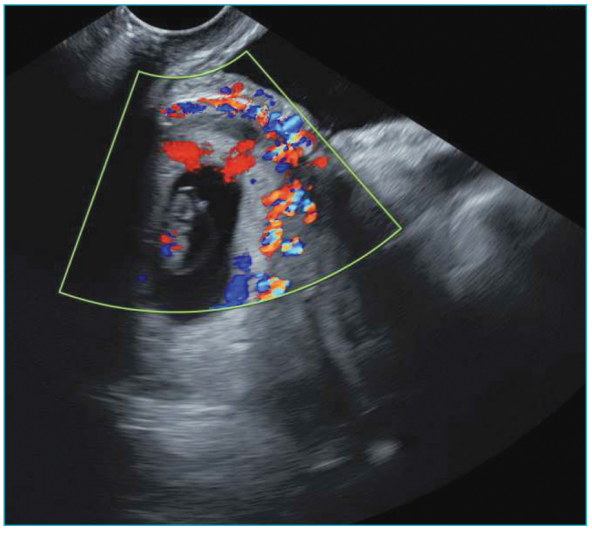

FIGURE 1: Pre-procedure ultrasonographic image.

FIGURE 2: Ultrasonographic image in the second week after the procedure.

tients are discharged after 24-48 hours of follow-up for vital signs, vaginal bleeding, and intra-abdominal bleeding. After discharge, weekly transvaginal USG and β-HCG are followed up (Figure 2). When β-HCG drops to 0-5 IU, follow-up is discontinued, and patients are advised not to get pregnant for at least 6 to 12 months.

All patients' demographic data and procedure results were retrieved retrospectively from electronic records, and reproductive anamneses after the procedure were obtained from patient files and telephone calls. Patients, who had had the procedure at least two years before, were called on the telephone and their intention to have a child, protection statuses, re-pregnancy, pregnancy outcomes, and inability to conceive (cases under medical follow-up after one year of unprotected intercourse were included) were recorded. Obstetric and neonatal outcomes of the pregnant cases were recorded as well. All cases with healthy pregnancies had cesarean section deliveries.

STATISTICAL METHODS

The conformity of the variables to normal distribution was analyzed by using visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk Test). Comparison of groups was performed by the Independent t-test for normally distributed numerical data and the Mann-Whitney U test was used for non-normally distributed numerical data. Number and percentage values, the Pearson chi-square test, and Fisher's exact test evaluated categorical variables. $p<0.05$ was considered statistically significant. Data analyses were conducted by the SPSS 22 (IBM, Armonk, NY, USA) software.

RESULTS

Sixty-three patients diagnosed with CSP in the perinatology clinic who underwent USG-guided D&C and hysterotomy were included in the study. The median age of the patients was 33 years (24-49), the median number of pregnancies was 4 (2-8), the median number of previous cesarean sections was 2 (1-4), and the median D&C week was 7 (4-12). While D&C was successful in 93.65% (n=59) of these patients, 6.35% (n=4) underwent hysterotomy. There was no statistically significant difference between the maternal age, gravida number, previous numbers of D&C, abortion counts, previous cesarean section, procedure weeks, preoperative and postoperative hemoglobin values of the patients who underwent D&C and the patients who underwent hysterotomy ($p>0.05$) (Table 1). The number of cases with positive fetal heart rate in cases that underwent hysterotomy was significantly higher ($p<0.05$). When the admission symptoms of the patients were taken into consideration, it was seen that 25.39% (n=16) of all cases presented with vaginal bleeding and 12.69% (n=8) with pelvic pain, while 61.90% (n=39) were diagnosed by routine USG examination. The blood transfusion rates in both groups were similar (Table 2). Among the cases that underwent hysterotomy, one patient was switched to laparotomy due to uterine rupture (1.58%), two cases (3.17%) for heavy bleeding, and one case for D&C failure (1.58%). Post-procedural reproductive results of 7 out of 63 patients treated for CSP could not be obtained because their contact details were no longer available. Among the remaining 56 patients, 2 of the 4 cases with hysterotomy achieved healthy pregnancy, while one had infertility. 38 (67.9%) out of 56 patients desired to get pregnant again. In this group, infertility rate was 15.78% (n=6). The rate of recurrent scars was 9.3% (n=3), and the rate of placenta accreta spectrum (PAS) was 6.25% (n=2). One of the PAS cases had cesarean section delivery by performing uterine-sparing surgery at 34 weeks and the other case at 35 weeks of gestation. The take-home baby figure was 25 out of 32 cases where pregnancy occurred, and the mean week of de-

TABLE 1: Clinical and demographic findings for the groups.

	D&C (n=59) Median; range	Hysterotomy (n=4) Median; range	Total (n=63) Median; range	p value
Age	33 (24-49)	32.5 (28-40)	33 (24-49)	0.734
Gravida	4 (2-8)	3.5 (2-5)	4 (2-8)	0.750
Parite	2 (1-4)	2 (1-3)	2 (1-4)	0.988
Abortion	0 (0-4)	0.5 (0-1)	0 (0-4)	0.828
Previous D&C	0 (0-4)	0 (0-1)	0 (0-4)	0.376
D&C (gestational age)	7 (4-12)	8.5 (6-11)	7 (4-12)	0.073
Previous cesarean	2 (1-4)	2 (1-3)	2 (1-4)	0.758
Preop hemoglobin	12.9 (8.2-15.9)	12 (9.5-14.7)	12.8 (8.2-15.9)	0.446
	D&C (n=59) $\bar{X}$±SD	Hysterotomy (n=4) $\bar{X}$±SD	Total (n=63) $\bar{X}$±SD	
Postop hemoglobin*	11.79±1.22	10.77±1.97		0.128

*Independent t-test; D&C: Dilatation and curretage; SD: Standard deviation.

TABLE 2: Comparison of basic and clinical characteristics of patients.

		D&C (n=59)		Hysterotomy (n=4)	p value
Fetal heartbeat	(-)	48 (81.4%)	(-)	1 (25.0%)	**0.009**
	(+)	11 (18.6%)	(+)	3 (75.0%)	
Vaginal hemorrhage	(-)	44 (74.6%)	(-)	3 (75.0%)	0.985
	(+)	15 (25.4%)	(+)	1 (25.0%)	
Pelvic pain	(-)	51 (86.4%)	(-)	4 (100%)	0.431
	(+)	8 (13.6%)	(+)	0 (0%)	
Ultrasonography exam	(+)	36 (61.01%)	(+)	3 (75.0%)	0.310
Blood transfusion	(-)	58 (98.3%)	(-)	4 (100%)	0.793
	(+)	1 (1.7%)	(+)	0 (0%)	

D&C: Dilatation and curettage.

livery was 36.95±1.68. In this group, the term healthy pregnancy rate was 64%. The mean time between D&C and conception of these 32 patients was 10.9±5.73 month (Table 3).

DISCUSSION

Early diagnosis and treatment of scar pregnancies, which are becoming more common around the world, are critical to avoiding catastrophic consequences. When the presenting symptoms of CSP, clinical presentation of which is nonspecific, were taken into account, it was seen that the rate of patients diagnosed by the USG after amenorrhea was higher in our series. The success rate in our series, where D&C was used as the first treatment, was 93.6%. No hysterectomy was performed on any of our patients. This result shows that D&C treatment is safe and successful.

TABLE 3: Reproductive outcome after the D&C procedure.

	Absent n (%)	Present n (%)
Pregnancy desire (n=56)	18 (32.1)	38 (67.9)
Subsequent pregnancy (n=56)	24 (42.9)	32 (57.1)
Infertility (n=38)	32 (84.22)	6 (15.78)
Recurrent scar (n=32)	29 (90.7)	3 (9.3)
Abortion (n=32)	28 (87.5)	4 (12.5)
PAS (n=32)	30 (93.75)	2 (6.25)
Pregnancy outcome (n=32)	7* (21.88)	25 (78.12)
Pregnancy outcome (n=25)	FGR 1 (4)	
	EMR 4 (16)	
	PD 1 (4)	
	PAS=2 (8)	
	Term healthy neonate 16 (64)	
	Ongoing pregnancy 1 (4)	
Procedure-pregnancy interval (month, n=32) $\bar{X}$±SD	10.9±5.73	
Delivery week (n=24) $\bar{X}$±SD	36.95±1.68	

*Abortion count+recurrent scar count; D&C: Dilatation and curettage; PAS: Placenta accreta spectrum; FGR: Fetal growth restriction; EMR: Early membrane rupture; PD: Preterm delivery; SD: Standard deviation.

Our re-scar rate was 9.3%, PAS rate was 6.25%, and among those who wanted to get pregnant after the procedure, infertility rate was 15.78%, and the re-pregnancy rate was 84.22%.

There is no consensus on the treatment of CSP. The main target in the treatment of CSP should be an early diagnosis, early termination, and fertility preservation. Many studies have reported that surgical treatment was superior to medical treatment. A study evaluating five surgical modalities for the treatment of CSP reported success rates of 99.2%, 97.1%, 95.4%, 93.6%, and 83.2% in transvaginal hysterotomy, laparoscopic hysterotomy, D&C combined with UAE and hysteroscopy, D&C combined with UAE, and hysteroscopic hysterotomy, respectively.[3] Many studies added other treatment modalities (intramuscular MTX, UAE, or HIFU) to D&C.[6] However, one of these additional methods, namely the UAE, requires much knowledge and experience, and at the same time, physicians should remember that the future fertility of women can be negatively affected by UAE.[7] HIFU is both very costly and not commonly used in the world.[8] The success rates of medical treatment methods, on the other hand, range between 77% and 92%. Nonetheless, they are not preferred by treatment centers and patients since the follow-up lasts up to 20 months and sometimes requires additional intervention.[9,10]

Although USG-guided D&C has been considered a treatment option because it is simple, inexpensive and easily accessible, it is not recommended in some studies due to the risk of massive bleeding, secondary surgery, blood transfusion, and even hysterectomy.[11] Some authors found the curettage option to be inconvenient because of the excessive vaginal bleeding and the potential for uterine rupture but they also noted that it was only partially contraindicated. Among all our cases, only one (1.58%) case ruptured during the D&C and received hysterotomy. Some researchers have argued that it might be a treatment option, reporting a very low complication rate.[12] The absence of a standard D&C protocol for CSP has led to varying results in different studies, as in some studies myometrial thickness was considered and in others gestational sac size was taken into account. In our study, we decided on the procedure by taking into account the gestational week in the D&C decision. D&C is a deterrent for patients and doctors because it necessitates lengthy follow-ups, carries the risk of intermittent bleeding, and entails reprocessing because of residual tissue. Zhang et al. reported that 3.15% of residual pregnancy tissue might remain after D&C, which might increase the risk of bleeding and second intervention, and this rate was between 4.31% and 6.03% in the literature.[13] Jurkovic et al. reported that even though 15% residue was seen in the USG after the procedure, 6% re-procedure was required clinically.[12,14] While Bağlı et al. had successful results in 31 of 36 patients that received suction curettage, they performed additional intervention in 5 cases.[15] In 26 cases, Polat et al. applied suction curettage to 19 patients and achieved successful results in 17 cases.[16]

In the study by Gao et al., 87.5% of those who desired pregnancy after uterine-preserving CSP treatment actually got pregnant, whereas in the study by Ben Nagi et al., the pregnancy rate was 87.5% and infertility was reported in 12.5% of cases. Pregnancy rates between 14.3% and 100% are mentioned in smaller case series.[17,18] In our study, infertility rates were similar to those reported in the literature. CSP recurrence rates in the published series range from 1/3 to 1/21.[19] In the meta-analysis by Morlando et al., the rate of repeat CSP was 17.6%, the intrauterine pregnancy rate was 82.6%, and the rate of those who wanted pregnancy and achieved pregnancy was 70.6%. In this meta-analysis, the uterine rupture rate was 1.5%, while the spectrum of miscarriage, preterm labor, and placenta accreta was 19.1%, 10.3%, and 4%, respectively. When the recurrent CSP cases in these pregnancies were evaluated, it was determined that 21% occurred after surgical treatments and 15.2% after non-surgical treatments.[20]

The greatest risk in pregnancies following CSP pregnancies is the increased risk of placenta accreta (PAS). In a series of 7 cases by Seow et al., placenta accreta was seen in 2 cases after conservative treatment.[21] Previous CSP carries a higher risk of uterine rupture and PAS than previous cesarean sections.[22] Although data on the number of pregnancies reaching term after CSP is limited, the figure pointed to 54.9% of uncomplicated live births in the last meta-analysis

(regardless of medical or surgical treatment) and this rate amounted to 59.5% (in hysteroscopic-guided D&C cases) in live full-term in the study by Tang et al.[23] In our study, our live full-term pregnancy rate was 64%, and the rate of take-home baby was 78.1%. Xu et al. reported that 57 of 117 CSP cases that received three different treatment modalities such as UAE+D&C, laparoscopy-assisted D&C, and laparoscopic resection, desired to get pregnant again and 24 of them became pregnant, while the pregnancy results were not affected by the type of treatment. Although many retrospective studies have reported success rates in USG-guided D&C in cases where the remaining myometrial tissue was 3 mm in CSP pregnancies, studies by Xu et al. reported successful results in 19 cases where the remaining myometrial thickness was less than 3 mm while none of their patients were submitted to laparotomy. The authors indicated that this result underlined that the remaining myometrial thickness and the type of CSP were not important when deciding whether to perform USG-guided D&C.[24] We, on the other hand, took into account the gestational week when making the USG-guided D&C decision for our cases. In this way, our success rate went as high as 93.6%, while our laparotomy rate remained at 6.4%.

The limitations of our study were that it was retrospective and non-randomized, the number of cases was low, treatment modalities could not be compared, and the procedure was performed only by considering the gestational week without taking into account the remaining myometrial thickness, CSP type or sac size.

CONCLUSION

In experienced hands, USG-guided D&C can be considered the first choice in early scar pregnancies in low and middle-income populations. Having a previous CSP does not mean that the results of the subsequent reproductive period will be catastrophic. We believe that similar reproductive results would be obtained when D&C and other treatment modalities were compared in CSP treatment. Prospective studies with a larger patient group are needed for standardized D&C protocols in CSP treatment.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Şükran Doğru;* ***Design:*** *Şükran Doğru;* ***Control/Supervision:*** *Ali Acar;* ***Data Collection and/or Processing:*** *Fatih Akkuş, Gülnur Eren;* ***Analysis and/or Interpretation:*** *Fatih Akkuş, Şükran Doğru;* ***Literature Review:*** *Şükran Doğru;* ***Writing the Article:*** *Şükran Doğru;* ***Critical Review:*** *Aslı Altınordu Atcı.*

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