

Role of MRI findings in the diagnosis and clinical assessment of retained placental tissue

Abstract

OBJECTIVE: To assess the role of MRI as diagnosis in women with retained placental tissue (RPT) and predictors of clinical assessment.

MATERIAL and METHODS: This was a retrospective study of 11 patients with RPT who were pathologically proved. All the women underwent ultrasound first and ordered MRI in order to confirm the objective feature. Seven cases had multiple studies for follow-up. MRI was retrospectively studied size, signal intensity on T1-weighted image, T2-weighted image, enhancing pattern on dynamic study, extend of attachment to the uterine myometrium and thickness of myometrium. Clinical reports were also reviewed and its outcome was compared with MRI findings.

RESULTS: Varied size was found as 30 to 102mm. On T2-weighted images, 10 cases showed high intensity. On T1-weighted images, 7 cases showed relative high intensity. 9 cases were hypervascular. Myometrial thickness of RPT attached region was from 4 to 27mm. The opposite side is thicker from 8 to 30mm. Broad extent of attachment to myometrium was observed in 4 cases. In the remaining 7 cases the attachment was under semicircle. 5 cases delivered without procedure showed RPT attached under semicircle, hence broad attachment resumed made it difficult to detach and may require some additional therapy. After UAE, 2 cases underwent MRI and showed totally infarcted on enhanced T1-weighted images.

CONCLUSION: MRI is useful for diagnosis and follow-up RPT. Contrast enhanced MRI and concerning extend of attachment to the myometrium can help the assessment of retained placental tissue.

Introduction

Retained placental tissue (RPT) is one of the causes of postpartum hemorrhage. Placental disorder is increasing now because intrauterine procedure, for infertility therapy or other reason, push up the risk of placental anomaly (1) (2). The treatment of the RPT now varies as follows; transcervical resection (TCR), intravenous injection of methotrexate (MTX) and uterine arterial embolization (UAE).

Though the usefulness of MR study for diagnosis of RPT has been already emphasized in some papers, the correlation with clinical outcome is not clear (3, 4).

The purpose of this study is to evaluate the role of MR imaging in diagnosing RPT and assessment of treatment.

Materials and Methods

From January 2002 to June 2009, 15 cases performed MRI to evaluate the post-partum hemorrhage at Nara Medical University. The subjects were continuous 11 of 15 cases, proved the placental tissue from their uterine contents histopathologically. The age distribution was 22-38 years old. Clinical outcome was reviewed.

All cases underwent transvaginal or transabdominal ultrasound before MRI, and MR study was performed in order to evaluate the vascularity of RPT objectively and to make differential diagnosis from intrauterine hematoma.

In All patients, pelvic MR imaging was performed on the 1.5-T whole-body MR systems (MAGNETOM Avanto(n=9) or Sonata(n=2), Siemens, Germany). Images were obtained with a phased-array body coil in all cases. Butylscopolamine

(Buscopan, Boehringer Ingelheim, Ingelheim am Rhein, Germany) was administered to reduce bowel peristalsis in all cases. MR sequences included axial and sagittal T2-weighted fast spin echo, axial T1-weighted spin echo and dynamic contrast enhanced study. The details were shown in Table 1. Dynamic contrast study with VIBE was obtained on sagittal plane every 30, 90, 150 second after intravenous administration of 0.1 mmol of gadolinium DTPA (Magnevist, Bayer-Shering, Osaka, Japan).

The size by maximal diameter in one plane, signal intensity on T1-weighted images and T2-weighted images, enhancing degree and pattern were retrospectively analyzed in each study by a well-trained radiologist. Signal intensities on T1- and T2-weighted images were judged high when they are higher than those of the myometrium. Enhancing pattern was divided into two patterns. "Immediate enhancement" was defined as a strong enhancement in early dynamic phase. We defined "gradual enhancement" as increasing and prolonged enhancement. The enhancement degree was also analyzed comparing myometrium as follows: marked, moderate, and poor enhancement.

We focused on myometrial thickness of attached region, comparing with that of opposite side (Figure 1). The extent of attachment of RPT to myometrium was evaluated over or under semicircle.

In this study, though the case is limited, we compared these findings between the patients delivered without any procedures and required surgical procedure.

Follow-up studies performed in 7 cases also analyzed. Two cases underwent MRI after UAE.

RESULTS

In total 11 cases proved the RPT histopathologically, 5 cases delivered RPT without any surgical procedure. Four cases underwent dilation and curettage after UAE and 1 case was performed TCR after MTX injection. The last one case underwent hysterectomy after MTX injection due to uncontrollable intra-uterine infection.

MRI could detect the RPT in the uterine cavity in all cases. The overview of MR features was shown in Table 2. The size was varied from 27x30mm-102x83mm. Signal intensity

on T2-weighted images was high in 10 and was low intensity in 1 case. On T1-weighted images, 7 cases showed high intensity, 1 showed iso intensity, and 3 showed low intensity. Dynamic MRI obtained for 10 cases. Enhancing pattern was gradually in 8 cases of 10, immediately was in the rest 2 cases. The enhancement degree comparing myometrium classified in 9 of 10 cases as marked enhancement(Figure 2). Myometrial thickness of attached region was varied from 4 to 27mm and that of opposite side was from 8 to 30mm. In all cases, the myometrium showed thinner in attached region than opposite side. Extent of attachment to myometrium was over semicircle in 4 of 11 cases, under semicircle in 7. In the 7 cases whose extent of attachment was under semicircle, 2 cases showed partial attachment and polypoid shape.

DISCUSSION

Main causes of maternal death are reported as "obstetric embolism", "postpartum hemorrhage", "placenta previa", and "pregnancy toxemias". In Japan, maternal

mortality rate has declined sharply from 19.5 per 100,000 births in 1960 to 6.5 in 2000, but still severe hemorrhage is sometime uncontrollable and cause of maternal death (5). Up to 1980 uterine atony and rupture were the most common reasons of postpartum hemorrhage, thereafter placental disorders become the most common etiology (6) (2).

RPT can be the cause of such severe hemorrhage in postpartum period. RPT also shows abrupt vaginal bleeding some days after partum intermittently. When intractable postpartum hemorrhage had occurred, emergent hysterectomy or UAE should be performed immediately (1) (7). Otherwise, if the hemorrhage is not so severe and under control by conservative treatment, recent trend is to avoid the excessive hysterectomy (2). The treatment of the RPT now varies as follows; transcervical resection (TCR), intravenous injection of methotrexate (MTX) and uterine arterial embolization (UAE). It is now controversial Though the serum level of β -HCG is a helpful distinguishing factor in the post partum period, it falls to almost normal level in RPT cases. Sonography is the primary modality used for the radiologic evaluation of RPT, but the reported diagnostic accuracy of sonography is variable (8, 9). Though the usefulness of MR study for diagnosis of RPT has been already emphasized in some papers, the correlation with clinical outcome of RPT and its MR feature is not clear.

In our study, MRI could detect RPT correctly in all cases. MRI features of RPT were reported as high intensity on T2-weighted images and low intensity on T1-weighted images (3, 4). In our study, 9 cases showed high intensity on T2-weighted images but one case with severe infectious necrotizing RPT (Figure 3). RPT after UAE also showed low signal intensity on T2-weighted images (Figure 4). This

feature of RPT on T2-weighted images can help the concerning of viability of RPT.

On T1-weighted images, RPT showed variable signal intensity and it presumed due to the amount of coagulation in RPT.

Dynamic MRI showed marked enhancement more than myometrium in most cases, and showed immediate or gradual enhancement. After UAE, the enhancement was significantly decreased. To determine the vascularity is very useful to decide the treatment strategy especially before TCR for it makes possible to predict of intraoperative bleeding. Tanaka et.al reported that seven cases of RPT due to placental accreta did not show delayed enhancement at the attachment to the myometrium and this appearance was presumed to demonstrate lack of decidua basalis. We could not find any relationship between these enhancing patterns and clinical outcome. It is difficult to prove placental increta or accreta histopathologically without hysterectomy. In our study, 5 cases were delivered RPT without any additional procedure so they were presumed as normally attached placental tissue, and the rest 7 cases could be placental accreta in the aspect of its clinical outcome. We observe carefully the delayed enhancement of decidua basalis but could not find any remarkable differentiation between these two groups. As Tanaka et.al had mentioned, the remaining basal layer of the endometrium was too thin and the timing of the dynamic MRI was too slow to express the difference.

Myometrial thickness of the attached region is thinner than opposite side in all cases. This feature may lead to misdiagnosis as myometrial invasion of RPT (placental increta), but it is presumed only due to obstacle of contraction of myometrium by RPT in our experience.

Extent of attachment to myometrium under semicircle was observed in 7 cases. In two of 7 cases that attachment is partial, over 40 days had passed before MR study from the partum. These cases showed typical polypoid enhanced mass, named as "placental polyp" in some papers (10, 11). Though it is controversial subject to classify the placental polyp as the different disease from RPT specifically, this is very characteristic feature of MRI and clinical symptoms with spontaneous vaginal bleeding in delayed postpartum period. Five cases delivered without procedure showed RPT attached under semicircle. One of these 5 cases attached under semicircle, delivered RPT next day without any procedure. This case showed attachment was very limited. This feature can be the indicator to wait self-delivery in earlier postpartum period. Broad attachment (over semicircle) resumed made it difficult to detach and may require some additional therapy.

Our study has limitation on the aspects of relative small amount of cases and retrospective select of patients. We could not clarify the usefulness of MRI comparing sonography but we believe MRI is useful for diagnose and follow-up RPT. Contrast enhanced MRI and concerning attachment to the myometrium can help the assessment of retained placental tissue.

Table 1 MR sequences

MAGNETOM

Avanto (1.5T)

	TR	TE	flip angle	ETL	NEX	Matrix	FOV	slice thickness
T2-weighted								
images FSE	3500	76		7	1	320x320	200	3
T1-weighted								
image SE	519	8.7		2	1	256x256	200	3
Dynamic								
VIBE	4.3	1.29	12			256x179	250	1

MAGNETOM

Sonata (1.5T)

	TR	TE	flip angle	ETL	NEX	Matrix	FOV	slice thickness
T2-weighted								
images FSE	4090	91	160	19	1	224x205	300	5
T1-weighted								
image SE	528	12	70	1	1	512x256	300	5
Dynamic								
VIBE	3.8	1.61	12			224x205	300	3

Table 2 MR findings and clinical outcome

Cas e Nu mbe r	Age	MR after delivery (day)	T1Wi	T2W i	Enhancing pattern	Size (mm)	MY thicknes s of attached site	MY thicknes s of opposite site	Extent of attachmen t	Clinical outcome
1	31	5	high	high	Graduate, marked	63x85	8	24	Under semicircle	Delivered without surgical procedure
		23	high	high	Graduate, marked	54x93	7	14	Under semicircle	
		60	disappe ared							
2	33	0	high	high	Graduate, marked	47x31	23	8	Under semicircle	Delivered without surgical procedure
		18	disappe ared							
3	38	0	high	high	Graduate, marked	61x51	13	26	Over semicircle	D&C after UAE
		7	high	high	Graduate, marked	61x46	6	14	Over semicircle	
4	26	1	high	high	Graduate, marked	51x64	27	30	partial	Delivered without surgical procedure
5	31	40	low	high	Immediate , marked	30x25	6	11	partial	D&C after UAE
6	22	0	iso	high	Graduate, moderate	79x91	6	15	Over semicircle	TCR after MTX

										injection
		8	high	high	Graduate, moderate	59x83	5	22	Over semicircle	
		34 (after MTX)	high	high	Immediate , marked	59x66	2	17	Over semicircle	
7	31	58	high	high	NA	27x30	15	13	partial	Delivered without surgical procedure
8	31	11 (afterUAE)	low	high	Graduate, marked	74x29	4	16	Under semicircle	D&C after UAE
		45	iso	high	Graduate, poor	11x18	9	16	Under semicircle	
		99	disappe ared							
9	33	37 (after MTX)	high	low	Graduate, poor	102x8 3	5	22	Over semicircle	MTX hysterecto my
10	30	7	low	high	Immediate ly, marked	31x33	11	28	Under semicircle	Delivered without surgical procedure
		34	iso	high	Immediate ly, marked	20x17	13	26	Under semicircle	

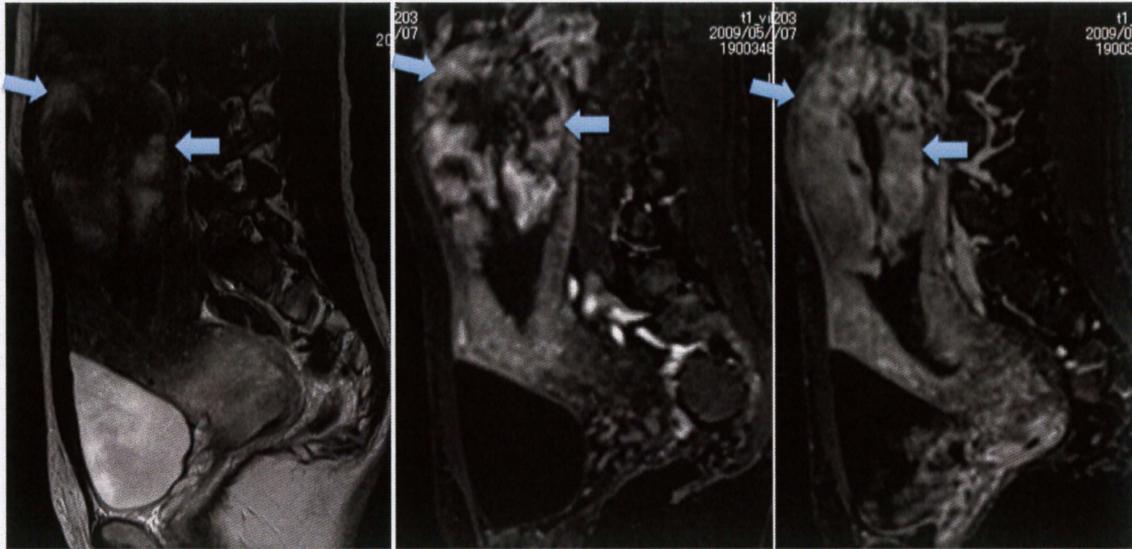
11	31	0	high	high	Gradually, marked	70x11 0	7	20	Over semicircle	D&C after UAE
		24 (afterUAE)	high	low	Gradually, poor	99x61	9	13	Under semicircle	

Figure 1.



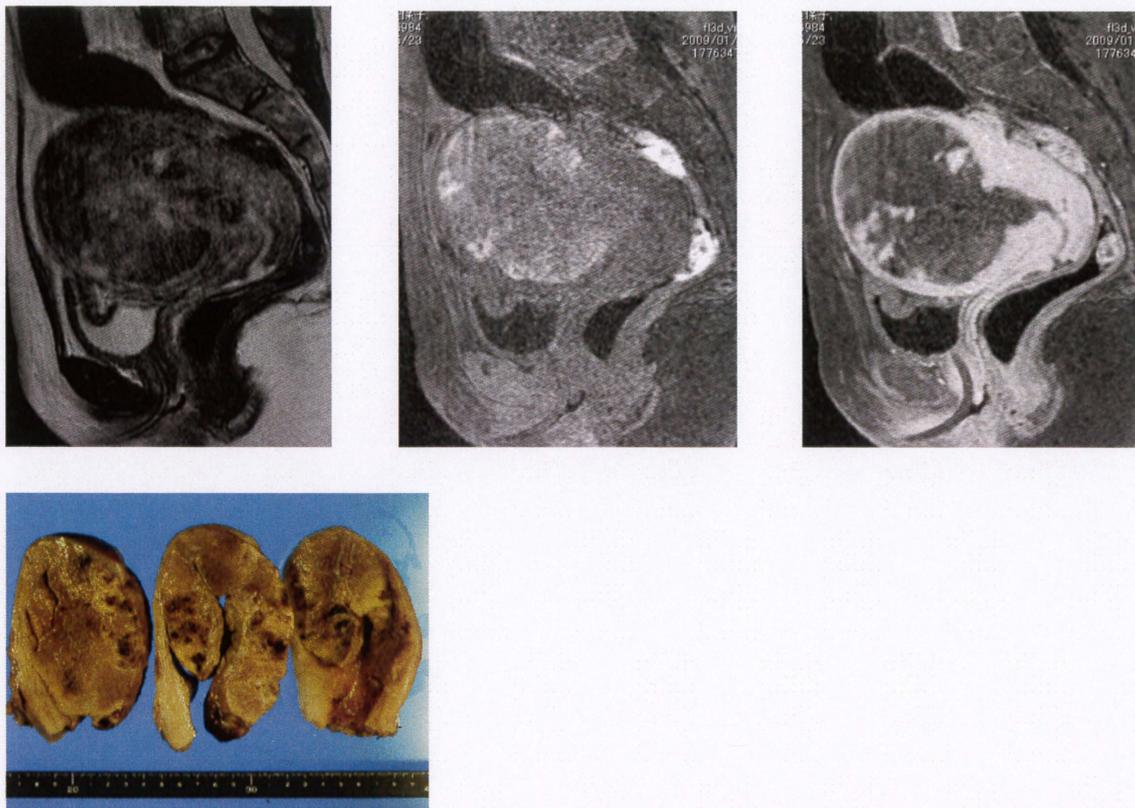
Gd-enhanced T1-weighted image in case 2.
Myometrial thickness was measured the attached lesion and
the opposite side.

Figure 2



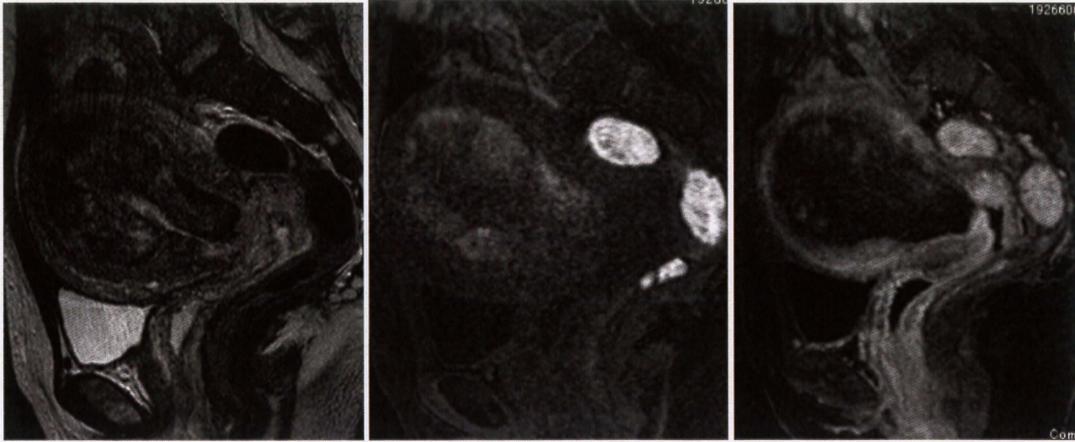
Case 11. A huge RPT showed high intensity on T2Wi was observed. Attached distance was over semicircle to myometrium. Dynamic MRI showed marked enhancement.

Figure 4.



Case 9. She was attended from another hospital due to RPT with infection. MTX had already administrated. RPT showed low intensity on T2WI. The infection was difficult to control, so the gynecologists decided on hysterectomy.

Figure 3.



Case 11 obtained MRI after UAE. RPT showed low intensity on T2Wi and high intensity on T1Wi. No significant enhancement was observed on Gd-T1Wi. This case under went D&C after this MRI. Infarcted RPT was removed safely.

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