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Prenatal diagnosis of placenta accreta and increta in patients with placenta previa using MRI imaging

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Introduction

Placenta accreta and increta represent serious obstetric complications associated with significant maternal morbidity and mortality, particularly in patients with placenta previa . Early and accurate prenatal diagnosis is crucial for optimal peripartum management and surgical planning. While ultrasound remains the primary screening tool, magnetic resonance imaging (MRI) has emerged as a valuable adjunct, particularly in complex or inconclusive cases

Objective

Describe the magnetic resonance imaging (MRI) features of placenta accreta and increta that aid in determining the presence and extent of abnormal placental implantation.

Methods

We conducted a retrospective review of MRI findings, from January 1, 2016, to December 31, 2021, in cases of placenta accreta/increta.The diagnosis of placenta accreta/increta was confirmed based on histological evidence from the examination of hysterectomy specimens.

Results

- In our series, only 12 patients underwent pelvic MRI due to suspected placenta accreta, representing 34.3% of cases.
- This limited use was primarily attributed either to the need for urgent management before the scheduled imaging date or to the lack of health insurance coverage.
- The mean gestational age at the time of MRI was 32.67 ± 1.96 weeks, with a range between 30 and 36 weeks.
- The radiological findings are presented in Table I.
- The three most frequently observed signs were heterogeneous placental signal intensity on T2-weighted imaging (75% of cases), disruption of the myometrial-placental interface (identified by a hypointense rim on T1-weighted imaging) in 58.3% of cases, and the presence of intraplacental dark bands on T2-weighted imaging (58.3% of cases) (Table I).

Table I: Distribution of Patients According to Radiological Findings on MRI

Radiological Signs	Number (n)	Percentage (%)
▪ Sign 1: Abnormal bulging of the lower uterine segment	5	41.7
▪ Sign 2: Heterogeneous placental signal intensity on T2-weighted imaging	9	75.0
▪ Sign 3: Intraplacental dark bands on T2-weighted imaging	7	58.3
▪ Sign 4: Disruption of the myometrial–placental interface (hypointense rim on T1)	7	58.3
▪ Sign 5: Extension of placental tissue into adjacent organs (hypointense on T2)	3	25.0

Conclusion

- In this group of patient (placenta accreta/increta), MRI showed limited performance in the prenatal diagnosis of placenta accreta spectrum (PAS) disorders.
- Indeed, the area under the ROC curve was 0.623, with a minimum combination of two MRI signs required to achieve a sensitivity of 37.1% and a specificity of 87.5%.
- MRI demonstrated limited efficacy in the prenatal diagnosis of placenta accreta and increta.

In these patients, the presence of three or more ultrasound signs (≥ 3 signs) was observed in 7 cases (58.3%). (Table II)

Table II: Distribution of Group 1 Patients According to the Number of Radiological Signs Identified on Placental MRI

Number of MRI Signs Observed	Number (n)	Percentage (%)
▪ 0 signs	3	25.0
▪ 1 sign	0	0.0
▪ 2 signs	2	16.6
▪ ≥ 3 signs	7	58.3
Total	12	100.0

Table III below outlines the diagnostic performance of various ultrasound signs in the prenatal detection of placenta accreta/increta.

Table III: MRI Performance in the Prenatal Diagnosis of Placenta Accreta/Increta

MRI Radiological Signs	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	AUC
Abnormal bulging of the lower uterine segment	41.7	33.3	81.2	18.2	65.1	0.375
Heterogeneous placental signal intensity on T2-weighted imaging	75.0	0.0	82.3	19.2	44.2	0.375
Intraplacental dark bands on T2-weighted imaging (Figure 2)	58.3	33.3	81.2	18.5	41.3	0.458
Disruption of the myometrial–placental interface (hypointense rim on T1-weighted imaging) (Figure 1 and 3))	58.3	0.0	94.7	29.1	58.1	0.292
Extension of placental tissue into adjacent organs (hypointense signal on T2-weighted MRI)	25.0	33.3	28.2	62.4	70.0	0.292
Combination of Signs						
Number of MRI Signs	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	AUC
▪ ≥ 1 sign	8.6	75.0	84.2	25.5	–	0.418
▪ ≥ 2 signs	37.1	87.5	94.2	18.2	–	0.623
▪ ≥ 3 signs	37.1	62.5	68.7	28.6	–	0.498

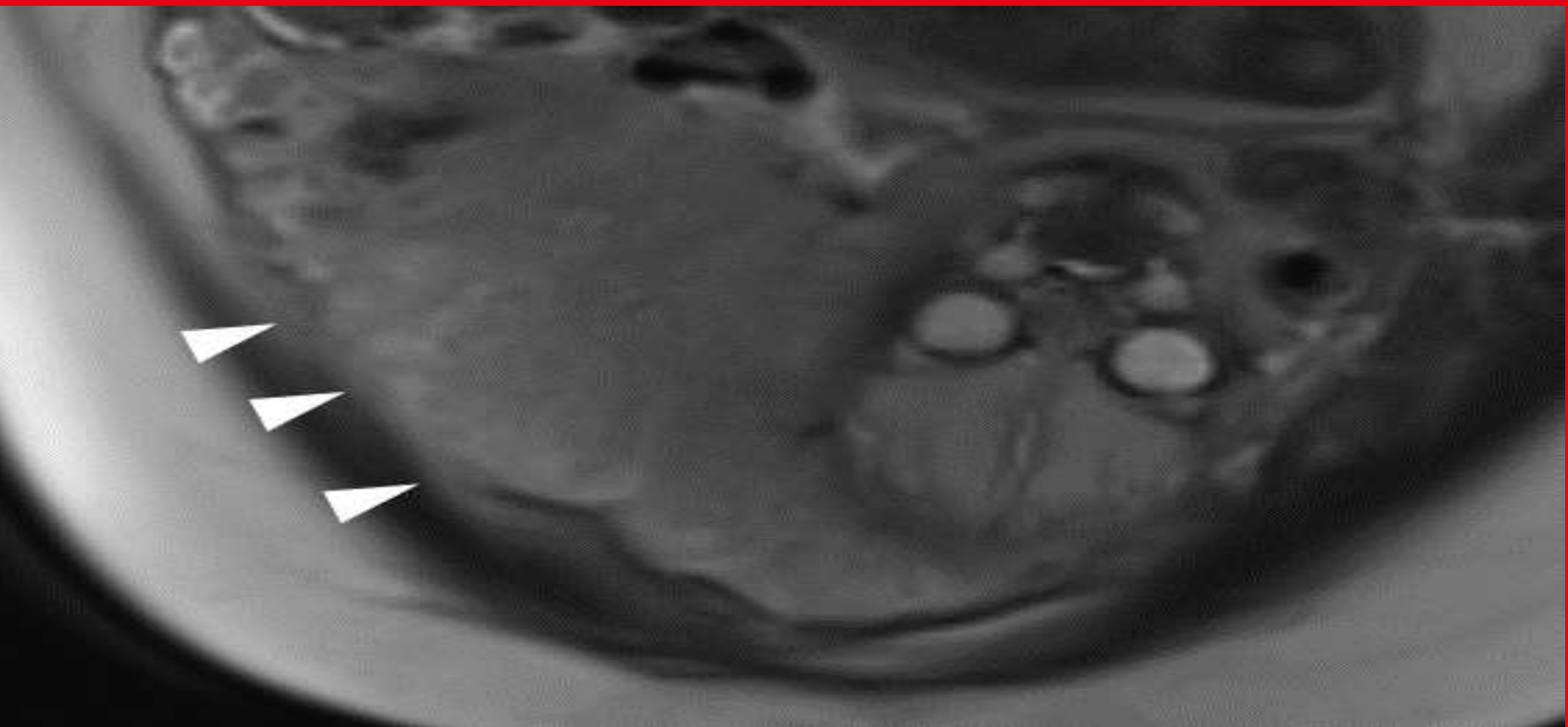


Figure 1 : Sagittal T2-weighted MRI image of the pelvis demonstrating features of placenta accreta. The placenta appears as a heterogeneous, thickened tissue abnormally invading the myometrium. The normal hypointense interface between the placenta and the myometrium is absent. Irregular bulging of the uterine contour can be noted.

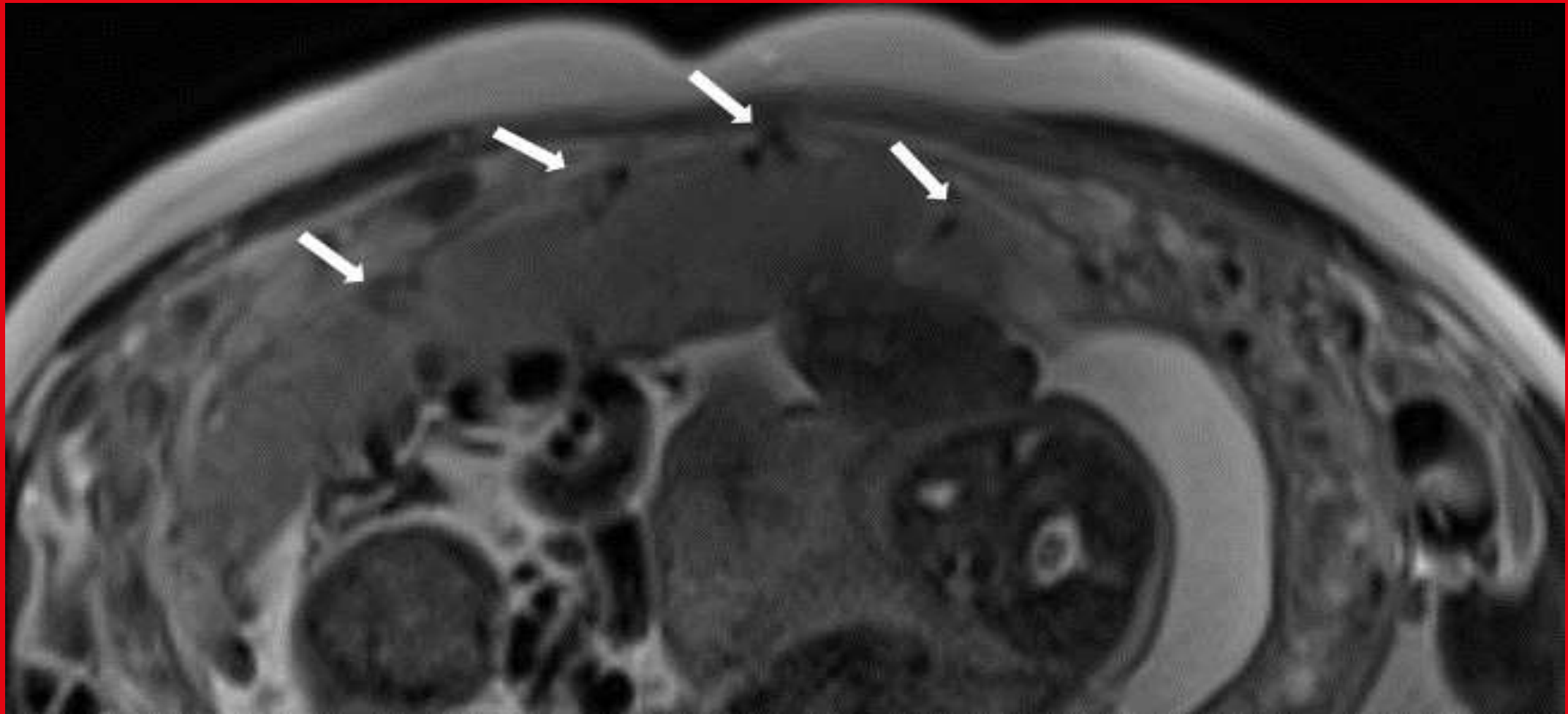


Figure 2 : Axial T2-weighted MRI image showing the placenta with a hypointense intraplacental band (arrows). The band represents areas of fibrin deposition and abnormal placental invasion.

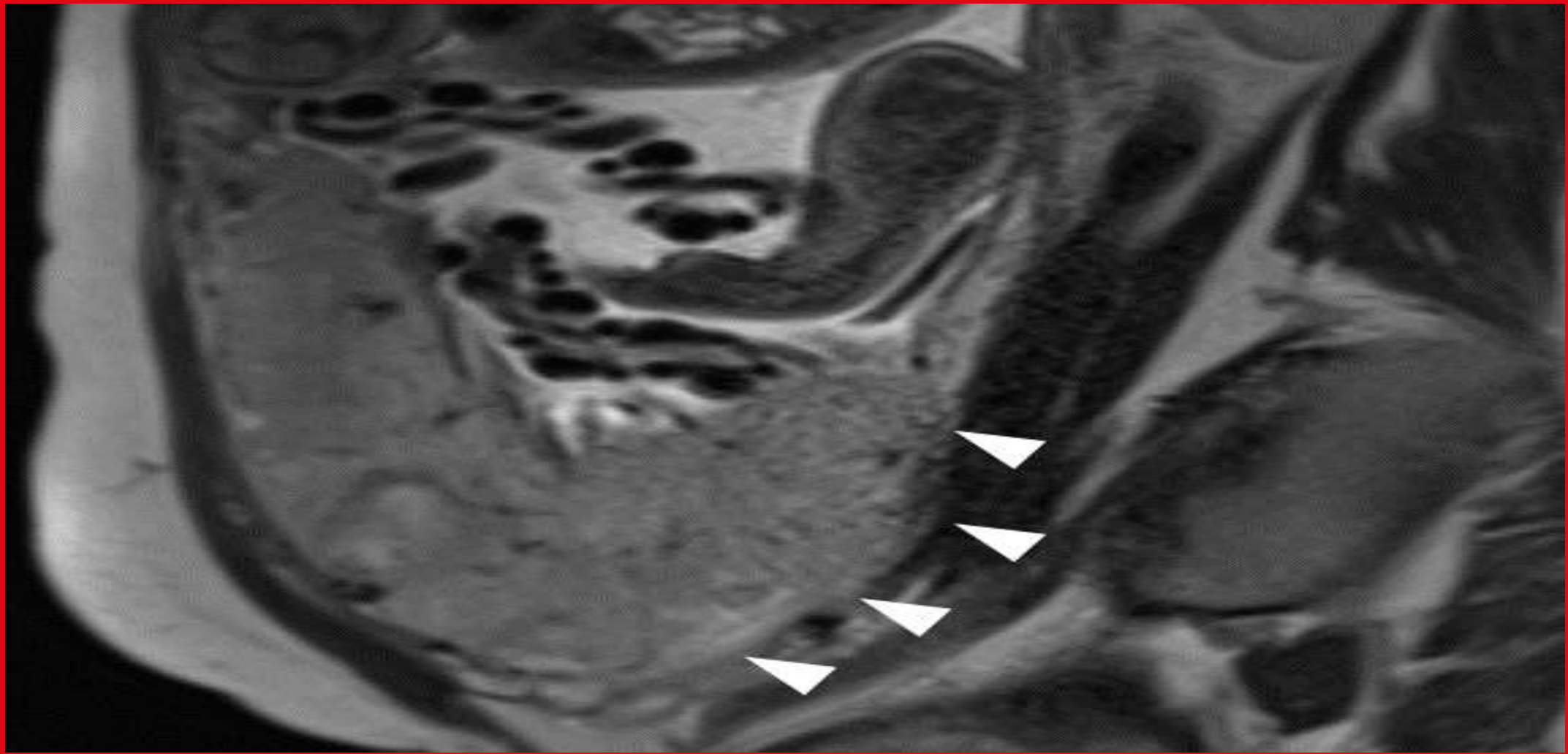


Figure 3 : Sagittal T2-weighted MRI image of the pelvis demonstrating features of placenta increta. The placenta appears heterogeneous with loss of the normal retroplacental hypointense zone and thinning of the myometrium. There is abnormal placental tissue extending toward the uterine serosa (arrowheads), suggestive of invasive placentation.