

Therapeutic curettage as a safe and effective first-line approach in cesarean scar pregnancy: A single-center comparative analysis with the literature

 ¹Burak GÜLER

 ²Burak HAZİNE

 ³Onuralp BİLGİN

 ³Resul KARAKUŞ

¹Department of Obstetrics and Gynecology, Acibadem Altunizade Hospital, Istanbul, Turkey

²Department of Obstetrics and Gynecology, Liv Hospital Vadistanbul, Istanbul, Turkey

³Department of Obstetrics and Gynecology, Zeynep Kamil Women and Children's Diseases Training and Research Hospital, Istanbul, Turkey

ORCID ID

BG : 0000-0003-1188-713X

BH : 0000-0001-9091-6562

OB : 0009-0004-5646-1946

RK : 0000-0001-7386-3833



ABSTRACT

Objective: Cesarean scar pregnancy (CSP) is a rare ectopic pregnancy implanted in a previous cesarean scar and is associated with risks of hemorrhage, uterine rupture, and infertility. Rising cesarean rates have increased its incidence, accounting for up to 6% of ectopic pregnancies. Diagnosis is made by transvaginal ultrasound, which typically shows an empty uterine cavity and a gestational sac at the anterior isthmus with thin myometrium. Treatment options include methotrexate, uterine artery embolization, hysteroscopic or laparoscopic excision, and curettage. No consensus standard exists; management should be individualized.

Material and Methods: We retrospectively analyzed 129 CSP patients treated between 2015 and 2025 at Zeynep Kamil Hospital, Istanbul. Inclusion required an ultrasound-confirmed diagnosis and complete hematologic data. Patients managed conservatively or with incomplete records were excluded. Treatment included primary curettage, methotrexate plus curettage, or laparoscopic repair. Curettage was ultrasound-guided using a Karman cannula. Hemoglobin and hematocrit levels were compared pre- and postoperatively, and transfusion needs were documented.

Results: Of the 129 patients, 123 (95.4%) underwent curettage, 3 underwent methotrexate plus curettage, and 3 underwent laparoscopic repair. The mean hemoglobin drop was 0.8 g/dL ($p < 0.001$), and the mean hematocrit decrease was 2.2% ($p < 0.001$). Only 3 patients (2.3%) required transfusion. Subgroup analysis showed greater hemoglobin decline in patients with a gestational age ≥ 8 weeks and fetal cardiac activity. Compared with the literature reporting larger declines and higher transfusion rates, our outcomes were favorable.

Conclusion: Ultrasound-guided therapeutic curettage is a safe, effective, and fertility-preserving first-line treatment for CSP. It achieved low blood loss and minimal transfusion requirements compared with prior reports. Despite the retrospective design and lack of long-term follow-up, our results support curettage as a reliable option in appropriately selected patients.

Keywords: Blood transfusion, cesarean scar pregnancy, ectopic pregnancy, hemoglobin drop, therapeutic curettage, ultrasound-guided aspiration.

Cite this article as: Güler B, Hazine B, Bilgin O, Karakuş R. Therapeutic curettage as a safe and effective first-line approach in cesarean scar pregnancy: A single-center comparative analysis with the literature. Zeynep Kamil Med J 2026;57(1):7–10.

Received: May 18, 2025 **Revised:** September 13, 2025 **Accepted:** September 19, 2025 **Online:** February 04, 2026

Correspondence: Burak GÜLER, MD. Acibadem Altunizade Hastanesi, Kadın Hastalıkları ve Doğum Kliniği, İstanbul, Türkiye.

Tel: +90 216 649 49 49 **e-mail:** opdrburakguler@gmail.com

Zeynep Kamil Medical Journal published by Kare Publishing. Zeynep Kamil Tıp Dergisi, Kare Yayıncılık tarafından basılmıştır.

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INTRODUCTION

Cesarean scar pregnancy (CSP) is a rare but increasingly recognized form of ectopic pregnancy, in which the gestational sac implants at the site of a previous cesarean section scar. This condition poses serious risks, including massive hemorrhage, uterine rupture, and loss of fertility. With the global rise in cesarean delivery rates, the incidence of CSP is also increasing. CSP may account for up to 6% of all ectopic pregnancies and is one of the most challenging conditions to manage in early pregnancy.^[1]

The pathophysiology of CSP involves implantation of the embryo into a microscopic tract or defect in the myometrium at the site of a prior uterine incision. As the pregnancy progresses, the gestational sac may invade deeply into the myometrium or even beyond the uterine serosa, leading to catastrophic complications. Diagnosis is primarily established via high-resolution transvaginal ultrasonography, which reveals an empty uterine cavity, an empty cervical canal, and a gestational sac located at the anterior uterine isthmus with thin or absent myometrial tissue between the sac and the bladder.^[2]

Several treatment options have been proposed, including systemic or local methotrexate (MTX) administration, hysteroscopic or laparoscopic resection, and surgical evacuation via suction or sharp curettage. The choice of therapy depends on factors such as gestational age, presence of fetal cardiac activity, extent of myometrial invasion, CSP type, hemodynamic status, and fertility preservation goals.^[3]

Previous studies have shown varying degrees of success and complications with each treatment modality. MTX may require multiple doses and prolonged follow-up and can be less effective in cases with fetal cardiac activity or high β -hCG levels. Surgical approaches, especially curettage, are technically simple but may result in significant hemorrhage if not carefully planned.^[4]

Despite advances in medical and surgical management, there is currently no universally accepted gold standard for CSP treatment.^[5] Management must be individualized according to gestational age, presence of fetal cardiac activity, residual myometrial thickness, and fertility goals.^[6]

The aim of our study is to present the outcomes of patients treated for CSP at a high-volume tertiary center where therapeutic curettage is the primary intervention and to evaluate hemoglobin and hematocrit changes and transfusion requirements. We also aim to compare these outcomes with those reported in recent literature.

MATERIAL AND METHODS

This retrospective study reviewed the medical records of 129 patients diagnosed with CSP between January 2015 and December 2025 at Zeynep Kamil Women and Children's Diseases Training and Research Hospital, Istanbul, Türkiye. Diagnosis was confirmed using transvaginal ultrasonography. Ethics approval was obtained from the institutional ethics committee of Zeynep Kamil Women and Children's Diseases Training and Research Hospital with decision number 82, dated December 11, 2024. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Inclusion criteria were a confirmed diagnosis of CSP on transvaginal ultrasound, a history of at least one cesarean delivery, and complete documentation of pre- and postoperative hemoglobin and hematocrit values. Patients were excluded if they had incomplete records, underwent only conservative treatment without surgical intervention, were younger than 18 or older than 45 years, or had chronic medical conditions that could affect hematologic parameters.

Therapeutic strategies included primary curettage, methotrexate followed by curettage, and laparoscopic repair.^[5,6] Hemoglobin and hematocrit levels were assessed preoperatively and postoperatively. Transfusion requirements were recorded.

To enhance safety, all procedures were performed in the operating room under anesthesiologist supervision. Hemostasis was ensured through continuous ultrasound monitoring, gentle negative-pressure aspiration, and stepwise evacuation. In cases with moderate bleeding, intravenous tranexamic acid and uterotonics were administered, while surgical hemostatic measures (balloon tamponade, bipolar coagulation, or laparoscopic conversion) were considered as backup strategies but were not required in our cohort.

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences version 22.0 (IBM SPSS Statistics 22). Descriptive statistics were presented as frequency, mean \pm standard deviation, median, and minimum–maximum values. The Wilcoxon signed-rank test was used to compare dependent variables. A p-value of <0.05 was considered statistically significant. The findings were also compared with selected studies from the literature.

RESULTS

Of the 129 patients, 123 (95.4%) underwent therapeutic curettage, while 3 patients received methotrexate followed by curettage, and another 3 underwent laparoscopic repair.

In the therapeutic curettage group, the mean preoperative hemoglobin was 12.2 ± 1.2 g/dL, and the mean postoperative hemoglobin was 11.4 ± 1.1 g/dL, indicating a mean hemoglobin drop of 0.8 g/dL ($p<0.001$). The mean hematocrit decreased from 36.9% to 34.7%, corresponding to an average reduction of approximately 2% ($p<0.001$). Only three patients (2.3%) in this group required blood transfusion (Table 1).

Compared with recent literature, which has reported hemoglobin reductions ranging from 1.7 to 2.2 g/dL and transfusion rates as high as 9.9% following surgical management of CSP, our findings suggest favorable hematologic outcomes with minimal transfusion requirements.^[6]

DISCUSSION

Our study demonstrates that therapeutic curettage, when performed under continuous ultrasound guidance using vacuum aspiration with a Karman cannula, is a safe and effective first-line option for the management of cesarean scar pregnancy (CSP). The mean hemoglobin drop of 0.8 g/dL and the transfusion requirement of only 2.3% in our cohort compare favorably with previously reported

Table 1: Demographic, clinical, and hematologic characteristics of patients with cesarean scar pregnancy (n=129)

Parameter	Value
Age, years	33.5±5.2 (20–45)
Gravida, median (min–max)	3 (2–9)
Parity, median (min–max)	2 (1–8)
Previous cesarean deliveries, mean±SD (range)	1.8±0.76 (1–4)
Treatment method, n (%)	Therapeutic curettage: 123 (95.4%) Methotrexate+curettage: 3 (2.3%) Laparoscopic repair+curettage: 3 (2.3%)
Gestational age, weeks	7.5±1.56 (4–11)
Fetal cardiac activity, n (%)	Present: 35 (27.1%) Absent: 94 (72.9%)
BMI (n=74)	29±5.2 (20–43)
Gestational sac size, mm (n=65)	14.8±8.9 (3–36)
Crown-rump length, mm (n=68)	9.2±7.2 (2–32)
Preoperative hemoglobin, g/dL	12.2±1.2
Postoperative hemoglobin, g/dL	11.4±1.1
Mean Hb drop, g/dL (p-value)	0.8 (p<0.001)
Preoperative hematocrit, %	36.9±3.5
Postoperative hematocrit, %	34.7±3.2
Mean Hct drop, % (p-value)	2.2 (p<0.001)
Blood transfusion, n (%)	Yes: 3 (2.3%) No: 125 (97.7%)
Subgroup analysis	Hb drop ≥8 weeks GA: 1.0 g/dL vs <8 weeks: 0.6 g/dL (p=0.04) Hb drop with FHR present: 1.1 g/dL vs absent: 0.7 g/dL (p=0.03)

SD: Standard deviation; BMI: Body Mass Index.

figures, in which hemoglobin reductions of 1.7–2.2 g/dL and transfusion rates approaching 10% have been documented.^[7] These favorable outcomes likely reflect early diagnosis, meticulous patient selection, and consistent institutional expertise.

A previous study emphasized that outcomes of curettage vary by CSP type, with type I and II cases responding better to minimally invasive approaches, whereas type III CSP carries a higher risk of hemorrhage and often requires more complex interventions.

^[7] Similarly, Alameddine et al.^[1] reported that gestational age at diagnosis and residual myometrial thickness are strong predictors of intraoperative bleeding risk. In our study, CSP type stratification was not performed, which represents a limitation; nonetheless, the low rate of major complications suggests that careful selection of candidates for curettage was achieved.

Alternative management strategies have been widely explored in the literature. Methotrexate, either systemic or local, has been used to avoid surgical intervention; however, it is less effective in cases with positive fetal cardiac activity or high β -hCG levels and requires prolonged follow-up. Uterine artery embolization (UAE) can be effective in controlling hemorrhage, but concerns remain regarding its impact on subsequent fertility.^[8] Minimally invasive surgical approaches, particularly hysteroscopic resection, have shown high success rates in selected series. Laparoscopic repair with defect closure has also been reported to be effective for deeply invasive type III CSP.^[9] Recent studies have further demonstrated that combining hysteroscopy with suction curettage may enhance visualization and safety, offering an alternative in selected cases.^[10] Similarly, contemporary series have confirmed the safety of ultrasound-guided suction curettage with low complication rates.^[11]

Another important area of concern is reproductive outcomes following CSP treatment. Studies have shown variable subsequent pregnancy rates and have highlighted the risk of recurrent CSP.^[8,12] In our cohort, long-term fertility outcomes were not systematically assessed, which is a notable limitation. Future studies should address these outcomes in a standardized manner, ideally within prospective multicenter frameworks.

The strengths of our study include the large single-center cohort, a standardized treatment protocol, and detailed perioperative hematologic assessment. Limitations include the retrospective design, absence of CSP type stratification, and lack of long-term follow-up on reproductive outcomes. Despite these limitations, our findings add robust evidence that therapeutic curettage, when carefully planned and executed, is a reliable and fertility-preserving treatment option for appropriately selected CSP patients.

In summary, early diagnosis, meticulous patient selection, and the use of standardized ultrasound-guided aspiration techniques allow therapeutic curettage to be considered a safe and effective first-line management strategy for CSP. Further prospective multicenter studies incorporating CSP typing and reproductive outcomes are warranted to establish optimal treatment algorithms.

CONCLUSION

Therapeutic curettage, when performed under ultrasound guidance and within standardized protocols, represents a safe, effective, and fertility-preserving first-line treatment for cesarean scar pregnancy in carefully selected patients. Our findings demonstrate significantly lower hemoglobin decline and transfusion requirements compared with previously reported outcomes. These results highlight the importance of early diagnosis, meticulous patient selection, and consistent institutional expertise. Future multicenter prospective studies incorporating CSP type stratification and long-term reproductive outcomes are warranted to establish evidence-based management algorithms.

Statement

Ethics Committee Approval: The Zeynep Kamil Women and Children's Diseases Training and Research Hospital Ethics Committee granted approval for this study (date: 11.12.2024, number: 82).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Conflict of Interest: The authors declare that there is no conflict of interest.

Financial Disclosure: The authors declare that they have not received any funding, grants, or other support during this study.

Use of AI for Writing Assistance: No artificial intelligence tools were used in the preparation of this manuscript.

Author Contributions: Concept – RK, BG; Design – RK, BG; Supervision – RK, BH; Results – BG; Materials – BG, OB; Data Collection and/or Processing – BH, OB; Analysis and/or Interpretation – OB; Literature Search – OB, BH; Writing – BG; Critical Reviews – RK.

Peer-review: Externally peer-reviewed.

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