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Acquired uterine arteriovenous malformation secondary to pregnancy in a cesarean scar: a diagnostic and therapeutic challenge

Malformación arteriovenosa uterina adquirida secundaria a embarazo en cicatriz de cesárea: un desafío diagnóstico y terapéutico

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ABSTRACT
An ectopic pregnancy in a cesarean section scar is a rare but potentially life-threatening condition associated with a high risk of massive hemorrhage and progression to severe vascular complications. We present the case of a patient with a history of a previous cesarean section who was initially diagnosed with an incomplete abortion and underwent uterine curettage, but who subsequently developed persistent uterine bleeding. Imaging studies revealed a uterine arteriovenous malformation associated with persistent trophoblastic tissue implanted in the cesarean scar. Despite medical treatment with methotrexate and a trend toward normalization of β-hCG levels, uterine bleeding persisted, necessitating definitive surgical management via total abdominal hysterectomy. Pathological examination confirmed the diagnosis of an ectopic pregnancy in a cesarean section scar complicated by a uterine arteriovenous malformation. This case highlights the importance of early ultrasound diagnosis, proper differentiation from an ongoing abortion, and the need for individualized management to reduce maternal morbidity and mortality.
Keywords: Ectopic pregnancy; Cesarean section; Arteriovenous malformations; Uterine hemorrhage; Hysterectomy.
Original contribution and significance: We present a rare case of an ectopic pregnancy in a cesarean scar complicated by a secondary acquired uterine arteriovenous malformation, a potentially life-threatening clinical association due to a high risk of hemorrhage. The case highlights the diagnostic challenges arising from its initial presentation and underscores the value of multimodal evaluation in establishing the correct diagnosis. It also illustrates the importance of an individualized, multidisciplinary approach to optimize clinical outcomes and prevent serious complications.

RESUMEN
El embarazo ectópico en cicatriz de cesárea es una entidad poco frecuente pero potencialmente letal, asociada a un alto riesgo de hemorragia masiva y a la progresión hacia complicaciones vasculares graves. Se presenta el caso de una paciente con antecedente de cesárea previa, inicialmente diagnosticada como aborto incompleto y sometida a legrado uterino, quien evolucionó con sangrado uterino persistente. Los estudios de imagen evidenciaron una malformación arteriovenosa uterina asociada a persistencia de tejido trofoblástico implantado en la cicatriz de cesárea. A pesar del tratamiento médico con metotrexato y la tendencia a la negativización de la β-hCG, el sangrado uterino persistió, por lo que fue necesario un manejo quirúrgico definitivo mediante histerectomía abdominal total. El estudio anatomopatológico confirmó el diagnóstico de embarazo ectópico en cicatriz de cesárea complicado con malformación arteriovenosa uterina. Este caso resalta la importancia del diagnóstico ecográfico precoz, la adecuada diferenciación con aborto en curso y la necesidad de un manejo individualizado para reducir la morbimortalidad materna.
Palabras clave: Embarazo ectópico; Cesárea; Malformaciones arteriovenosas; Hemorragia uterina; Histerectomía.
Aportación original e importancia: Se presenta un caso poco frecuente de embarazo ectópico en cicatriz de cesárea complicado por una malformación arteriovenosa uterina secundaria adquirida, una asociación clínica potencialmente mortal por un alto riesgo de hemorragia. El caso destaca las dificultades diagnósticas derivadas de su presentación inicial y resalta el valor de la evaluación multimodal para establecer el diagnóstico correcto. Asimismo, ilustra sobre la importancia de un abordaje individualizado y multidisciplinario para optimizar los resultados clínicos y prevenir complicaciones graves.

Introducción

Ectopic pregnancy in a cesarean scar (Cesarean Scar Pregnancy, CSP) is a rare and potentially serious condition characterized by the implantation of the gestational sac on or within the fibrous defect of a previous hysterotomy. Its clinical significance lies in the high risk of severe maternal complications, such as massive hemorrhage, early uterine rupture, and progression toward the placenta accreta spectrum (PAS), even in the early stages of pregnancy[1,2,3] Currently, CSP is considered not only a specific form of ectopic pregnancy but also the initial stage of a pathophysiological process that can progress to advanced forms of PAS[1,4].

The estimated incidence of CSP ranges from 1 in 1,800 to 1 in 2,600 pregnancies, accounting for up to 6% of ectopic pregnancies in women with a history of cesarean section[1,5]. Its frequency has increased in recent years, in line with the rising cesarean section rate and the greater availability of high-resolution transvaginal ultrasound. However, the actual incidence may be underestimated due to diagnostic errors, primarily confusion with an ongoing abortion or a cervical ectopic pregnancy[3].

From a pathophysiological perspective, blastocyst implantation occurs through deficient scar tissue, facilitating direct invasion of the myometrium and deep uterine vasculature by the trophoblast, which explains the high risk of hemorrhage and its association with acquired uterine arteriovenous malformations[3,4,6].

Diagnosis is primarily based on transvaginal ultrasound with color Doppler, the method of choice for identifying the location of the pregnancy, assessing myometrial involvement, and characterizing the abnormal vascularization[4,7]. Regarding management, there is no single therapeutic strategy; however, the Society for Maternal-Fetal Medicine advises against a watch-and-wait approach due to the high risk of maternal morbidity[4].

In this context, we present the case of a pregnancy in a cesarean scar with a sluggish course, complicated by a persistent uterine arteriovenous malformation refractory to medical treatment, which required radical surgical management.

Case report

A 36-year-old patient, G5 P3023, with a history of three previous cesarean sections and umbilical hernioplasty. On August 22, 2025, she was diagnosed with a singleton active pregnancy of 10.1 weeks via ultrasound (LCN) and threatened miscarriage, due to one-day-long vaginal bleeding associated with hypogastric cramping pain, at a private clinic in Pichinaqui, Chanchamayo.

On September 4, 2025, she presented with increased vaginal bleeding and abdominal pain and sought care at the Dr. Julio Demarini Caro Regional Teaching Hospital of Tropical Medicine, where she was diagnosed with an incomplete abortion and underwent uterine curettage, after which she was discharged. However, moderate vaginal bleeding persisted, accompanied by symptoms of acute anemia.

Given these findings, a computed tomography angiography (CTA) was performed on October 10, 2025, which revealed a high-flow uterine vascular lesion in the anterior wall, with tortuous vessels, early enhancement, and early venous drainage, consistent with uterine arteriovenous malformation (UAVM), with no evidence of retained placental tissue, endometritis, or adnexal masses.

Based on this diagnosis, an exploratory laparotomy was performed on October 12, 2025; however, it was not possible to perform a total abdominal hysterectomy due to a frozen pelvis and suspicion of UAVM. Subsequently, on October 15, 2025, she was discharged and referred to the Arzobispo Loayza National Hospital, with medical treatment and an outpatient appointment scheduled for October 21, 2025, presenting with a β-hCG level of 487.38 mIU/mL.

Following the initial evaluation, it was decided to admit her on October 21, 2025. Upon admission, her β-hCG level was 246.33 mIU/mL and her Hb was 11.83 g/dL. Transvaginal Dop-

pler ultrasound revealed a heterogeneous, solid intramyometrial-submucosal mass in the anterior wall, with intense arterial and venous vascularization, distorting the endometrial cavity. The differential diagnosis included UAVM, uterine myoma, and uterine neoplasm.

An abdominal-pelvic CT scan confirmed a vascular lesion with apparent endometrial communication; the primary diagnoses were considered to be UAVM and, less likely, gestational trophoblastic disease. Finally, a follow-up ultrasound on October 23, 2025, revealed a heterogeneous lesion measuring 5 × 6 × 7 cm, with low-velocity vascularity (<10 cm/s) and invasion of the anterior myometrium, associated with persistently positive β-hCG, which reinforced the suspicion of residual trophoblastic disease (Figure 1).

Management and course

During hospitalization, it was decided to proceed with medical management using methotrexate (50 mg/m² IM, administered on 10/29/2025 and 11/11/2025), and a progressive decrease in β-hCG levels was observed until they became negative (Figure 2).

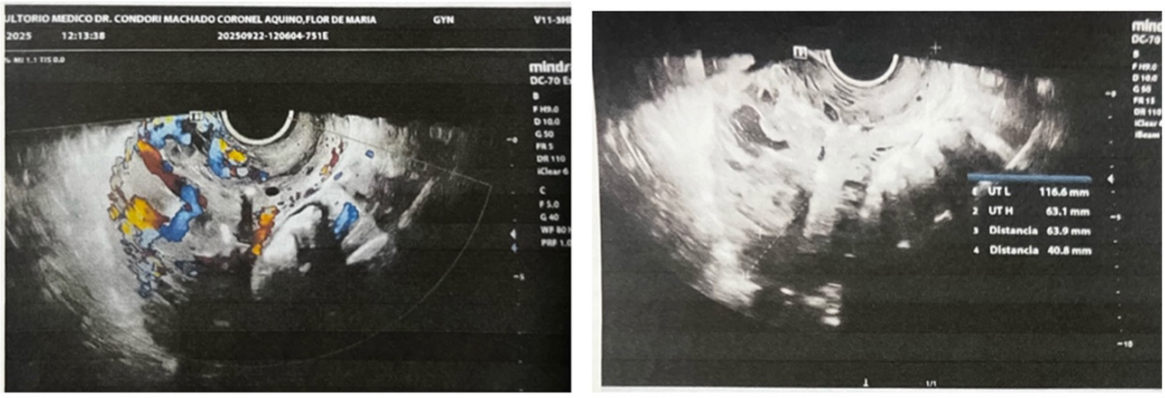

Figure 1: Transvaginal ultrasound with color Doppler showing a heterogeneous lesion measuring 5 x 6 x 7 in the anterior myometrium at the level of the cesarean section scar, with low-velocity intralesional blood flow (< 10 cm/s).

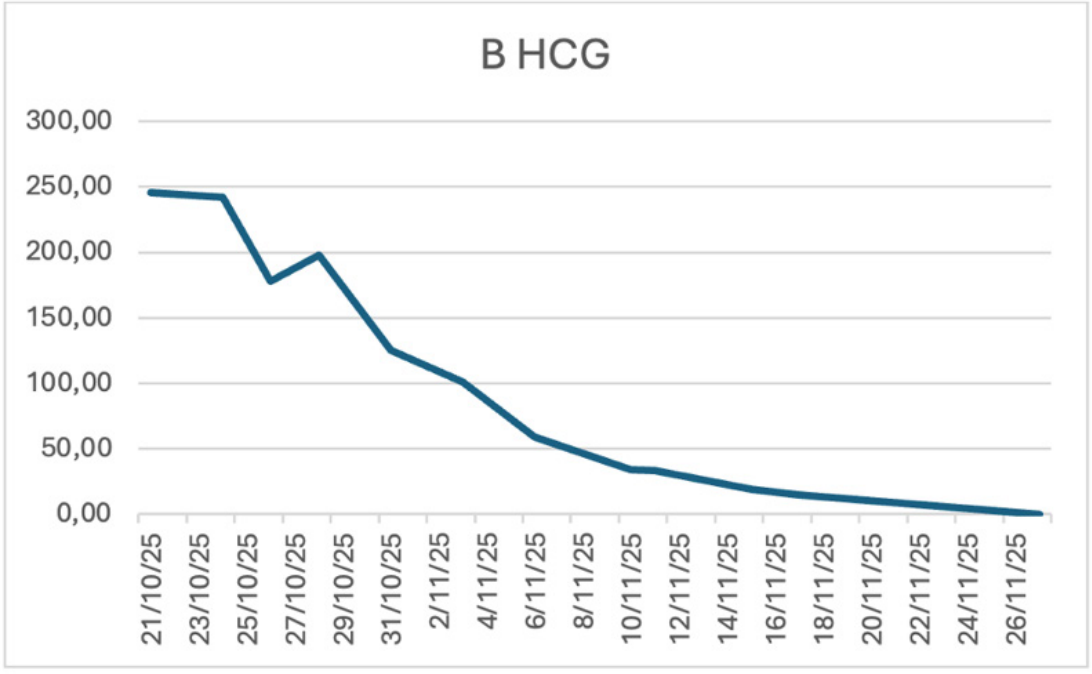

Figure 2: Changes in serum β-hCG levels, showing a gradual decline during follow-up between October 21/25, and November 27/25.

A pelvic MRI (November 14, 2025) confirmed the presence of an intramyometrial vascular mass in the anterior wall of the uterus, consisting of tortuous, high-flow vessels without a defined cleavage plane, consistent with Uterine Vascular Malformation (UAVM), with no solid component or necrosis (Figure 3).

Despite the decline in β-hCG levels, the patient continued to experience uterine bleeding; therefore, following a medical consultation, a decision was made to proceed with definitive surgical management. On 11/25/2025, a diagnostic laparoscopy and hysteroscopy were performed, which were converted to an exploratory laparotomy, and a total abdominal hysterectomy with bilateral salpingo-oophorectomy was completed. A uterine vascular mass, severe adhesions, and parametrial congestion were observed, with no intraoperative complications (Figure 4).

Definitive diagnosis

On November 27, 2025, the β-hCG test was negative. The histopathological examination (December 1, 2025) confirmed the presence of degenerated chorionic villi with abundant blood, consistent with an ectopic pregnancy in a cesarean section scar associated with a secondary uterine arteriovenous malformation.

Discussion

Pregnancy on a cesarean scar (CSP) is a rare form of ectopic pregnancy whose incidence has increased in parallel with rising cesarean section rates and the greater availability of high-resolution transvaginal ultrasound. It is currently considered an early manifestation within the pathophysiological continuum of the placenta accreta (PAS) spectrum, due to abnormal trophoblast invasion through the uterine scar defect into the myometrium and the underlying vasculature.

This invasion promotes neoangiogenesis and the development of complex vascular lesions, including what is known as acquired uterine arteriovenous malformation or, more recently, enhanced myometrial vascularity (EMV) associated with persistent trophoblastic tissue[4,8,9].

Our case shares several characteristics with previously published reports. The patient had a history of prior cesarean sections, per-

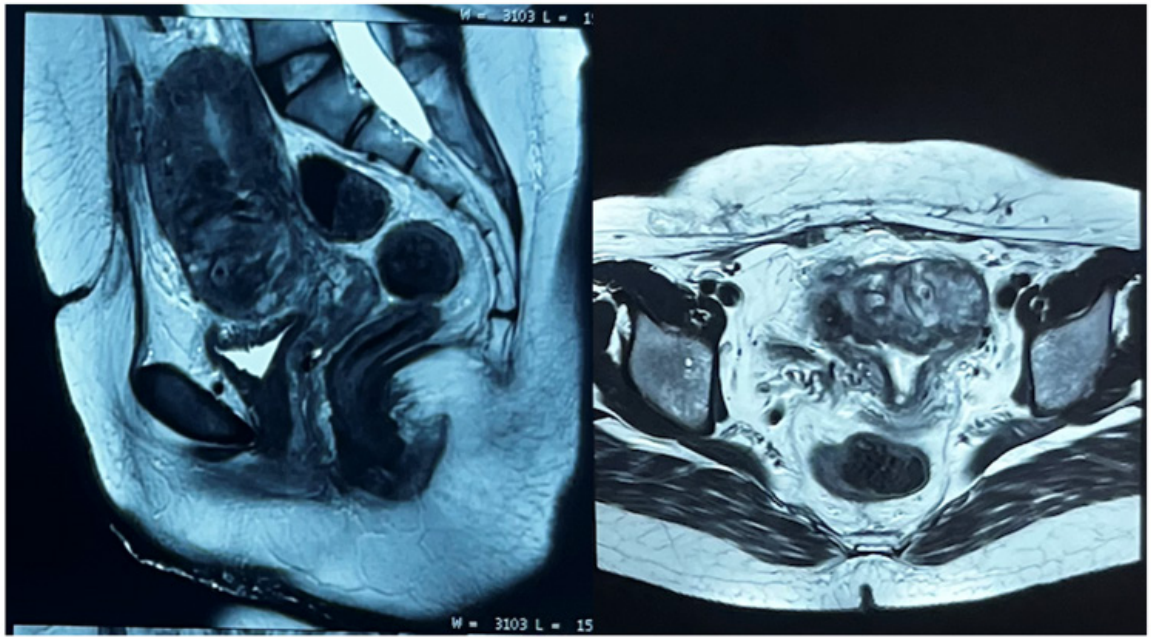

Figure 3: Magnetic resonance imaging of the pelvis (composite image showing sagittal and axial sections) showing an intramyometrial vascular lesion in the uterine wall, consisting of tortuous vessels with autoflow, extending into the endometrial layer; there is no defined cleavage plane or solid component. These findings are consistent with uterine arteriovenous malformations.

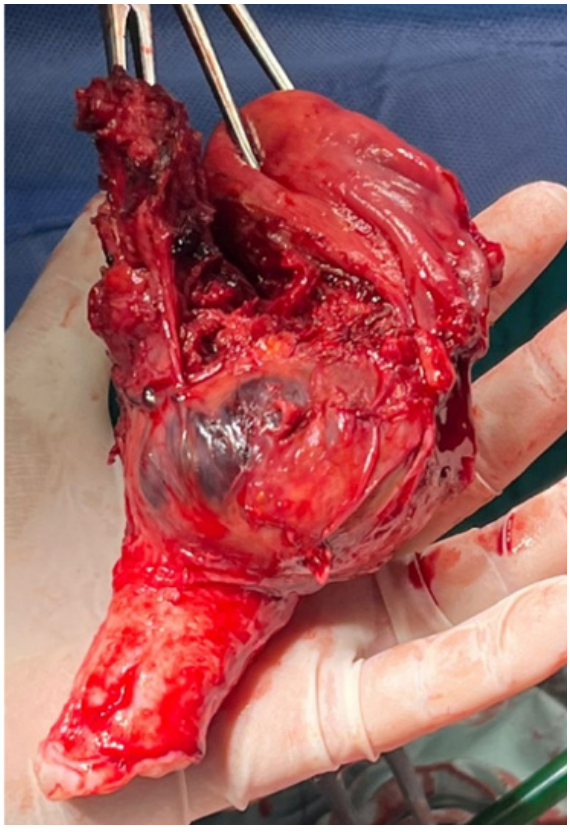

Figure 4: Surgical specimen from a total abdominal hysterectomy, showing involvement of the uterine segment superior to the cesarean section scar, with hemorrhagic tissue and abnormal vascularization—findings consistent with an ectopic pregnancy in a cesarean section scar complicated by a uterine arteriovenous malformation.

sistent uterine bleeding, and an initial misdiagnosis of incomplete abortion, which led to the performance of a uterine curettage. This clinical sequence has been described in multiple reports of UAVM secondary to CSP.

Kim et al. reported a case of acquired UAVM following a pregnancy in a cesarean scar, while Shafqat et al. described a case of UAVM following treatment of a CSP, noting that uterine manipulation during a pregnancy implanted in the scar may promote the development or persistence of a high-flow vascular lesion.

Similarly, Le and Nguyen recently reported a case of uterine pseudoaneurysm following uterine aspiration for CSP, highlighting the risk of potentially life-threatening hemorrhage associated with these lesions[10–12].

From a diagnostic standpoint, transvaginal ultrasound with color Doppler remains the first-line tool recommended by international consensus guidelines. In our patient, ultrasound revealed a highly vascularized, heterogeneous intramyometrial lesion located in the anterior uterine wall at the level of the cesarean section scar, a finding consistent with the criteria described by Jordans et al. for CSP and with the Doppler patterns reported for acquired UAVM. The persistence of a vascular mass associated with detectable levels of β-hCG suggested the presence of residual trophoblastic tissue, a situation also described by Timor-Tritsch et al., who emphasize that many lesions previously termed arteriovenous malformations actually correspond to EMV secondary to persistent products of conception[14].

Unlike other cases where the diagnosis was established solely by Doppler ultrasound, our patient required a multimodal evaluation using CT angiography and magnetic resonance imaging. CT revealed a high-flow vascular lesion with early arterial enhancement and early venous drainage, while MRI showed tortuous intramyometrial vessels without a defined cleavage plane. These findings are consistent with those described by Giurazza et al. and by Le and Nguyen, who note that magnetic resonance imaging and computed tomography angiography are useful for characterizing the anatomical extent of the lesion, defining the differential diagnosis, and planning treatment[12,15].

With regard to biochemical follow-up, our patient showed a progressive decrease in β-hCG levels until they became negative following methotrexate administration. However, uterine bleeding persisted, and imaging continued to show significant vascular involvement. This pattern is consistent with the findings reported by Timor-Tritsch et al. and Dewilde et al., who emphasize that biochemical resolution does not necessarily imply the disappearance of abnormal vascularity. Therefore, therapeutic decisions should be based primarily on clinical and imaging findings and not exclusively on serum β-hCG levels[4,14,16]. Regarding treatment, there is currently no single strategy for vascular lesions associated with CSP. The alternatives described include expectant management in selected cases, medical treatment with methotrexate, uterine artery embolization (UAE), conservative surgical re-

section, and hysterectomy. The Society for Maternal-Fetal Medicine recommends avoiding expectant management due to the high risk of severe hemorrhage.

In most recent reports, uterine artery embolization is the most commonly used conservative treatment, with success rates exceeding 85%. However, its availability is limited in many centers, and it is not always effective for extensive or complex lesions[1,17,18].

Unlike the cases reported by Le and Nguyen or by Jha et al., in which it was possible to preserve the uterus using conservative techniques, our patient required a total abdominal hysterectomy. This decision was based on persistent uterine bleeding, the large size of the vascular lesion, suspicion of extensive myometrial invasion, failure of medical treatment, the presence of severe adhesions, and the patient's lack of desire for future pregnancy. Pathological examination ultimately confirmed the presence of degenerated chorionic villi associated with an acquired uterine arteriovenous malformation, establishing a causal relationship between the CSP and the observed vascular lesion[12,19]. This association is rarely described in the literature, as noted by Ngoc Diep Le[20], who reported a case of arteriovenous malformation following endouterine aspiration for a scar pregnancy.

This case provides additional evidence regarding a rare complication of pregnancy on a cesarean scar and reinforces the importance of considering a diagnosis of CSP in any patient with a history of cesarean section and first-trimester bleeding. It also highlights the value of multimodal evaluation using Doppler ultrasound, computed tomography, and magnetic resonance imaging for the differential diagnosis of uterine vascular lesions, as well as the need to tailor treatment based on clinical stability, reproductive desires, and available resources[1,8,13,21].

Conclusions

Ectopic pregnancy in the cesarean scar is a rare but high-risk condition; delayed diagnosis is associated with serious vascular complications, such as uterine arteriovenous malformation, and with high maternal and perinatal morbidity and mortality. This report demonstrates that inadequate initial management—particularly the performance of invasive uterine procedures based on an erroneous diagnosis—can lead to a slow clinical course that is difficult to resolve.

A return to negative serum β-hCG levels does not guarantee the anatomical or functional resolution of lesions associated with CSP; therefore, follow-up should be based on comprehensive and serial clinical and imaging evaluations. In cases of persistent, extensive, or medically refractory uterine arteriovenous malformation, radical surgical management may be the only effective option for controlling bleeding and preventing potentially life-threatening complications.

This case underscores the importance of early and accurate ultrasound diagnosis, correct differentiation between CSP and ongoing abortion, as well as the implementation of evidence-based therapeutic strategies grounded in the proper classification of CSP and the recommendations of international guidelines. A timely multidisciplinary approach is essential for optimizing maternal outcomes and reducing morbidity and mortality associated with this emerging condition within the spectrum of placental anomalies.

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All authors approved the final version of the manuscript and accept responsibility for all aspects of the work, guaranteeing the integrity and accuracy of the information presented.

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