Laparoscopic myomectomy (LSM) is a minimally invasive procedure; it is often requested by patients because of its minimal invasiveness. This procedure has, therefore, been widely performed in recent years. However, there is a need for more reports from the obstetric field to determine the effects of this procedure on subsequent pregnancies. In this regard, we searched Japanese medical literature databases for articles on Japanese cases of uterine rupture, placenta increta, or placenta percreta in pregnancy following myomectomy. This review article aims to analyze the retrieved data to clarify the issues involved and to provide useful feedback to gynecologists by sharing information with them on such issues.

There were 32 cases with available detailed data between 2000 and 2017. There were 7 cases of uterine rupture in pregnancy following laparotomic myomectomy (LTM), comprising 1 full-term case (14.3%), 5 preterm cases (71.4%), and 1 case at 16 gestational weeks (abortion period, less than 22 gestational weeks) (14.3%). On the other hand, there were 25 cases of uterine rupture in pregnancy following LSM, comprising 2 full term cases (8.0%), 18 preterm cases (72.0%), and 5 abortion cases (at 7, 10, 16, 19, and 21 gestational weeks) (20.0%). There was no distinct difference between the frequencies of uterine rupture following LTM and LSM in relation to the abortion period or the preterm period. Cases of uterine rupture following LSM included 3 cases who had undergone subserous myomectomy in which electrocauterization alone was used for resection and hemostasis. In 4 cases, the submucosal myoma had been enucleated, with exposure of the endometrium.

Placenta accreta spectrum disorders occurred in the scar region in the following cases: placenta accreta, 7 cases; placenta increta, 3 cases; and placenta percreta, 12 cases. Three cases were described as having myometrial laceration or separation or incomplete uterine rupture. There were 5 cases of complete uterine rupture (at 16, 18, 18, 22, and 37 gestational weeks) accompanied by intraabdominal hemorrhage. In the other 20 cases, incomplete uterine rupture was diagnosed at the time of cesarean section. Simple total hysterectomy or Poro’s operation was performed in 11 cases during surgery.

In comparison with uterine rupture in pregnancy following cesarean section, uterine rupture in pregnancy following myomectomy often occurs at an earlier stage, and thus requires caution. Pregnancies and deliveries after myomectomy carry the risks of uterine rupture and the development of placenta accreta spectrum disorders. Precautions in the management strategies for such pregnancies and deliveries, as well as the gist of the feedback given to gynecologists, are discussed herein.

Introduction

Laparoscopic myomectomy (LSM) is a minimally invasive procedure; it is often requested by patients and has therefore been widely performed in recent years. However, the number of cases studied is not sufficient to determine its effect on subsequent pregnancies. Further reports from the obstetric field are therefore needed. In the
past few years in Japan, complications including uterine rupture and placenta accreta spectrum, encompassing placenta accreta, placenta increta, and placenta percreta, have been reported in some pregnancies following LSM or reduction surgery for adenomyosis.\(^1\)\(^-\)\(^4\) There are examples of medical lawsuits in which obstetricians were sued for uterine ruptures that occurred during pregnancies or deliveries following uterine myomectomy performed by gynecologists. According to the seventh report from the Recurrence Prevention Committee of the Japan Obstetric Compensation System, 30 among a total of 1,191 analyzed cerebral palsy cases were attributed to uterine rupture. Among relevant single obstetric factors causing cerebral palsy, uterine rupture is ranked as the fourth leading cause after placental abruption, umbilical cord compression, and infection. Preventive measures against uterine rupture are thus also essential to improving infant outcomes.\(^5\)\(^,\)\(^6\)

Suturing and ligation are generally more difficult during laparoscopic surgery than during laparotomy. Therefore, in laparoscopic surgery, incision, hemostasis, and ligation are frequently carried out with powered surgical devices. These devices allow surgeons to simultaneously achieve resection, hemostasis, and adhesion of tissue through thermal denaturation, coagulation, and necrosis. Because surgery can proceed without suturing, these devices also contribute to reducing operative time. However, if thermal denaturation and necrosis affect the surrounding tissues, unexpected complications, such as weakening of tissues, formation of dead spaces, and thinning of the muscle layer, may occur.\(^7\)\(^-\)\(^10\) These complications may adversely impact subsequent pregnancies. Surgeons often receive feedback regarding the short-term outcomes and complications of surgery. In contrast, they rarely receive feedback about the long-term outcomes and complications, because attending physicians often change and move to other hospitals. For these reasons, long-term outcomes and complications are generally not incorporated into training and education programs.

The long-term outcomes and complications of uterine myomectomy performed by gynecologists can only be assessed and determined based on preservation of fertility and a favorable course of pregnancy and delivery. Because the course of pregnancy and delivery is mainly managed by obstetricians rather than the gynecologists who performed the original surgery, patients hold obstetricians responsible for the outcomes of pregnancy and delivery. Conflicts often arise between obstetricians and pregnant women over delivery modes, due to gynecologists having previously told patients, without evidence, that a vaginal delivery can be expected without problems in a subsequent pregnancy. Therefore, whether previous surgery performed by surgeons is successful should be determined based on the outcomes of subsequent pregnancy and delivery. Providing the original surgeon with this feedback is often difficult because the surgery was performed at a different hospital or the obstetrician does not know who performed the surgery.

Thus, it seems important for obstetricians to accumulate and analyze outcomes of pregnancies and deliveries to identify the problems associated with uterine myomectomy. Providing feedback to gynecologists regarding these issues is also essential for improving their skills.

We searched for abstracts and articles included in Japanese conferences on complications reported in women who became pregnant and delivered infants after uterine myomectomy, particularly uterine rupture, placenta increta at the myomectomy scar, and placenta percreta. We aimed to analyze the cases identified in our literature search as well as our own treated cases, to report the results of our analyses, and to discuss the pathogenesis of associated complications. We hope that gynecologists will use the feedback available based on the results of this study to re-evaluate the indications for myomectomy as a means of achieving fertility preservation, to identify precautions for surgical procedures and maneuvers as well as areas needing improvement, and to thereby develop better teaching methods and technical training programs.

**Literature review on uterine rupture during pregnancies following myomectomy in Japan**

Medical Online (Meteo Inc.),\(^11\) a Japanese medical literature database, containing Japanese language articles and conference abstracts on Japanese cases, was searched for articles written during the 19-year period from 2000 to June, 2018, using the key words “uterine rupture” and “myoma”. Our search yielded 67 cases described in conference abstracts and articles. Among these, including cases that we had previously investigated,\(^1\) detailed data were available for 32 cases. Cases of uterine rupture were selected and divided according to pregnancy following laparotomic myomectomy (LTM) or LSM. Then, the onset time and site of uterine rupture were examined. Those with pregnancies following hysteroscopic submucosal myomectomy or adenomyomectomy were excluded. In addition, cases in which an unruptured uterus or incomplete uterine rupture had been detected during cesarean delivery were also excluded.

We ultimately identified 7 cases of uterine rupture in pregnancy following LTM and 25 of uterine rupture in pregnancy following LSM. In the pregnant women with a history of LTM, the onset times of uterine rupture ranged from 16 to 37 gestational weeks (mean + standard deviation [SD]: 28.3 + 6.6 weeks; median: 30 weeks);
the rupture occurred during the full-term period in one woman (14.3%), during the preterm period in 5 women (71.4%; 22–27 gestational weeks: 1 woman, 14.3%; 28–33 gestational weeks: 4 women, 57.1%; 34–36 gestational weeks: 0 women), and during the abortion period of less than 22 gestational weeks in one woman (14.3%, 16 gestational weeks) (Table 1). In the pregnant women with a history of LSM, the onset times ranged from 7 to 37 gestational weeks (mean ± SD: 28.9 ± 8.4 weeks; median: 32 weeks), and it occurred during the full-term period in 2 women (8.0%), during the preterm period in 18 women (72.0%; 22–27 gestational weeks: 3 women, 12.0%; 28–33 gestational weeks: 6 women, 24.0%; 34–36 gestational weeks: 9 women, 36.0%), and during the abortion period of less than 22 gestational weeks in 5 women (20.0%, 7, 10, 16, 19, and 21 gestational weeks in one woman each) (Table 1). Relative incidences of uterine rupture, corresponding to the gestational age did not differ, in either the abortion or the preterm period, between women with a history of LTM versus LSM. The rupture site was associated with the myomectomy scar in all women with a history of LTM; it was the uterine fundus in 4 women and the anterior or posterior uterine wall in 3 women. Among the women with a history of LSM, uterine rupture occurred at the uterine fundus in 11 and the anterior or posterior uterine wall in 9, whereas the rupture site was not associated with the scar or was unknown in 6 women.

The group with a history of LSM included 3 women who had undergone subserous myomectomy. In all 3, the procedure had been performed using only electrocautery for resection and hemostasis, such that the myomectomy site had not been sutured. In these women, uterine rupture occurred at 28, 35, and 37 weeks. In one of them, a myoma with a diameter of 2 cm in the muscle layer had been enucleated, but the myomectomy site had not been sutured. The uterus ruptured at this site. Enucleation of a submucosal myoma had perforated into the endometrium or endometrial cavity in 4 women. In another woman, despite the absence of myoma in the posterior uterine wall, the wall had been extensively cauterized using electrocautery because of endometriosis and the cauterized area ruptured vertically. In the woman who developed uterine rupture at 7 gestational weeks, pathological examination of the myomectomy specimens revealed concomitant adenomyosis. All but one of these women had complained of abdominal pain or abdominal straining. Uterine rupture was suspected based on ultrasonographic findings of intraabdominal hemorrhage or abnormal findings on fetal heart rate monitoring.

### Literature review on placenta accreta in pregnancies following LSM in Japan

**Placenta accreta spectrum after laparoscopic myomectomy: A Japanese article review**

Medical Online (Meteo Inc.), a Japanese medical literature database containing Japanese language articles and conference abstracts on Japanese cases, and Ichushi-Web (Japan Medical Abstracts Society), the Japanese medical literature database maintained by the Japan Medical Abstract Society, were searched for papers written between 2000 and 2018, using the key words “myomectomy” and “placenta accreta or increta or percreta”. Our search yielded 16 cases from the former and 50 cases from the latter. After eliminating duplication of cases, women with a history of adenomyomectomy, those with a history of hysteroscopic submucosal myomectomy, and those with placenta previa accreta were excluded; 25 cases with detailed data available were included.

Based on the available data, primiparous women accounted for 88.2% (15/17 cases), and those 35 years of age and older accounted for 70% (14/20 cases). LTM had been performed in 11 women, LSM in 12. The procedure that had been performed was unknown in 2 women. The gestational age was categorized as the abortion period in 3 women (16, 18, and 18 weeks), the preterm period in 11 (22–27 weeks in 1 woman and 28–36 weeks in 10 women), and the full-term period in 8, while it was unknown in 3. Regarding delivery modes, in all 3 women with uterine rupture during the abortion period, the fetuses were removed through laparotomy performed for intraabdominal hemorrhage. Infants were delivered

| Table 1. Comparison of LTM and LSM on gestational weeks of uterine rupture |
|-------------------------|------------------|------------------|------------------|
| surgery | total cases (n) | abortion | gestational weeks at uterine rupture |
| | | | preterm | term |
| LTM | 7 | 16 | 25, 28, 30, 30, 32 | 37 |
| LSM | 25 | 7, 10, 16, 19, 21 | 25, 26, 26, 28, 31, 32, 32, 32, 32, 34, 34, 34, 35, 35, 35, 35, 35, 36 |
| | | | 37, 37 |

LTM, laparotomic myomectomy; LSM, laparoscopic myomectomy
via a cesarean procedure in 20 women and vaginally in 2 women. The diagnoses were placenta accreta in 7 women, placenta increta in 3, placenta percreta in 12, and myometrial rupture/uterine dehiscence or incomplete uterine rupture in 3. Five women were diagnosed as having complete uterine rupture (at 16, 18, 18, 22, and 37 gestational weeks) accompanied by intraabdominal hemorrhage. The remaining 20 women were diagnosed as having incomplete uterine rupture at cesarean delivery. In 11 women, total abdominal hysterectomy or Poro’s operation was performed during surgery. In 13 women, after spontaneous separation or manual removal of the placenta, the rupture site was treated with debridement, sutured, and repaired. In one woman, hemostasis was achieved during cesarean delivery, and the incision was then closed. However, massive hemorrhage occurred on postpartum day 34, requiring hysterectomy. The histological diagnosis of the resected uterus in this case was placenta accreta.

Incidence of uterine rupture and placenta accreta spectrum in subsequent pregnancies following myomectomy

Recently, uterine rupture in subsequent pregnancies following myomectomy, especially laparoscopic myomectomy, has been recognized and become [OR: is now] a matter of concern14–22) because the major advantage of the laparoscopic approach in gynecologic surgery is well known to be that the technique is minimally invasive and consequently the number of LSM has been rising rapidly, as compared to LTM. In the last 30 years and in developed countries, the incidence of uterine rupture in an unscarred uterus is reportedly within the 0.003–0.07% range,23,24) while that in prior classic cesarean section is in the 0.6–9% range,25–28) that in prior cesarean section with a low-transverse incision is in the 0.2–1.1% range,23,27,28) those in pregnancy following LTM range from 0.4–5.3%,29–32) and that in pregnancy following LSM is in the 0–1.2% range.17,29–31)

According to a large-scale survey conducted in Japan during the 5-year period from 2011 to 2015, the incidence of uterine rupture was 0.015% (152/1,027,249 deliveries).21 Scarred uterine rupture occurred at an earlier gestational age than unscarred uterine rupture. Particularly in women with a history of uterine myomectomy or adenomyomectomy, uterine rupture occurred earlier than that in women with a history of cesarean delivery, and the mean gestational age was approximately 30 to 32 weeks. This survey revealed that not only are infant outcomes uniformly poor, including death and cerebral palsy, but the impact on mothers is also severe, including hysterectomy.21 Our literature review also showed that the mean gestational age at the onset of uterine rupture was 28.3 ± 6.6 weeks (mean ± SD) in the women with a history of LTM. Among them, 14.3% developed uterine rupture during the abortion period, 71.4% during the preterm period. In the women with a history of LSM, the mean gestational age was 28.9 ± 8.4 weeks (mean ± SD); uterine rupture occurred during the abortion period in 20.0% and during the preterm period in 72.0%. In pregnancies following uterine myomectomy, regardless of whether LTM or LSM is performed, uterine rupture reportedly occurs at almost the same rate.2,29,32,33)

All five cases with uterine rupture before 22 gestational weeks following LSM had abdominal pain and were diagnosed based on findings of intraabdominal hemorrhage, and underwent surgery. The outcomes in such cases were apparently poorer than the outcomes of those with pregnancies following cesarean delivery or cases with unscarred uterine rupture near full term. In pregnancies with prior LSM, it is definitely necessary to perform ultrasonography to make an accurate early differential diagnosis, even when patients complain of slight abdominal pain in the first or second trimester. It is also important for each hospital to devise an optimal delivery management protocol for vaginal birth after myomectomy and to carefully manage trial labor and prepare for emergencies such as uterine rupture, if pregnant women with prior LSM or LTM attempt to deliver vaginally, as with a trial of labor after cesarean section (TOLAC).34)

Obstetricians and gynecologists should know that, when the placenta is implanted at the myomectomy site, there is a high risk for the development of placenta accreta spectrum disorders, and that the site can rupture and cause intraabdominal hemorrhage in some cases.1,3,4,15) Moreover, in some placenta accreta spectrum cases, placenta percreta without uterine rupture are diagnosed during cesarean delivery, and its site protrudes into the peritoneal cavity, causing incomplete uterine rupture.1) Because this condition requires sophisticated decisions regarding issues such as repair of the ruptured site after removal of the placenta and hemostatic treatment, it is important to regularly make efforts to master various hemostatic techniques for metrorrhagia. Incidences of uterine rupture and placenta accreta spectrum in prior myomectomy might be lower than that for prior cesarean section30) but it has become apparent that rates of neonatal death and cerebral palsy are higher in cases with uterine rupture in prior myomectomy than in those developing during labor at or near full term.1,12,27) Because there is a risk of uterine rupture and massive hemorrhage in cases with placenta accreta spectrum following myomectomy, it is necessary to obtain informed consent in the event of hysterectomy becoming necessary.
Precautions for uterine myomectomy and technical training programs

Compared with laparotomy, laparoscopic surgery generally makes suturing and ligation more difficult; consequently, incision, hemostasis, and ligation are frequently carried out with powered surgical devices. New devices have been introduced for this purpose; various powered surgical devices such as the monopolar electrocauterizer, bipolar electrocauterizer, vessel sealing system, ultrasonic coagulating and cutting device, and laser devices are used. These devices allow surgeons to simultaneously achieve resection, hemostasis, and adhesion of tissue through thermal denaturation, coagulation, and necrosis. Because surgery can proceed without suturing, these devices also help reduce the time required for surgery (OR: also facilitate reducing the operative time). However, if thermal denaturation and necrosis affect the surrounding tissues, unexpected complications such as weakening of tissues, formation of dead spaces, thinning of the muscle layer, and scarring can occur.\(^7\)–10,16,17,19,22) These complications can also adversely affect subsequent pregnancies. Because uterine rupture occurred in 3 women who had been treated for pedunculated subserous myoma using resection, coagulation, and hemostasis with an electrocauterizer and one woman with endometriosis in the posterior uterine wall, which had only been cauterized with an electrocauterizer, even application of coagulation and hemostasis processes to the uterine surface can apparently produce thermal denaturation and necrosis deep in the muscle layer. Furthermore, coagulation and hemostasis processes performed during or after abrasion of myoma in the muscle layer may seriously damage the normal muscle layer. It is therefore preferable for surgeons to acquire suturing skill rapidly, without relying on powered surgical devices, to the maximum extent possible. Acquisition of suturing skills that allow wound closure without creating dead spaces after myomectomy is also important for preventing hematoma in the muscle layer, thinning of the muscle layer, scarring, and myometritis after surgery. It is important, particularly for beginners, to familiarize themselves with the features of surgical devices and the methods of using them, in addition to enhancing their surgical skill levels, before using the devices. In some reports, hematoma in the uterine muscle layer developed after myomectomy in 1.5 % to 4.4 % of cases,\(^38\)–40) and intramural hematoma was also observed by ultrasonography in 74% of cases immediately after myomectomy.\(^41\) Thus, it may be necessary even for skilled surgeons to train constantly in order to maintain as well as improve their suturing skills.

Moreover, not only the skills of achieving hemostasis and suturing but also methods of enucleation, such as intracapsular myomectomy, are important for saving the fibroid pseudocapsule, containing the vascular supply and thereby avoiding hemorrhage, as well as to enhance wound healing without surgical complications.\(^9\) An incision is made on the myoma surface into the myoma nodule, and the myoma is detached at the border between the myoma nodule and the muscle layer with the pseudocapsule.\(^42\) This might result in bleeding, injury to the blood supply, and delayed wound healing, if the myoma nodule detachment was shallow and the pseudocapsule was damaged. It is also important to minimize use of the electrocauterizer in the uterine muscle layer, when enucleation of the myoma nodule has been performed on this layer.

Acquisition of informed consent and cooperation between medical institutions

To avoid conflicts between surgeons and obstetricians, as well as between obstetricians and patients, patients who may subsequently become pregnant should be sufficiently informed of the possibility of uterine rupture. Delivery modes should be determined at the discretion of obstetricians in consideration of the conditions and staff at delivery facilities. Without understanding the current situation, gynecologic surgeons should not simply assure their patients after surgery that, in a subsequent pregnancy, vaginal delivery of the infant will be possible without problems. Furthermore, responses to inquiries from obstetricians should include detailed information on not only operative time, blood loss volume, size and location of myomas, the number of enucleated myomas, and whether perforation into the endometrial cavity occurred, but also facts such as the direction of the incision, whether and how the myomectomy site was sutured, and hemostatic techniques. Such information is needed to select and determine delivery mode. When the time from uterine rupture to delivery exceeds 17 minutes, the infant prognosis becomes ever poorer.\(^43\)

Thus, pregnant women at risk of uterine rupture need to be managed at facilities equipped to handle extreme emergency situations. When vaginal delivery is planned, all available information should be assessed to provide the necessary care. In addition, providing feedback on cases of uterine rupture to gynecologists is also an obligation for obstetricians.

In young women and women who desire to have children in the future, gynecologists should rigorously examine whether these patients have the appropriate indications for myomectomy. Gynecologists should sufficiently explain not only the advantages and disadvantages of the procedure, but also those of conservative treatment. The optimal therapeutic strategies should then be selected. It is also preferable to provide
information on fertility treatments and options after conservative management, as well as informing patients of problems encountered in pregnancies complicated by myoma.

Precautions for pregnancy and delivery management in women with a history of myomectomy

Management during pregnancy

In pregnant women with a history of LTM or LSM, uterine rupture characteristically occurs at an earlier gestational period than in women with a history of cesarean delivery. When abdominal pain occurs during pregnancy, uterine rupture should always be suspected regardless of the gestational stage. When pregnant women complain of epigastric discomfort due to peritoneal signs or radiating pain, as well as nausea, vomiting, and upper abdominal pain, they should not be diagnosed as having diseases of other specialties, such as gastroenteritis, without careful consideration. While uterine contraction and the fetal heart rate are monitored, differential diagnoses should include obstetric disorders. When pregnant women complain of sudden abdominal pain or severe pain, not only should their vital signs be monitored, but also the presence or absence of intraabdominal hemorrhage should be confirmed, regardless of gestational age, by performing focused assessment with sonography for obstetrics (FASO), as for patients with trauma evaluated by applying Point of Care methods using abdominal ultrasonography. Obstetric disorders that need to be differentiated include uterine rupture, threatened abortion, threatened premature delivery, and HELLP (hemolysis, elevated liver enzymes, and low platelets) syndrome. Intraabdominal hemorrhage during pregnancy is caused by not only uterine rupture but also ruptures involving aneurysms or the vascular plexus and laceration of or damage to adhesion sites caused by endometriosis, which often require laparotomy. Prompt treatment is essential in such cases.

During pregnancy, attention should be paid to the site of placental implantation, and ultrasonography should be performed to closely examine whether placenta accreta, increta, or percreta is present. When ultrasonography shows findings of any of the placenta accreta spectrum disorders, such as loss of the normal hypoechoic retroplacental zone, thinning of the retroplacental myometrium, and increased placental vascularity, magnetic resonance imaging should be performed to obtain more detailed data, based on which the delivery mode should be determined.35,44,45)

Delivery modes and management

In the past, many comparative studies on outcomes of vaginal delivery in pregnant women with a history of cesarean delivery or myomectomy found no difference in outcomes.29,32,34) Meanwhile, LSM has rapidly evolved in the past few years and is therefore now frequently performed. At present, gynecologists at various levels of skill acquisition are performing the procedure in clinical practice. Thus, when delivery modes are determined for pregnant women with a history of myomectomy, obstetricians need to assess detailed information on hemostatic, suturing, vertical or transverse incision, and other techniques used during myomectomy in addition to the type, size, and number of myomas and the postoperative course. If vaginal delivery is selected after assessment of all relevant information, adequate informed consent should be obtained beforehand. Furthermore, it is important to always prepare facilities for obstetric emergencies, to develop manuals, and to routinely train staff for emergency responses.

When placenta accreta spectrum is suspected, a sufficient volume of blood should be prepared for blood transfusion, including autologous transfusion. Then, cesarean delivery should be performed, taking every possibility including hysterectomy and conservative management without placental abruption, into consideration. In cases with placenta increta or percreta, to prevent massive intraoperative hemorrhage, a prophylactic arterial balloon occlusion catheter may need to be placed before cesarean delivery.46)

Future outlook

Currently, it is not possible to predict which condition is more likely to cause uterine rupture after myomectomy and which site is more prone to rupture. In general, many surgeons use the diamond-shaped port placement where the accessory ports are placed in the bilateral lower quadrants and suprapubic region.47,48) Vertical incision seems to be more often performed because it is technically easy to incise vertically and suture transversely, using the diamond-shaped port placement. In Japan, Takeuchi H, et al. prefer to use parallel port placement because it is advantageous to incise the uterus transversely and suture vertically.49,50) In fact, the arteries and arterioles in the myometrium essentially run transversely, i.e., not vertically. Thus, a transverse uterine incision would seem to be a more logical strategy for reducing blood loss and avoiding hematoma. Moreover, given the location of a cesarean delivery wound, a vertical uterine incision is known to more frequently cause uterine rupture than a lower transverse incision. Based on examinations of women with uterine rupture during pregnancy following arterial embolism, the common sites of uterine rupture are expected to be the median portions of the anterior and posterior uterine walls and the uterine fundus, which are
the most distal areas of blood flow from the right and left uterine arteries. Thus, when the incision for myomectomy leaves a uterine scar, a transverse incision on the anterior and posterior uterine walls is expected to be more beneficial for healing with scar formation at the incision site. However, when the uterine fundus is incised, both vertical and horizontal incisions are disadvantageous for healing with scar formation because the fundus is poorly vascularized. In terms of the onset of uterine rupture, these two incisions would therefore presumably be essentially equivalent.

In contrast, the question of which myomectomy procedure causes placenta accreta has not yet been answered. Studies on women with placenta previa accreta have suggested that the placenta accreta spectrum is common in women with inflammatory conditions or poor endometrial development. Thus, in women in whom inflammation affects the endometrium after myomectomy, it is highly likely that a placenta accreta spectrum disorder will develop during a subsequent pregnancy. In the future, accumulation of more cases and pathological specimens, as well as further studies, may shed light on these issues.

Furthermore, implementation of training and realistic simulations on a routine basis in actual clinical settings is extremely important for ensuring prompt and appropriate responses to emergency cases.

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Conflicts of Interest

None.

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