Practical Assessment of diagnosis of Placenta Accreta: Radiologist Perspective

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Authors: A. Wilches, G. Palazuelos Jimenez, J. A. Abreu, A. Vasquez, C. Rumie, J. Romero; Bogotá/CO
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Learning objectives

The objectives of this exhibit are:

- To identify the risk factors related to the development of placenta accreta.

- To describe the ultrasound appearance of the normal placenta and remark the main differences with placenta accreta.

- To describe the Magnetic Resonance appearance of the normal placenta and illustrate the morphologic and signal intensity changes in placenta accreta.

- Highlight the importance of an early diagnosis in order to achieve a better outcome for patients.

Background

Placenta accreta (PA) is the abnormal insertion of the placenta, secondary to a defect in the basal decidua, allowing the chorionic villi to invade the myometrium (Figure 1). According to the depth of myometrium invasion, it is divided into: Placenta accreta (surface layer involvement), Placenta increta (myometrium invasion) and Placenta percreta (Serosal Invasion). Placenta accreta occurs in 1: 2500 births with an incidence close to 0.9%.

Risk factors for PA are:

- History of previous cesarean deliveries with direct relationship, as greater number of caesarean sections, greater the risk.

- Placenta previa.

- In Vitro Fertilization.

- Maternal age over 35 years.

- Previous uterine surgery.

PA is an obstetrical problem with high maternal morbidity, in some cases with fatal outcomes due to hemorrhagic shock, injury to the urinary tract and uterine rupture.
The diagnosis is confirmed with the histological findings. However, in some cases the hemorrhage can be controlled without hysterectomy and in this scenario, pathological sample is not obtained.

An early and accurate prenatal diagnosis gives the opportunity to evaluate therapeutic alternatives in order to reduce morbidity and mortality.

The first line of diagnostic evaluation in patients with suspected PA is the grayscale and Doppler transabdominal and transvaginal examination, followed by Magnetic Resonance Imaging (MRI) of pelvis, in cases where the ultrasound is inconclusive or the evaluation of placenta is limited.

**Images for this section:**

![Image of placenta previa with placenta percreta](https://www.myESR.org)

**Fig. 1:** Schematic representation of a placenta previa with placenta percreta. Placental vessels reach the anterior myometrium and invades the posterior bladder wall (circle)

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Findings and procedure details

1. Image findings of Placenta Accreta

1.1 Ultrasound

Ultrasound (US) is essential in the diagnosis of PA due to its low cost and wide accessibility, it also has high sensitivity and specificity, detecting between 50-80% of cases. The US in the 18-20 gestational weeks provides information about the anterior myometrium and the bladder wall in patients of high risk.

In the second trimester the placenta normally is homogeneously echogenic (Figure 2), with some thin septa, surrounded by hypoechoic myometrium. By the third trimester calcifications and venous lakes appear, which may exhibit laminar flow, these findings give the placenta a heterogeneous appearance. The retroplacental line (decidua) is hypoechoic and regular and on the exploration with color Doppler, blood presents parallel flow distribution.

The sonographic features of PA include:

- Placental lacunae extending to the myometrium.

- Loss of normal retroplacental space and reduction or interruption of the hyperechoic interface of the uterine serosa with the bladder wall.

The placenta previa (Figure 3) and placental lacunae with extension to the myometrium are the main findings associated with placenta accreta, loss of the retroplacental space and the reduced thickness of the myometrium has less diagnostic value.

Placental lacunae extending to the myometrium (Figure 4) is the ultrasound finding with higher positive predictive value (PPV) for PA, as greater the number of lacunae, increases the risk of placenta accreta. They correspond to vascular structures within the parenchyma giving it an aspect of "Swiss Cheese". It usually extends from the placenta to the myometrium and differs from vascular lakes by the presence of turbulent flow on color Doppler examination (sensibility 90%, specificity 78%) (Figure 3).

Due to 88% of placenta previa cases are associated to some degree of accretism, an assessment by transvaginal ultrasound with Doppler examination is recommended. In color Doppler examination placental vessels that penetrate the myometrium can be observed, representing the site of invasion (Figure 5). Loss of visualization of the myometrium is identified when it is less than 1 mm thick. Thinning or interruption the hyperechogenic interface of the bladder serosa has low sensitivity of 18% but high
specificity of 100%. The bladder invasion could be presented as bladder wall irregularity with extensive vascularization.

1.2 Magnetic Resonance Imaging (MRI)

MRI could define the uterine and adjacent organs involvement, with a sensitivity range from 77% to 89.6% and a specificity of 92%.

The sequences used in the protocol include Fast Spin-Echo T2WI in coronal, sagittal and axial planes and Fast Imaging Employing Steady State Acquisition (FIESTA - GE®). At least one fast Spin-Echo T1WI is acquired to detect areas of subchorionic hemorrhage.

In the 19 to 23 gestational weeks, normal placenta presents homogeneous signal intensity on T2WI in approximately 85% of cases. In the 24-31 gestational weeks, 90.7% of placentas demonstrate discrete lobulated contours. The degree of lobulation and heterogeneity of the placenta generally increases with gestational age. Low signal thin septa can usually be seen in normal placenta between lobules.

On T2WI the uterine wall often has a trilaminar appearance and can be described as a high intensity vascular layer between two thinner layers of low signal intensity. However, in normal patients the myometrium may also appear thinner under the placenta. A finding that does not represent abnormal placentation.

The specific findings of PA on MRI are:

- Bulging of the uterus.
- Placenta of heterogeneous signal intensity on T2WI.
- Dark and thick intraplacentarian bands on T2-weighted images (Figure 6 - 7).

Irregularity or interruption of the normal low intensity of the bladder wall and nodular contour of the bladder wall may be useful markers determining bladder invasion.

The bulgingout appearance of the placenta is the most useful sign as isolated finding, but it is not clearly defined in the literature.

The change in appearance of “inverted pear” of the lower uterine segment and the new appearance of “hourglass” can be an indicator of PA. A convex contour of the placentarian border can be seen (Figure 8).

Intraplacentarian dark bands on T2WI are thicker than the normal placenta septa and generally extend into the placenta beyond the placenta-myometrium interface (Figure
The presence of a homogeneous placenta virtually excludes the diagnosis of PA. Retroplacental hypointense line absence or disruption represents areas of chorionic villi invasion, however, without other associated signs, is a poor predictor of abnormal placentation.

Comparing the two diagnostic methods, US examination is fundamental in the diagnosis due to its low cost and wide disponibility. US has a sensitivity of 83% and a specificity of 72%. When it is associated with Color Doppler, a sensitivity close to 97% and a specificity of 92% has been reported. The positive predictive value (PPV) of MR is of 100% (65% US), while the negative predictive value (NPV) is greater for ultrasound (98% versus 82%)

MRI should be reserved for cases with equivocal ultrasound findings or to evaluate uterine zones difficult to assess with US, like the posterior aspect of the placenta.

Images for this section:

Fig. 2: Sagital grayscale ultrasound of a woman with a pregnancy of 33 weeks demonstrates anterior and posterior placenta with homogeneous echogenicity, without venous lacunae.

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**Fig. 3:** Sagital grayscale and color Doppler ultrasound demonstrating placenta previa with venous lacunae which presents turbulent flow.

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Fig. 4: Sagittal transvaginal grayscale and color Doppler ultrasound demonstrates posterior placenta previa with venous lacunae demonstrating turbulent flow. It also shows placental vessels in the myometrium.

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**Fig. 5:** Sagital transabdominal grayscale and power Doppler ultrasound demonstrating loss of the space between the bladder and placenta. Power Doppler examination shows placental vessels extending to the bladder wall.

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**Fig. 6:** Sagittal T2WI demonstrates hypointense (dark) bands at the placenta previa (arrows).

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Fig. 7: Axial T2WI demonstrates low signal bands at the placenta previa (arrows).

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Fig. 8: Sagittal T2WI demonstrates corporal anterior, lower insertion placenta with disruption of the hypointense line between the myometrium and placenta (arrow)

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Fig. 9: Sagittal T2WI demonstrating loss of the hypointense retroplacental line (arrows). There is not adequate differentiation of between the placenta and myometrium.

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Fig. 10: Sagital T2WI demonstrates placental tissue with lineal dark structures (placental vessels) in contact with the bladder wall (arrow).

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Conclusion

- Placenta accreta is a rare obstetric problem that could endanger maternal and fetal health. The major risks are massive bleeding and adjacent organs injuries.

- Ultrasonography plays a major role due to its wide accessibility, but sometimes is insufficient. The main sign of placenta accreta found with ultrasound is the presence of venous lacunae extending to the myometrium with turbulent flow on color Doppler examination.

- MRI offers information of the degree of involvement of the myometrium and adjacent structures. Main findings of placenta accreta in magnetic resonance include dark and thick intraplacental bands in T2 sequence, placenta previa and focal uterine bulging.

- The early diagnosis of this pathology is pivotal in reducing risk of maternal hemorrhage and death.

Personal information

A. Wilches, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

G. Palazuelos Jimenez, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

J.A. Abreu, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

A. Vasquez, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

C. Rumie, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

J. Romero, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.
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