

EP16.05

Accuracy of ultrasound in the prenatal diagnosis of placenta accreta and increta

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Introduction

Placenta Accreta Spectrum (PAS), including accreta and increta, poses a growing obstetric risk due to its association with severe maternal complications. Ultrasound, as the primary diagnostic tool, offers valuable signs, such as intraplacental lacunae and myometrial thinning, though its accuracy remains variable. This study evaluates the diagnostic performance of ultrasound by comparing prenatal imaging with histopathological results, aiming to identify the most predictive features and improve diagnostic reliability.

Objective

To evaluate the diagnostic accuracy of ultrasonography in predicting invasive placentation among at-risk pregnant women.

Methods

This retrospective study, from January 1, 2016, to December 31, 2021, was conducted on women diagnosed with placenta previa or low-lying placenta involving the anterior uterine wall and associated with PAS as identified by the US. Transabdominal and transvaginal greyscale US was performed on admission and compared to histopathological examination after cesarean hysterectomy.

Results

We compiled 35 cases of placenta accreta/increta, including 28 cases of placenta accreta and 7 cases of placenta increta, corresponding to an average annual incidence of 4.6 and 1.2 cases, respectively. During the study period, a total of 46,204 deliveries and 52,210 pregnancies were recorded. The average frequency of placenta accreta was therefore 0.61‰ per delivery, corresponding to 1 case per 1,639 deliveries, and 0.53‰ per pregnancy, corresponding to 1 case per 1,886 pregnancies. For placenta increta, the average frequency was 0.15‰ per delivery, or 1 case per 6,666 deliveries, and 0.13‰ per pregnancy, or 1 case per 7,692 pregnancies.

Obstetric ultrasound was performed to investigate signs of placental accreta. It was carried out prior to delivery in all 35 patients (100% of cases). The ultrasound findings varied depending on the case (Tables I and II). Specifically:

- Intraplacental lacunae were observed in 27 patients (77.1% of cases). In 22.9% of these cases, the lacunae were numerous, some of which were large and irregular (stage 3). This sign demonstrated a sensitivity of 74.3% and a specificity of 25% (Figure 1).
- Absence or interruption of the hypoechoic interface between the placenta and the myometrium was identified in 14 patients (40% of cases). This sign had a sensitivity of 40% and a specificity of 62.5% (Figures 2 and 3).
- Disruption of the hyperechoic zone at the interface between the uterine serosa and the bladder was observed in 13 patients (37.1% of cases). This sign showed a sensitivity of 85.7% and a specificity of 62.5% (Figure 4).
- Thinning of the myometrium adjacent to the bladder was found in 18 patients (51.4% of cases). This sign had a sensitivity of 42.9% and a specificity of 66.7% (Figure 5).
- Doppler mode was utilized in all patients. The most frequently observed Doppler ultrasound findings were:
 - Visualization of vessels invading the bladder in 2 patients (5.7% of cases), with a sensitivity of 28.6% and a specificity of 33.3% (Figure 6);
 - Flow within the lacunae in 4 patients (11.4% of cases), with a sensitivity of 57.1%;
 - Abnormal vascularization directed toward the bladder in 2 patients (5.7% of cases), with a sensitivity of 28.6% and a specificity of 66.7%;
 - Increased vascularity at the uterus-bladder interface in 6 patients (17.1% of cases), with a sensitivity of 85.7% and a specificity of 33.3%.

Conclusion

Regarding the performance of ultrasound in the prenatal diagnosis of placenta accreta/increta in Group 1, the following findings were observed:

- **Interruption of the hyperechogenic zone** at the interface between the uterine serosa and the bladder, along with **hypervascularization of this interface on Doppler mode**, appeared to be the most sensitive ultrasound signs (85.7%). However, these signs demonstrated **low specificity** (62.5% and 33.3%, respectively).
- **The presence of intraplacental lacunae, the absence or interruption of a hypoechogenic band between the placenta and myometrium, interruption of the hyperechogenic zone** at the uterine serosa–bladder interface, and **thinning of the myometrium adjacent to the bladder** were associated with a **positive predictive value (PPV) ≥ 80%** for accreta, despite their **low diagnostic accuracy**.
- **The combination of multiple ultrasound signs** improves the diagnostic accuracy of prenatal detection of placenta accreta/increta, with **higher predictive value when more than two signs are present**.

Overall, **obstetric ultrasound demonstrates limited performance** in the prenatal diagnosis of placenta accreta/increta.

Table I: Distribution of the Various Ultrasound Features Observed in Patients with Placenta Accreta and Increta

Ultrasound Feature	n	%
Sign 1: Intraplacental Lacunae	27	77.1
• Grade 0 (no lacunae)	1	2.9
• Grade 1	8	22.9
• Grade 2	10	28.6
• Grade 3 (numerous, large, irregular lacunae)	8	22.9
Sign 2: Absence or disruption of the hypoechoic interface between placenta and myometrium	14	40.0
Sign 3: Interruption of the hyperechoic interface between uterine serosa and bladder	13	37.1
Sign 4: Thinning of the myometrium adjacent to the bladder	18	51.4
Sign 5: Doppler-based Vascularization Abnormalities	7	20.0
• Visualization of vessels invading the bladder	2	5.7
• Blood flow within lacunae	4	11.4
• Abnormal vascularization extending toward the bladder	2	5.7
• Hypervascularization of the uterine–bladder interface	6	17.1

Table II : Diagnostic Performance of Ultrasound in the Prenatal Detection of Placenta Accreta/Increta

Ultrasound Signs	Sensitivity (%)	Specificity (%)	Positive Predictive Value (PPV) (%)	Negative Predictive Value (NPV) (%)	Accuracy (%)	AUC
Intraplacental lacunae	25.7	75.0	81.2	18.2	65.1	0.500
Absence or interruption of the hypoechoic zone between placenta and myometrium	60.0	37.5	82.3	19.2	44.2	0.667
Interruption of the hyperechoic interface between uterine serosa and bladder	85.7	37.5	81.2	18.5	41.3	0.429
Thinning of the myometrium adjacent to the bladder	42.9	33.3	94.7	29.1	58.1	0.548
Visualization of vessels invading the bladder	28.6	66.7	50.0	16.6	30.0	0.310
Vascular flow within lacunae	57.1	0.0	57.1	0.0	40.0	0.286
Abnormal vascularization extending toward the bladder	28.6	33.3	66.6	28.6	70.0	0.476
Hypervascularization at the uterus–bladder interface	85.7	66.7	75.0	50.0	70.0	0.595
Combination of multiple signs:						
• ≥ 1 sign	82.9	25.0	82.8	25.0	72.1	0.539
• ≥ 2 signs	74.3	50.0	86.6	30.7	70.0	0.621
• ≥ 3 signs	37.1	62.5	81.2	18.5	42.0	0.498

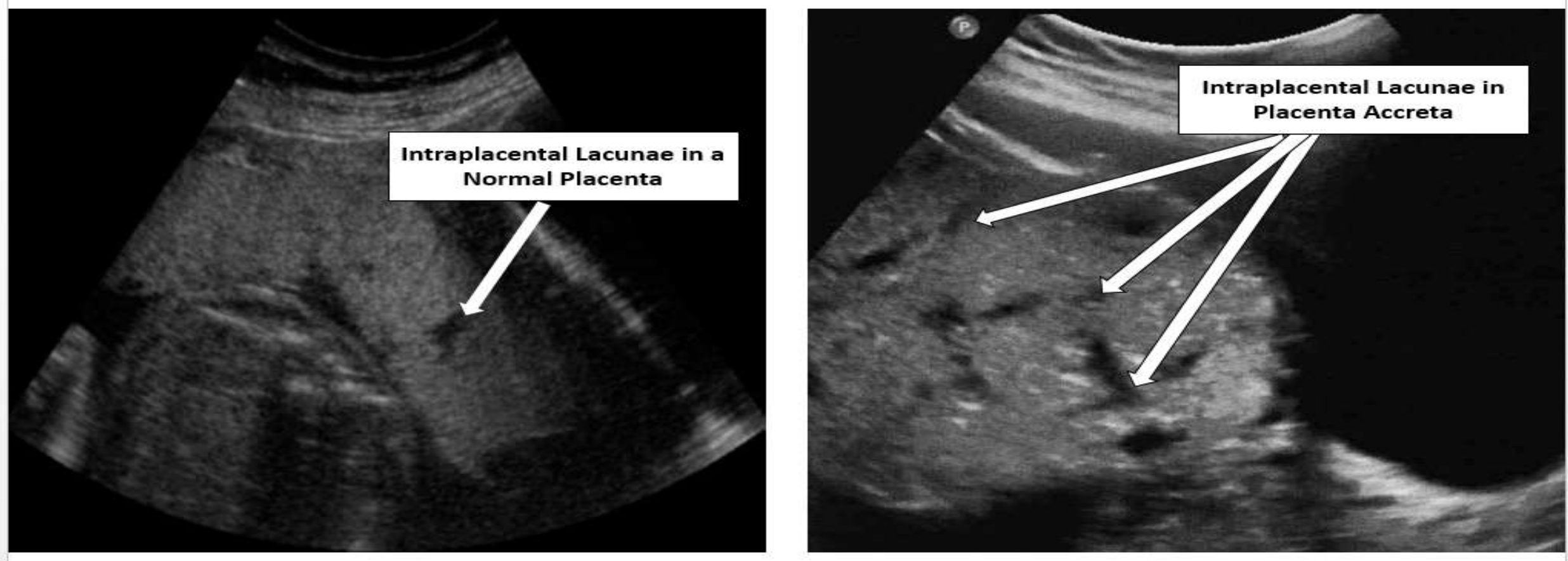


Figure 1 : Transabdominal obstetric ultrasound showing intraplacental lacunae in a normal placenta (left image) and in a case of placenta accreta (right image), characterized by numerous, large, and irregular lacunae.

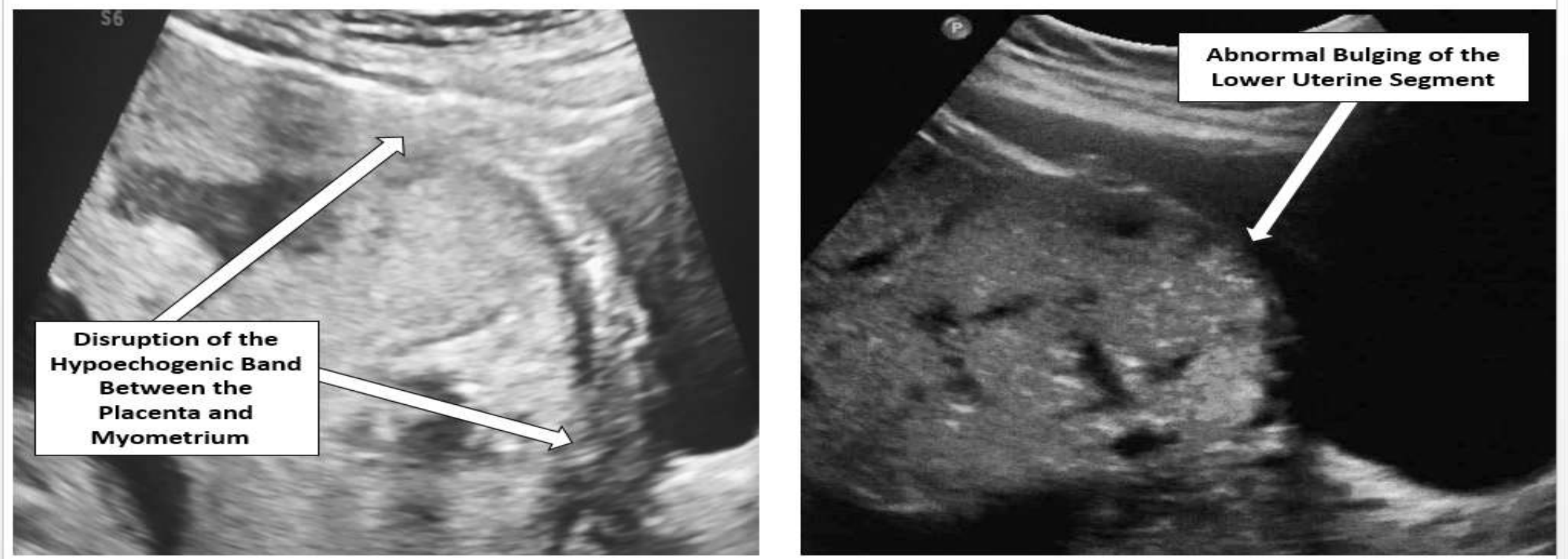


Figure 2 : Transabdominal obstetric ultrasound showing disruption of the hypoechogenic band between the placenta and myometrium (arrows), suggestive of placenta accreta.

Figure 3 : Transabdominal obstetric ultrasound showing abnormal bulging of the lower uterine segment adjacent to the bladder (arrows), suggestive of placenta accreta.

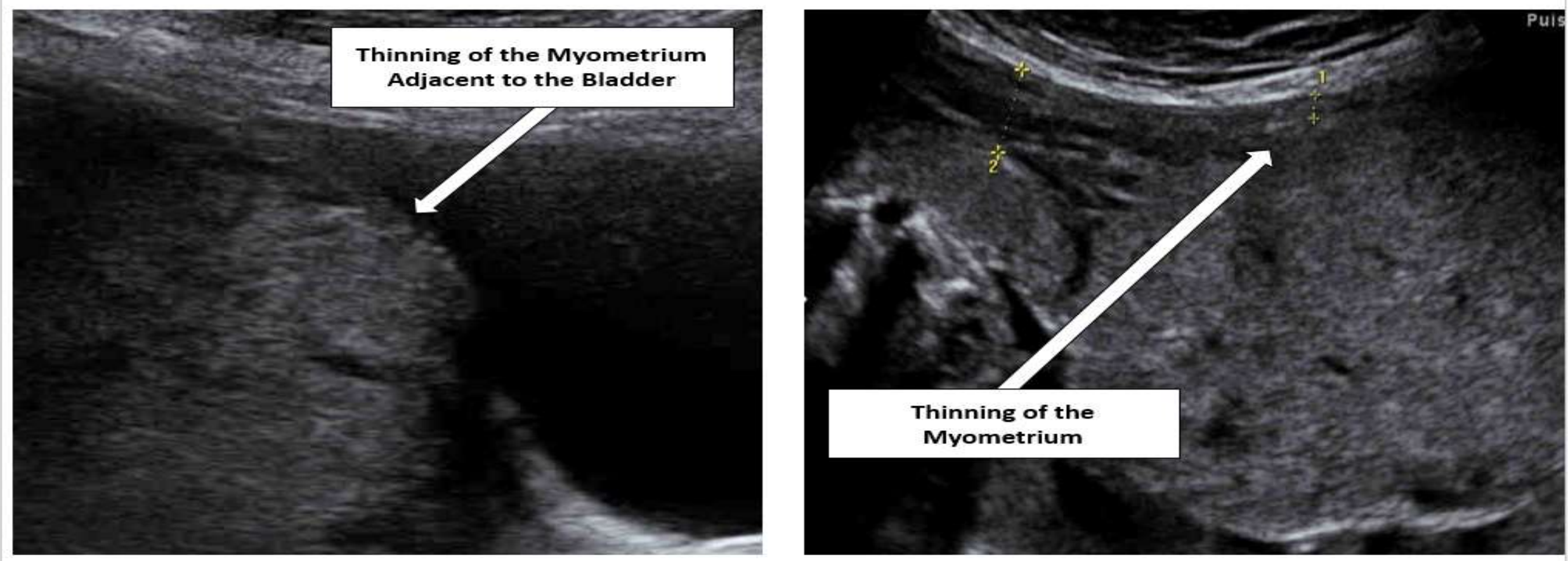


Figure 4 : Transabdominal obstetric ultrasound showing thinning of the myometrium (right image) adjacent to the bladder (left image), suggestive of placenta accreta.

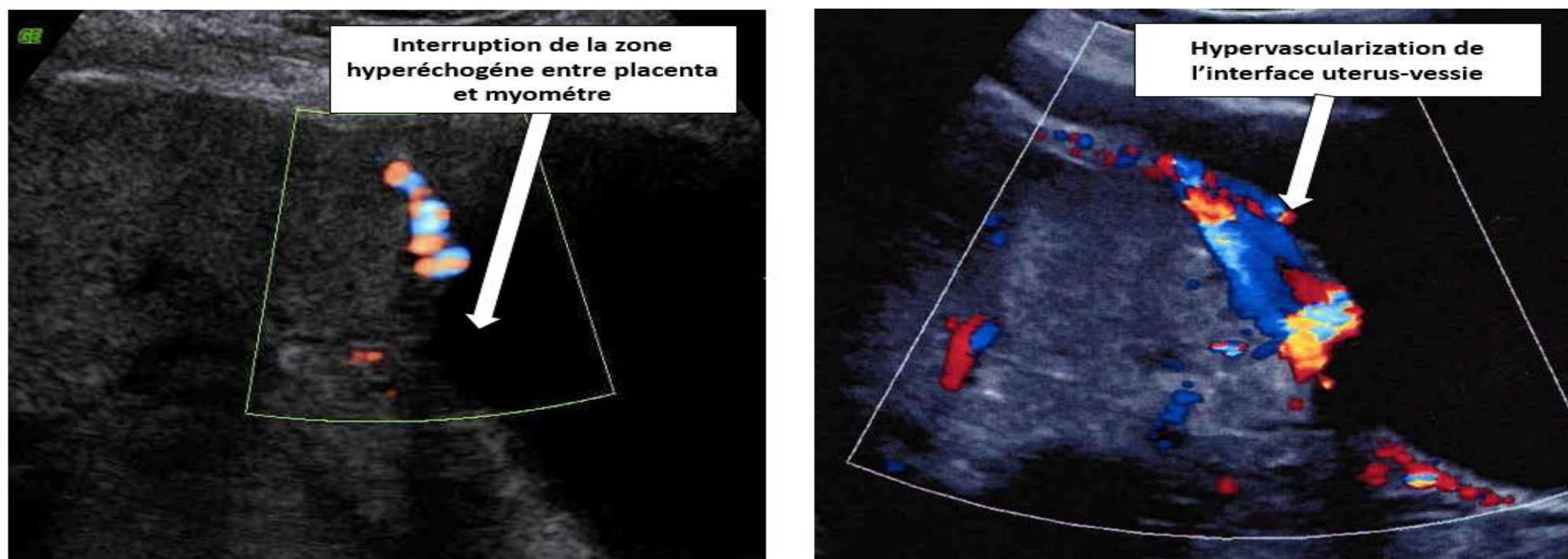


Figure 5: Abdominal obstetric ultrasound demonstrating an interruption of the hyperechoic zone between the placenta and myometrium (arrows), suggestive of placenta accreta.

Figure 6: Abdominal obstetric ultrasound using Doppler mode showing hypervascularization of the uterine-bladder interface (arrows), suggestive of placenta accreta.