

## CASE REPORT

# Early identification of uterine scar defect by preconception magnetic resonance imaging to achieve successful pregnancy outcome after laparoscopic-assisted myomectomy: Two case reports

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**Funding information**

None.

**Abstract**

Myomectomy improves the reproductive ability of women. However, the risk for uterine rupture and abnormal placentation remains a concern. In two cases with scar defects after laparoscopic-assisted myomectomy, one case developed amniocele, while other case showed abnormally invasive placenta. Obstetrical management measures with cesarean sections yielded uneventful postoperative courses.

**KEYWORDS**

laparoscopic-assisted myomectomy, magnetic resonance imaging, myomectomy scar defect, preconception management, pregnancy outcomes

## 1 | INTRODUCTION

Uterine myomas are the most common pelvic tumors in women that can present with various symptoms.<sup>1</sup> When an adverse reproductive outcome is a major issue for women who desire to preserve their uterus and fertility, various types of myomectomy have been demonstrated to significantly improve the reproductive ability of selected infertile women.<sup>1</sup> However, although uncommon,<sup>2</sup> the association between pregnancy after myomectomy and the risk of uterine rupture<sup>3,4</sup> and/or abnormal placentation remains a concern,<sup>5</sup> considering the possible devastating obstetric outcomes for the mother and fetus.

Ultrasonography is the initial modality of choice to assess the integrity of the uterine wall structure after myomectomy.<sup>6-8</sup> Attempts have also been made to evaluate

the uterine structure after myomectomy by magnetic resonance imaging (MRI).<sup>9</sup> However, reports on sequential changes in the uterine structure on MRI before and after myomectomy and in subsequent gestation are limited.<sup>10</sup>

Here, two cases, in which the uterine scar defect after laparoscopic-assisted myomectomy (LAM)<sup>11</sup> was detected before conception by MRI, were presented with outcomes of subsequent pregnancy.

## 2 | CASE REPORTS

### 2.1 | Case 1

A 37-year-old woman (nulligravida) with no previous disease history was referred with a diagnosis of multiple

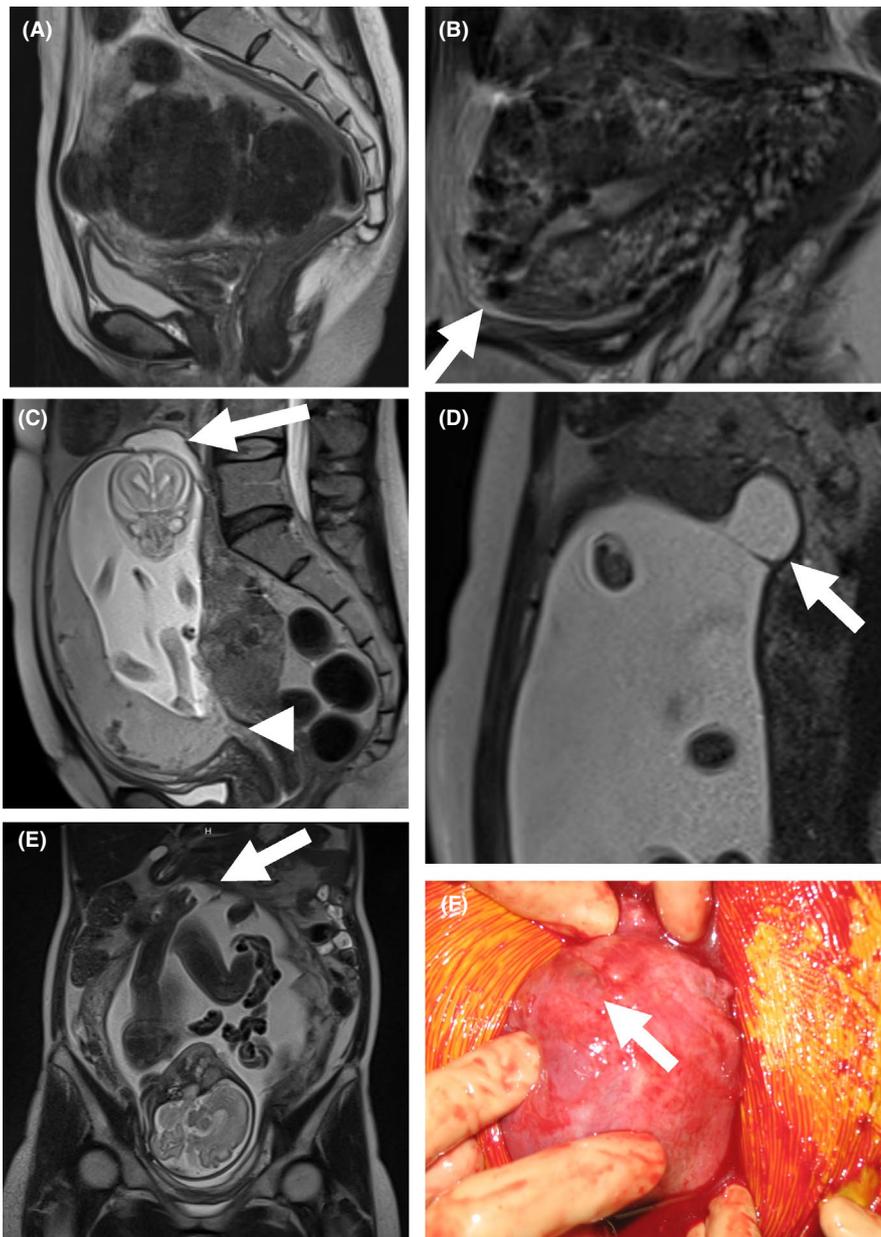
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myomas causing hypermenorrhea. Sagittal T2-weighted MRI at the initial examination showed multiple intramyometrial and subserosal myomas (Figure 1A). After the administration of gonadotropin-releasing hormone agonist twice, LAM was urgently performed due to abrupt uterine bleeding. Fourteen myomas weighing 505 g were excised. The intraoperative blood loss was 1000 ml.

Three months after LAM, sagittal T2-weighted MRI (Figure 1B) showed a myomectomy scar defect (arrow) at the fundal portion. Twenty-four months later, conception was achieved by assisted reproductive technology (ART). At 18 weeks of gestation, sagittal T2-weighted MRI (Figure 1C).<sup>12</sup> showed extreme myomectomy scar thinning with partial dehiscence (arrow) and a low-lying placenta (arrowhead).

Regarding the condition of uterine scar, the potential risk of uterine rupture was deemed high because of this scar defect. Thus, she was admitted for close monitoring and conservatively managed with bed rest. At 24 weeks of gestation, sagittal T2-weighted MRI (Figure 1D) showed the formation of an asymptomatic amniocele (arrow) with an intact uterine serosa. At 31 weeks of gestation, coronal T2-weighted MRI (Figure 1E) showed the right hand of the fetus entering the enlarged amniocele (arrow). At 34 weeks of gestation, elective cesarean section was performed due to strong concerns of uterine rupture. An 1828 g male infant with an Apgar score of 6/10 was delivered. After delivery, thinned myomectomy scar (Figure 1F, arrow) without rupture was detected under direct vision. The postdelivery course of the mother and fetus was uneventful.



**FIGURE 1** A case showing amniocele at the site of scar defect in pregnancy after laparoscopic-assisted myomectomy. (A) Sagittal T2-weighted magnetic resonance imaging (MRI) showed multiple intra-myometrial and subserosal myomas at the initial examination. (B) Sagittal T2-weighted MRI showed myomectomy scar thinning (arrow) at the fundal portion three months after LAM. (C) Sagittal T2-weighted MRI showed extreme myomectomy scar thinning with partial dehiscence (arrow) and low-lying placenta (arrowhead). (D) Sagittal T2-weighted MRI showed the formation of an asymptomatic amniocele (arrow) with an intact uterine serosa at 24 weeks of gestation. (E) Coronal T2-weighted MRI showed that the right hand of the fetus entered the enlarged amniocele at 31 weeks of gestation. (F) A thinned myomectomy scar (arrow) is shown at 34 weeks of gestation, elective cesarean section was performed

## 2.2 | Case 2

A 38-year-old woman (gravida 1 para 0) who had undergone surgery twice for ovarian endometrioma was referred with a diagnosis of multiple myomas causing infertility. At the initial examination, sagittal T2-weighted MRI showed multiple intramyometrial myomas (Figure 2A). After the administration of gonadotropin-releasing hormone agonist twice, LAM<sup>13</sup> was performed. Five myomas weighing a combined total of 287 g were excised with an intraoperative blood loss of 900 ml.

Three months after LAM, sagittal T2-weighted MRI (Figure 2B) showed myomectomy scar defect (arrow) at the fundal portion. Four months later, conception was achieved by ART. At 14 weeks of gestation, sagittal T2-weighted MRI (Figure 1C) showed placenta increta (arrow) at the site of the myomectomy scar defect and placenta previa (arrowhead). The potential risk to uterine integrity during pregnancy was considered high because of the possibility of uterine rupture and abnormal placentation. After referral to the hospital in her hometown, she was admitted due to threatened premature delivery, which was conservatively managed by tocolysis. At 36 weeks of gestation, elective cesarean section was performed due to the strong concern for uterine rupture. A 2972 g female infant with an Apgar score of 7/8 was delivered. In this case, hysterectomy at cesarean section was required because of hemorrhaging due to the morbidly adherent placenta. The postdelivery course of the mother and fetus was uneventful.

## 3 | DISCUSSION

Myomectomy is believed to increase the rate of successful subsequent gestation by providing potential benefits in cases with spontaneous pregnancy and those of conception by ART.<sup>1</sup> The mechanisms that possibly underlie the improvement of fertility after myomectomy include reduced uterine contractility, restoration of the normal uterine anatomy, and suppression of local inflammatory response.<sup>14</sup> Thus, the benefit of myomectomy in women who desire fertility depends on the location of the myoma. Consequently, intramural myoma, which distorts the shape of the uterine cavity, could be the most frequent target for preconception myomectomy.<sup>11</sup>

On the other hand, when an intramural myoma close to the endometrial cavity would be excised, the damage caused to the endometrium and the myometrium can be a significant concern<sup>8</sup> because any surgery that damages or transects the endometrium can potentially cause uterine rupture and/or abnormal placentation in subsequent gestation.<sup>10</sup>

The healing of the myomectomy scar depends on the integrity of the surgically created and repaired uterine scar, in addition to the extent of the uterine damage resulting from the use of a power device such as unipolar electrocautery.<sup>15</sup> During the healing of the myomectomy scar, the thickness of the uterine scar progressively decreases, and, by the third postoperative month, blood flow and uterine volume significantly decrease, as previously shown on ultrasonography<sup>6,7</sup> and dynamic contrast-enhanced MRI.<sup>9</sup>

Unless adequate healing of the myomectomy scar occurs, dehiscence—defined as the thinning or separation of a prior uterine scar—may develop.<sup>15</sup> Although myomectomy scar thinning itself is assumed to be harmless when a woman is not pregnant, caution should be paid to avoid uterine rupture due to the worsening of scar dehiscence, which is induced by the enlargement of gestational products after conception is achieved.<sup>10,15-20</sup>

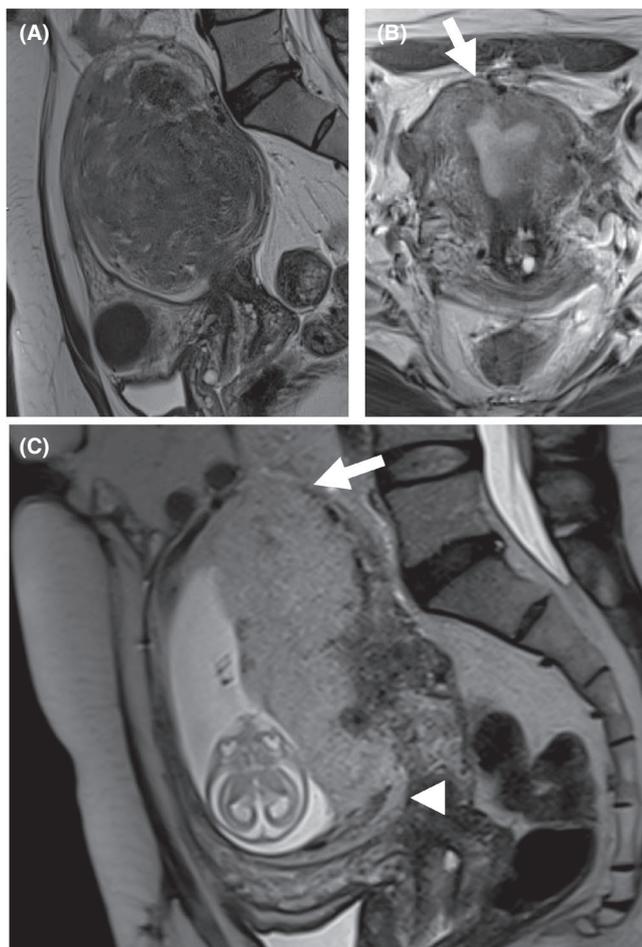
Another concern is the development of abnormally invasive placenta at the site of the myomectomy scar defect because this may cause deep placental penetration toward the serosa as pregnancy progresses.<sup>2,5</sup> Thus, although the identification of a myomectomy scar defect before conception may be important for avoiding subsequent catastrophic outcomes due to uterine rupture and/or abnormal placentation, early detection might be difficult.<sup>10,16</sup>

In this study, uterine wall integrity was assessed early to identify the high-risk cases by preconception MRI at 3 months after LAM, when the healing of the myomectomy scar is generally assumed to have been completed.<sup>9</sup> At this time point, myomectomy scar defects were identified in current two cases. In these cases, it should be noted that the scar defect occurred in the fundal portion of the uterus, where the thickness of the muscular layer becomes thinner laterally toward the interstitial portion.

When myomectomy scar defect is identified in women with a desire for future fertility, surgical repair of the thinned scar before pregnancy could be an option.<sup>6,17</sup> However, in two cases in this study, observational management was chosen instead of surgical repair because the prognosis of pregnancy after myomectomy scar repair was unclear.

After successful conception by ART, each of these two cases developed a potentially serious morbidity. MRI evaluation in the early second trimester revealed a worsening of scar dehiscence in one case (Figure 1C), which subsequently resulted in the formation of an amniocele (Figure 1D). In the other case, placenta increta occurred at the site of the thinned myomectomy scar (Figure 2C).

Amniocele, also known as uterine sacculation, is a very rare condition that occurs during pregnancy where a portion of the uterine wall bulges and forms a sac-like



**FIGURE 2** A case showing placenta increta at the site of scar defect in pregnancy after laparoscopic-assisted myomectomy. (A) Sagittal T2-weighted magnetic resonance imaging (MRI) showed multiple intra-myometrial myomas at the initial examination. (B) Sagittal T2-weighted MRI showing myomectomy scar thinning (arrow) at the fundal portion, three months after LAM. (C) Sagittal T2-weighted MRI showing placenta increta (arrowhead) at the site of the thinned myomectomy scar and placenta previa (arrowhead) at 14 weeks of gestation

structure as a result of mechanical or functional weakening of the scar after uterine surgery, including myomectomy. Then, amnion, amniotic fluid, and parts of the fetus may eventually prolapse.<sup>16–18</sup>

Reports are limited on the development of amniocele as a result of uterine wall dehiscence after myomectomy when pregnancy continues into the third trimester.<sup>17–19</sup> The development of an amniocele may be a risk factor for subsequent complete uterine rupture, which may lead to acute complications that threaten the life of the mother and the fetus. However, determining whether a case should be managed expectantly or surgically can be difficult. Management includes repair of the uterine wall<sup>20</sup> or termination of the pregnancy, especially

when an amniocele is identified in the early second trimester.<sup>17</sup>

The current two cases demonstrate that MRI plays a central role in defining the etiology of a uterine abnormality to ascertain the extent of an identified defect because it achieves superior resolution of soft tissue compared with ultrasonography. Furthermore, MRI was sequentially employed in selected cases as an additional imaging study to assess the integrity of the uterine wall because this technique is less susceptible to artifacts from adjacent bowel gas compared with ultrasonography.

The demonstration of an intact uterine serosa on MRI can exclude the presence of a full-thickness uterine rupture and dehiscence in the early second trimester of pregnancy. As the patient is entirely asymptomatic at this stage, conservative management of the pregnancy in order to achieve fetal maturation after admission for long-term bed rest and close monitoring may be a feasible option.<sup>19</sup>

This approach would not be clearly without risk because the possibility for conversion to a full-thickness rupture is always present. However, the visualization of the complete circumference of the uterine fascia, a relatively large (albeit thin) basal fundus defect, and the absence of transmural defects on MRI are important factors in deferring delivery.

After entering the third trimester of pregnancy, fetal viability was assessed by fetal heart rate monitoring. Although scar dehiscence worsened to some degree with the progress of gestation, favorable maternal and fetal outcomes were achieved by performing cesarean section at 34 weeks of gestation, before the onset of labor,<sup>4</sup> which avoided complete uterine rupture.

Placenta accreta occurs when the anchoring villi are allowed to penetrate into the myometrium through an endometrial defect.<sup>5</sup> When the trophoblastic tissue invades deeper within the myometrium, placenta increta occurs. Similarly, when the trophoblastic tissue invades through the serosal surface of the uterus, placenta percreta occurs.<sup>5</sup>

Prior uterine surgery, such as myomectomy, may cause endometrial damage associated with the development of decidual defects when pregnancy is achieved.<sup>5</sup> Thus, the increase in the rate of pregnancy after myomectomy could be attributed to the increase in abnormally invasive placenta.

In this study, placenta increta at the site of the myomectomy scar was the most serious sequela of the close relationship between abnormal placentation and previous myomectomy, as observed in case 2. However, the early detection of myomectomy scar defects before conception

by MRI provided a useful clue for the detection of abnormal placentation in the early second trimester. Thus, the patient and her family could be appropriately cautioned, and successful maternal and fetal outcomes were eventually achieved, despite the need for cesarean hysterectomy.

## 4 | CONCLUSIONS

The early evaluation of the myomectomy scar by pre-conception MRI can provide significant information that is useful in achieving successful pregnancy outcomes in women who wish to conceive after LAM. Myometrial scar defects are potential high-risk findings that can subsequently cause significant obstetrical morbidities including amniocele and abnormally invasive placenta. Especially for women with myometrial scar defects detected during preconception MRI, postconception MRI in the early second trimester should be conducted to detect obstetrical morbidities, such as scar dehiscence and/or abnormally invasive placenta, for further careful obstetrical management.

## ACKNOWLEDGEMENT

No acknowledgments to be made.

## CONFLICT OF INTEREST

The authors report no conflict of interest.

## AUTHOR CONTRIBUTIONS

Akihiro Takeda contributed to project development, data collection, management, data analysis, and manuscript writing. Mayu Shibata and Wataru Koike contributed to data collection, management, and data analysis.

## ETHICAL APPROVAL

All procedures performed were in accordance with the ethical standards. The examination was made in accordance with the approved principles.

## CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

## DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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**How to cite this article:** Takeda A, Shibata M, Koike W. Early identification of uterine scar defect by preconception magnetic resonance imaging to achieve successful pregnancy outcome after laparoscopic-assisted myomectomy: Two case reports. *Clin Case Rep.* 2022;10:e05441. doi:[10.1002/ccr3.5441](https://doi.org/10.1002/ccr3.5441)