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Review Article

MRI of the Placenta Accreta-Review of Two Cases

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Abstract

Placenta Accreta (PA) is a term used to describe various types of abnormal placentation, when chorionic villi attach directly to or invade the myometrium [1]. This is a significant cause of maternal morbidity and mortality being the most common reason for emergent postpartum hysterectomy. Major risk factors for PA are placenta previa and previous caesarean section.

The number of patients with PA is increasing; therefore accurate early prenatal identification of abnormal placentation is of paramount importance for optimal obstetric management.

Although Ultrasound (US) remains the primary diagnostic tool for the diagnosis of abnormal placentation, the role of MRI has been increasing.

The aim of our paper is to present MRI appearance of abnormal placentation based on two cases.

Introduction

Normal anatomy of the placenta and MRI findings

Knowledge of normal anatomy and MRI appearance of the placenta is important for accurate diagnosis.

The placenta has two surfaces - foetal, where the umbilical cord is attached, and maternal. Foetal surface is limited by the chorionic plate and amniotic membrane, while the maternal surface is limited by the basal plate. Chorionic vessels, which are branches of the umbilical vessels containing blood from the embryo, send their branches perpendicularly deep into the placenta and form villi. The maternal spiral arteries, which are branches of the uterine vessels, pierce the basal plate and open into the space surrounding the villi (intervillous space). The placental septi are projections from the basal plate into the intervillous space. Uterine veins drain intervillous space by piercing the basal plate and run to the decidua. Development of the maternal blood supply to the placenta is complete by the end of the first trimester of pregnancy (approximately 12–13 weeks) [2].

This normal anatomy could be also found on MRI.

(1) The placenta returns intermediate signal intensity on T2-weighted images and is usually clearly distinct from the underlying myometrium. Homogeneity of the placenta changes with advancing gestational age. Initially, up to 19-23 weeks, placenta is homogeneous and regular; at 24-31 weeks, it becomes slightly lobulated due to presence of faint septi; and after 36 weeks, placenta has its mature appearance with stratification into lobules [3].

(2) Placental septi are subtle, thin and regular.

(3) Myometrium has triple-layered appearance with the inner and outer layers seen as thin, low T2-weighted signal bands and the middle layer seen as thick intermediate T2-weighted signal with multiple vascular flow voids. Myometrial thickness diminishes as pregnancy advances.

(4) Normal placental vascularity is seen as numerous flow voids under placenta.

(5) Normal gravid uterus is pear-shaped and has a smooth contour [4] (Figure 1).

Placenta Accreta (PA) is a common term describing various types of abnormal placentation, when chorionic villi attach directly to or invade the myometrium [1]. Therefore, PA is classified on the basis of the depth of myometrial invasion into accreta vera, increta and percreta (Figure 2). Major risk factors for PA include the presence of placenta previa and previous caesarean section. The clinical consequence of PA could be massive haemorrhage at the time of placental separation which may lead to serious medical conditions.

Placenta accreta vera is identified when villi are in contact with myometrium, but do not invade it. This is the mildest form of PA. Placenta increta occurs when villi partially invade the myometrium. Placenta percreta is seen when villi penetrate through entire myometrial thickness or beyond the serosa. This is the most severe form of PA [1].

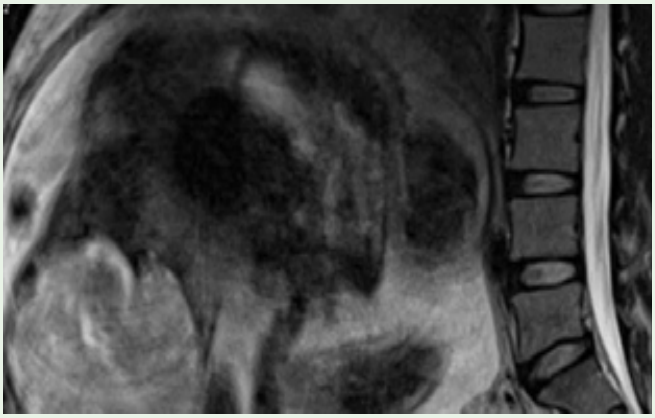

Figure 1: T2-weighted (HASTE) sagittal (A) and coronal (B) MRI of the normal placenta. (A) MRI of 28Y patient with the history of one C-section and suspicion of placenta previa on the US. MRI confirms normal lying placenta (>2 cm from the internal cervical os). The placenta is homogeneous, with thin, subtle placental septi and lies at 44 mm from the internal cervical os (line).

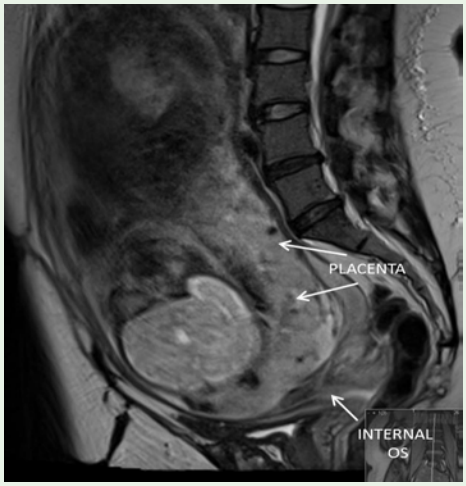

Figure 3: Abnormal position of the placenta- complete previa in 34 Y patient with previous C-section. Heterogeneity of the placenta is also noted.

Normal position of the placenta is confirmed when the lower margin is noted at least 2 cm away from the internal cervical os. Placenta previa is defined as abnormally low position of the placenta- near to or overlying the internal cervical os and is therefore divided into four types:

- low-lying placenta - lower placental margin is within 2 cm from the internal os.

- marginal previa – lower placental margin extends to the internal os, but does not cover it.

- complete previa - placenta completely covers the internal os (Figure 3).

- central previa - midportion of the placenta completely covering the internal os.

There are some features of invasion of the placenta into myometrium, which could be used for diagnosis os PA with good interobserver reliability [4-6]. These are as following:

(1) Dark intraplacental bands on T2-weighted images – appear as low T2w signal intensity linear or nodular areas extending from the placenta-myometrium interface within the placenta. These represent deposits of fibrin and are thicker than normal placental septa and are randomly distributed (Figure 4)

(2) Heterogeneity of the placenta (Figure 3,5). This may correspond to increased placental vascularity or areas of haemorrhage. This appearance is highly suspicious as homogeneous signal intensity can exclude abnormal placentation with high confidence.

(3) Abnormal disorganized placental vascularity- corresponds to tortuous, hypertrophied vessels deep within the placenta. They are located in some areas of dark bands and correspond to areas of signal void on T2 HASTE and high signal on True FISP images.

(4) Uterine bulging or disruption of normal pear-shaped uterus with the fundus being narrower than lower uterine aspect.

(5) Focal interruptions or extension through the myometrium or even invasion of adjacent structures. This is highly specific for placenta increta and percreta.

(6) Tenting of the urinary bladder.

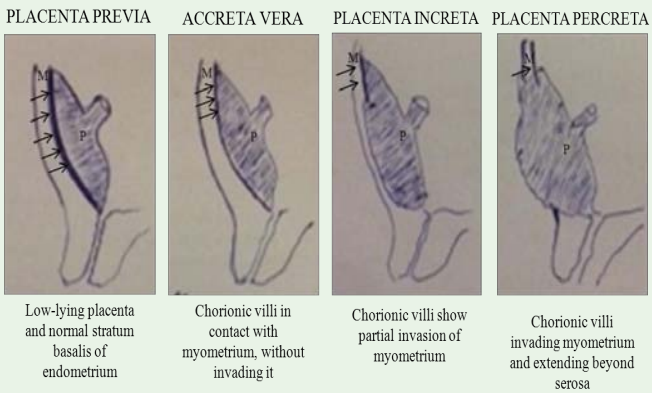

Figure 2: Diagram showing different types of abnormal placentation. M-myometrium, P-placenta, arrows- stratum basalis of the endometrium.

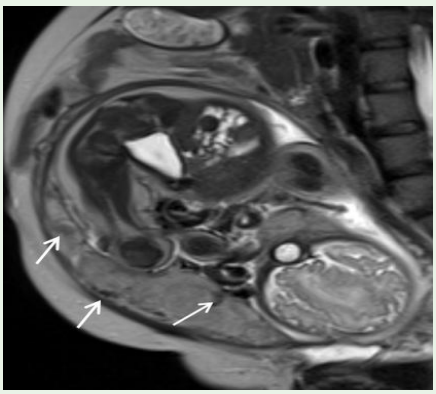

Figure 4: Dark intraplacental bands representing deposits of fibrin, thicker than normal placental septa and show random distribution.

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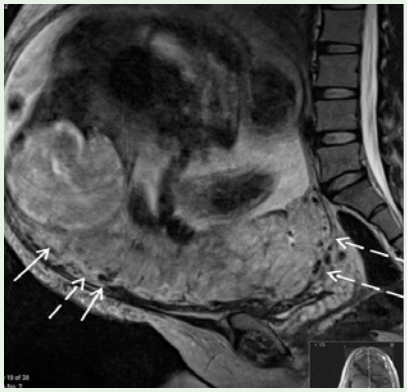

Figure 5: Placenta complete previa is noted. Heterogeneous signal intensity of the placenta, dark intraplacental bands (arrow) and focal interruptions of the myometrium (dash) in 31 Y patient with previous 2 C-sections. The appearances are highly suspicious for placenta increta.

Clinical presentation and imaging findings:

34-years old female with previous C-section had been suffering from vaginal bleeding and was referred for US scan at 33 weeks which showed right lateral position of the placenta completely covering the internal os on the right and a c-section scar. The placenta did not appear to be adherent, as a clear demarcation between the placenta and the anterior uterine wall was identified. The MRI scan showed complete placenta previa (Figure 3) with dark intraplacental bands, hypertrophied and disorganised intra-placental vessels and foci of the heterogeneity within the placenta. Suspicion of placenta accreta was raised. Cesarean section was performed and histology result confirmed the diagnosis of placenta accreta vera.

31-years old patient with previous 2 casearean sections underwent US scan at 22 week of her 3rd pregnancy, which showed placenta located across the internal cervical os. Follow-up US at 37 weeks showed major placenta previa completely covering the os and the myometrium between the bladder and placenta appeared irregular and very vascular. This was likely to be a morbidly adherent placenta. T2-weighted MRI sequences were performed and showed highly heterogeneous placenta involving the inferior wall of the uterus and completely occluding the internal os (Figure 5). Focal interruptions through the myometrium were identified, which raise high suspicion of placenta increta. The patient underwent caesarean section. A hysterectomy was also performed due to complications. Histology report confirmed the presence of placenta previa and features of placenta increta.

Discussion

Prevalence of placenta accreta is approximately 1 in 1000 deliveries, with a reported range from 0.04 to 0.9% [4], and its major predisposing factors are placenta previa and caesarean section. In the United States, its prevalence has risen tenfold in the last 50 years, predominantly due to increased number of caesarean sections [5]. More frequent occurrence of PA is expected to be noted also in the UK - according to NHS statistics, one out of four pregnant patients undergoes C-section [7].

The occurrence of placenta previa is 1 in 200 pregnancies at the time of delivery and it is associated with 3% risk of developing PA. The risk of PA increases with the number of previous caesarean deliveries [8]: in patients with placenta previa 11% with one C-section have PA; 40% with two C-sections, and 61% with three C-sections have PA [9-13].

The clinical consequence of PA is massive haemorrhage at the time of placental separation which may lead to serious medical conditions such as ARDS, DIC or renal failure. Therefore accurate prenatal identification of abnormal placentation is of paramount importance to allow optimal obstetric management.

Although US remains the primary diagnostic tool for the diagnosis of abnormal placentation, there has been increased role of MRI, due to its better tissue differentiation, contrast, more precise information on depth of invasion and depiction of posterior placentas.

Normal US at 18-20 weeks of gestational age do not completely exclude PA in high-risk patients. MRI is generally performed in the later stages of pregnancy and in equivocal US for more precise assessment of the extent of a placenta percreta [14]. The most reliable features of placenta accrete on MRI are: heterogeneity of the placenta; deposits of fibrin which are presented as dark intraplacental bands thicker than normal placental septa; disorganized, tortuous placental vascularity; uterine bulging; tenting of the urinary bladder and focal interruptions within the myometrium. Majority of these features were visualized in our patients. In the second patient, MRI showed the presence of myometrial interruptions, which is consistent with placenta increta, which was also confirmed histological.

Conclusion and Learning Points

- Increasing number of patients with caesarean sections results in higher prevalence of placenta accreta. The clinicians should be aware of that condition and its imaging features. Accurate early identification is paramount for optimal obstetric management.

- Although ultrasound remains the primary diagnostic tool for the diagnosis of abnormal placentation, the role of MRI has been increasing, especially when ultrasound findings are ambiguous. Knowledge of MRI appearances of normal and abnormal placentation is of great importance for accurate diagnosis of placenta accreta.

- The most reliable MRI findings of placenta accreta include: heterogeneity of the placenta, dark intraplacental bands and uterine bulging.

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