# Surgical Treatments for Adenomyosis

# 11

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**Abstract**

The objective of this prospective study performed at Juntendo University School of Medicine was to evaluate a novel method of laparoscopic adenomyomectomy (LA). The subjects were 76 women with adenomyosis who wished to conserve fertility.

Two methods of LA and hysteroplasty were used: wedge resection (WR) and the double flap method (DF). WR was performed on 22 women with exteriorly growing focal adenomyosis close to the serosal membrane, and DF was performed on 54 women with adenomyosis growing interiorly close to the endometrium. WR was performed by making a V-shaped notch to remove the adenomyotic nodule and surrounding serosa with a electric cautery. The remaining muscle layer was sutured so that hysteroplasty could be performed. For the DF procedure, after a transverse incision, the adenomyotic nodule was removed, with the remaining serosal tissue serving as the upper and lower flaps, which were overlapped and sutured.

For the operative outcome in the WR and DF groups, the average surgical duration was 118.6 ± 43.3 min and 144.0 ± 44.5 min, and the estimated blood loss was 172.1 ± 175.2 mL and 245.3 ± 232.3 mL, respectively. The visual

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N. Sugino (ed.), *Uterine Fibroids and Adenomyosis*, Comprehensive Gynecology and Obstetrics, https://doi.org/10.1007/978-981-10-7167-6_11

analog scale of dysmenorrhea and hypermenorrhea was significantly decreased after surgery, and this trend continued for more than 3 years. Investigation by second-look laparoscopy showed that 3 out of 24 patients (12.5%) had de novo adhesion to the adnexa and 12 patients out of them (50%) had postoperative adhesions to the incision site of the uterus. All patients exhibited tubal patency with an indigo carmine solution used for chromotubation, but wound thinning was observed in only one patient by leakage of it. The postoperative pregnancy rate was 38.8% (12 out of 31 infertile patients), 73.3% (11 out of 15 pregnancies) of which resulted in live births. There were no severe complications during pregnancy and delivery.

In conclusion, LA was found to be safe and useful for minimally invasive surgery to conserve fertility.

**Keywords**

Adenomyomectomy · Laparoscopy · Conservative surgery · Focal adenomyosis · Laparoscopic adenomyomectomy

## 11.1 Introduction

Adenomyosis is a benign gynecological disease defined to invasion of ectopic endometrial glands and stroma into the uterine myometrium. Premenopausal women with adenomyosis typically suffer from dysmenorrhea, hypermenorrhea, chronic pelvic pain, and infertility.

Over two decades ago, the standard surgical treatment of adenomyosis is a hysterectomy. However with the changes in women's lifestyles, such as marrying later in life and having fewer children, adenomyosis is on the rise in unmarried and nulligravid women. A laparoscopic adenomyomectomy (LA) is minimally invasive and a conservative surgical option to preserve fertility for infertile women with disorder of implantation or previous miscarriage.

We demonstrated the details of perinatal complication due to adenomyosis experienced in our hospital in Fig. 11.1.

According to count, the majority of perinatal complications due to adenomyosis were premature birth, malpresentation, and PROM in our hospital. On the other hand, we should be careful of the uterine rupture during pregnancy as the postoperative complication [1].

### 11.1.1 Surgical Indication of LA

We show the option of the treatment for adenomyosis in Fig. 11.2.

LA is a palliative surgery for patients with focal adenomyosis who wish the conception, making it difficult to completely excise of adenomyosis; therefore, keeping the balance of radicality with fertility is difficult.

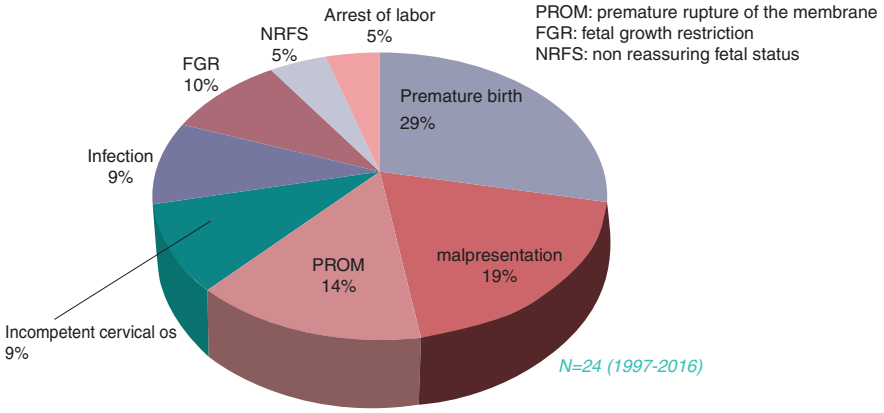


**Fig. 11.1** The details of perinatal complication due to adenomyosis in our hospital

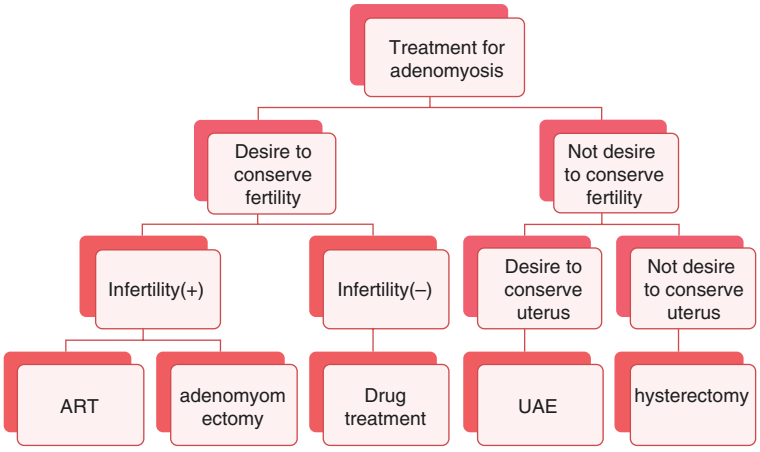


**Fig. 11.2** The option of the treatment for adenomyosis. We usually apply the treatment for adenomyosis according to desire to conserve fertility or not, and infertility or not

Despite the surgical procedure of LA being highly difficult, there is also a high risk of recurrence and perinatal complications such as the postoperative premature birth or the uterine rupture. Thus, many surgeons often find it difficult to make a decision regarding the surgical indication. In our hospital, LA is often normally selected for infertile women whose symptoms due to adenomyosis cannot be controlled well, or uterine cavity is deformed, with a history of perinatal complication due to adenomyosis and increasing size of adenomyotic tumor rapidly in either surgical method of laparotomy or laparoscopy.

### 11.1.2 Two Types of LA Methods and Criteria for Selection

We demonstrate two types of laparoscopic LA for women with partial adenomyosis depending on development of adenomyotic lesion and aimed to evaluate the

efficacy of them. The focal type adenomyosis was classified into two types: exteriorly growing type where development of adenomyotic nodule occurred close to the serosal membrane and interiorly growing one where it appeared close to the endometrium.

The wedge resection method (WR) involves excision of the adenomyotic tissue together with the serosal membrane, and it is applicable to exteriorly growing type of adenomyosis. On the other hand, the double flap method (DF) is used for removing substantial tissue while preserving the normal muscle layer on the serosal site and is suitable for interiorly growing type adenomyosis (Fig. 11.3).

Because WR is the procedure used for removing adenomyotic tissue together with the surrounding serosal membrane and normal muscle layer, the extent of adenomyotic nodule excision is limited. On the other hand, the DF removes the adenomyotic tissue while the remaining serosal membrane and surrounding normal muscle layer serve as flaps to counteract the loss of myometrium. So we usually apply WR to exteriorly growing focal adenomyosis with a diameter of 5 cm or less and choose DF for interiorly growing one with a diameter under 8 cm.

Diffuse type of adenomyosis, which spans the entire uterus, was excluded as unsuitable for this procedure.

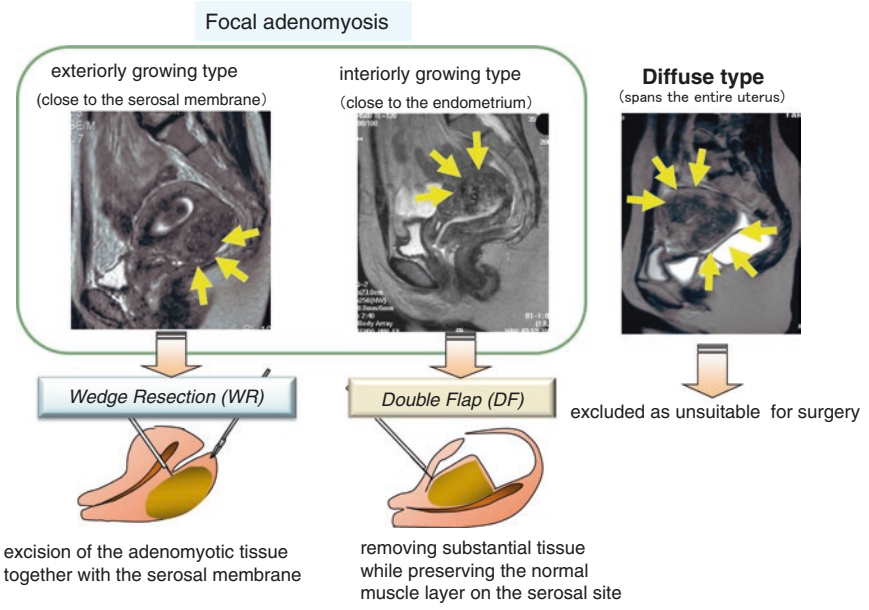


**Fig. 11.3** Two types of LA methods and criteria for selection. WR is applicable to exteriorly growing focal adenomyosis with a diameter of 5 cm or less. In DF is suitable for interiorly growing one with a diameter under 8 cm. Diffuse type or larger one is not considered to perform laparoscopy

## 11.2 Surgical Procedure

Surgical preparation and commonality of two methods. The patients were placed in lithotomy, and the Uterine Manipulator (Ethicon, Tokyo, Japan) was replaced into the uterine cavity for mobilization of the uterus. After the pneumoperitoneum was established, a 11-mm scope was inserted periumbilically. Three additional puncture sites were made: two 5-mm sites 2 cm above the anterior superior iliac supine and a 12-mm site 3 cm above the umbilicus on the left anterior axial line. The operator stood on the patient's left side, controlling the 12-mm trocar with his right hand and manipulating the left lower 5-mm trocar with his left hand. The right lower 5-mm trocar was controlled by the assistant's right hand.

After observing the abdominal cavity, cystectomy was performed on the cases of adenomyosis complicated with endometrioma and lysis of adhesions, and the removal of deep endometriotic lesions around Douglas' pouch were performed for the complete cul-de-sac obliteration cases. Vasopressin 20 IU in 1 mL diluted 100 times with saline solution was infused into the adenomyotic tissue.

### 11.2.1 Wedge Resection (WR)

We apply wedge excision to adenomyosis 5 cm in diameter or less with outside spatial pattern. The adenomyotic nodule and sorounding serosa are removed by making a V-shaped notch with a electric cautery of monopolar needle or scissors. The remaining muscle layer was sutured so that hysteroplasty could be performed. Similar to LM (laparoscopic myomectomy), we begin to sew it up from the base of the muscularis which tore and sew it up in from two to four layers according to depth not to make dead space, but various invention is necessary for suture subsequently because it is hard to put myometrium unlike LM in the case of LA. We attach adhesion inhibitor on the uterus' wounded area after the saturation (Fig. 11.4).

### 11.2.2 Double Flap Method: (DF)

We add transverse incision in needle-formed monopolar from the top of adenomyosis to the limit reaching the endometrial cavity and resect a lesion of adenomyotic tissue as en bloc with the remaining serosal tissue serving as the upper and lower flaps, which were overlapped and sutured. Because normal muscularis remains in the serosa side in the case of inside spatial pattern, we leave this part and resect only an adenomyosis tissue. Left normal muscularis becomes the flap and can fill greatly defective normal muscularis. After excision of the adenomyotic tissue, any perforations to the endometrium were sewn up with 2/0 thread. The inner side of the lower serosal flap was sutured with 1/0 thread, and the upper fringe of the serosal flap was sutured to the muscle layer continuously. Likewise, the inner side of the upper serosal flap was sutured to the muscle layer, while overlapping with the lower serosal flap and the bottom fringe of the serosal flap, and lower serosal flap surface was continuously sutured to close the muscle layer incision [3].

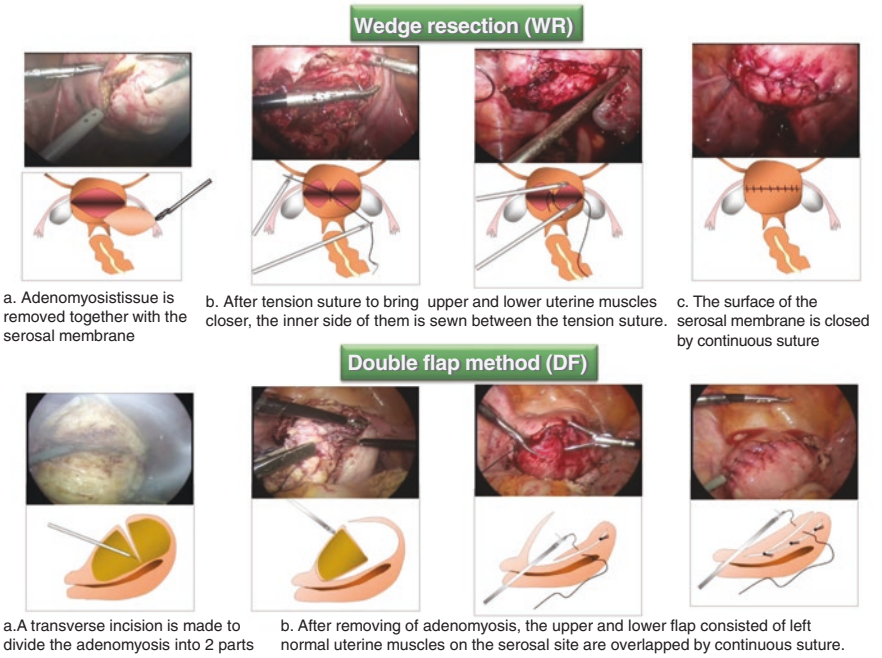


**Fig. 11.4** Surgical techniques of two types LA. Wedge resection (WR): (**a**) adenomyosis is removed together with the serosal membrane. (**b**) Muscle layer was closed to each other by tension suture. (**c**) The inner side of muscle layer is sewn between the tension suture. (**d**) The surface of the serosal membrane is closed by continuous suture. Double flap method (DF): (**a**) a transverse incision is made to divide the adenomyotic region into two parts. (**b**) Adenomyosis is removed remaining the normal muscle layer on the serosal membrane side. (**c**) The upper and lower flaps consisting left normal muscularis are overlapped by continuous suture. Modified from [8]

## 11.3 Patient Characteristics

Seventy-six women who were diagnosed with adenomyosis underwent LA at our hospital during 2003 and 2013. In detail, WR was performed for 22 patients, and DF method was performed for 54 patients.

Each patient was sufficiently informed of all aspects of the trial before the surgery, and written consent was obtained. Additionally, this study was reported to and approved by the institutional review board.

Preoperatively, patients were diagnosed as having adenomyosis in a maximal junctional zone thickness >12 mm by MRI [2]. From past experience in laparoscopic myomectomy, the exclusion criteria are those with the size of over 80 mm in a low-intensity area or a uterine size equivalent to about 12 weeks of pregnancy.

The median age of the subjects was 36 years of age (range, 28–39 years). The details of past pregnancies were one case of spontaneous abortion, two cases of elective abortion, and one case of normal delivery. Symptoms included 14 cases of dysmenorrhea (100%), 8 cases of menorrhagia (57.1%), and 8 cases of infertility (57.1%). The details of infertility cases were five cases of primary infertility and three cases of secondary infertility. The median infertility period was 47 months (range 12–60 months).

The average of widest median diameter of adenomyosis measured by MRI was 47 mm (range 30–80 mm). The region of adenomyosis occurrence was the anterior wall for six cases and the posterior wall for eight cases.

59 cases were administered the GnRH agonist (leuprolide acetate1.88 mg, Takeda, Tokyo, Japan), and one case was administered dienogest, totaling ten cases with preoperative treatment.

Postoperative observations were made by MRI or second-look laparoscopy [3] to investigate wound healing and postoperative adhesion after adenomyomectomy.

SLL was performed for 24 patients who desired pregnancy in the future and the average of whose age was 35.4 ± 3.7.

## 11.4 Result

### 11.4.1 Operative Findings and Outcome

The details of complicated disease were as follows: endometrioma was 39.5% (30/76) and deep infiltlating endometriosis (DIE) was 43.4% (33/76). As the result of operative outcome in the WR group and the DF group, the average of surgical duration was 118.6 ± 43.3 (min) and 144.0 ± 44.5 (min), and the average of estimated blood loss was 172.1 ± 175.2, (mL) and 245.3 ± 232.3, respectively (Table 11.1).

The average of specimen in DF group was more heavy than the one in WR group comparing patients whose adenomyotic nodule was of the same size (Fig. 11.5).

No conversion to laparotomy or major complications occurred during surgery.

### 11.4.2 The Change of Symptoms

The postoperative improvement of symptoms indicated by changes in dysmenorrhea was evaluated using the visual analog scale (VAS). The visual analog scale of dysmenorrhea was significantly decreased from 9.3 (range, 9–10) before surgery to 3.5 (range, 1–6) after surgery, and this trend continued for over 3 years (Fig. 11.6).

All 45 patients with hypermenorrhea improved after surgery.

**Table 11.1** Patient's background and operative findings

| | WR ($n$ = 22) | DF ($n$ = 54) |
|---|---|---|
| Age (years) | 35.8 ± 4.3 | 36.8 ± 3.8 |
| Infertility ($n$) | 9 (40.9%) | 22 (40.7%) |
| Size of adenomyotic tumor (cm) | 4.2 ± 0.9 | 5.0 ± 1.2 |
| The level of CA125 (U/mL) | 112.8 ± 120.4 | 209.9 ± 194.3 |
| Administration of GnRHa ($n$) | 18 (81.8%) | 41 (75.9%) |
| Complication of endometrioma ($n$) | 7 (31.8%) | 23 (42.6%) |
| Complication of DIE ($n$) | 11 (50.0%) | 22 (40.7%) |
| r-ASRM | 441 ± 48.1 | 40.1 ± 45.9 |
| Surgical duration (min) | 118.6 ± 43.3 | 144.0 ± 44.5 |
| Estimated Blood loss (mL) | 172.1 ± 175.2 | 245.3 ± 232.3 |

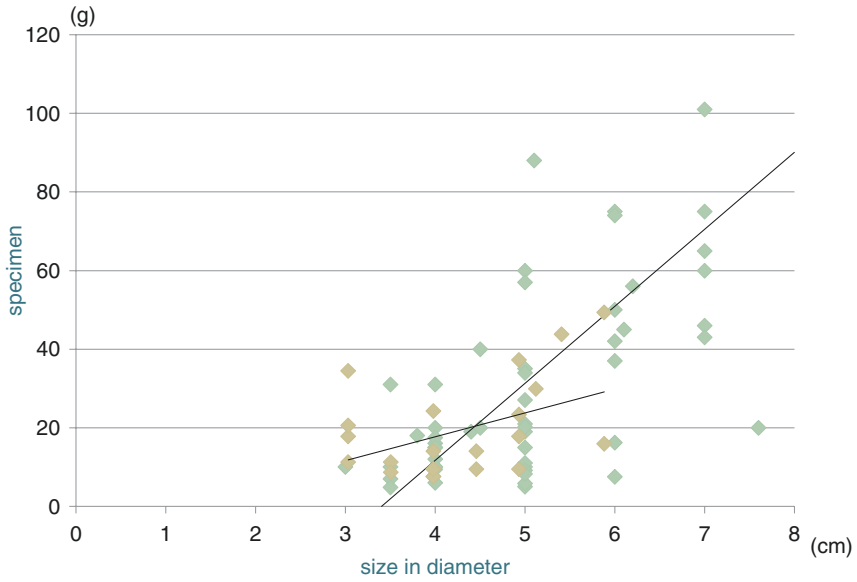


**Fig. 11.5** The correlation between the size in diameter and specimen of adenomyosis. The average of specimen in DF group was more heavy than the one in WR group comparing patients whose adenomyotic nodule was of the same size

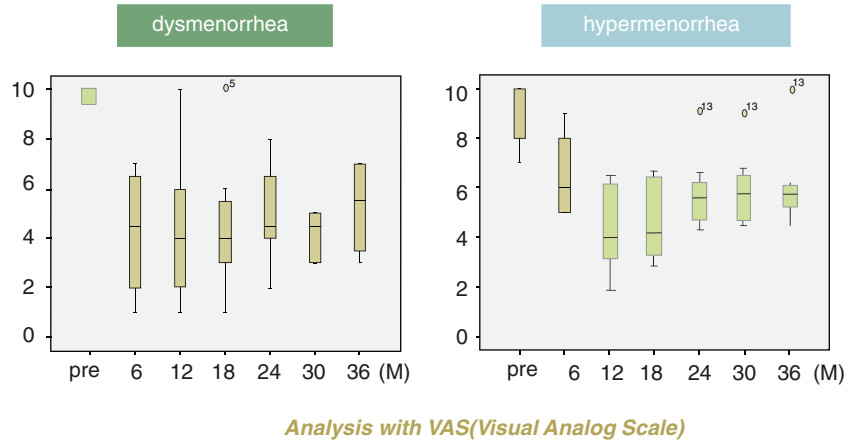


**Fig. 11.6** Changes in dysmenorrhea and hypermenorrhea until 3 years postoperatively were evaluated using the VAS. Both decreased quickly after surgery and this trend continued for over 3 years

### 11.4.3 The Outcome of Second-Look Laparoscopy (SLL)

Three out of 24 patients (12.5%) had de novo adhesion to the adnexa and 12 out of them (50%) had postoperative adhesions to the incision site of the uterus.

All patients exhibited tubal patency, but wound thinning was only observed in one patient by leakage an indigo carmine used for chromotubation. The patient with

wound thinning underwent debridement and reconstructive surgery by laparoscopy.

Eight infertile patients (33.3%) conceived after SLL and the mean period until pregnancy (since performing SLL) was 15.6 months.

### 11.4.4 Postoperative Pregnancy Rate and Cumulative Pregnancy Rate

Twelve of the 31 infertile patients (38.8%) who underwent LA conceived and 85.7% of all these pregnancies were spontaneous pregnancies containing of timing method or IUI without ART. The mean period until pregnancy was 24.5 months, and three patients experienced repeated pregnancies.

The cumulative pregnancy rate was approximately 40% of patients who conceived 2 years after LA and approximately 60% of patients who got pregnant 3 years after surgery (Fig. 11.7).

### 11.4.5 Outcome of Pregnancy and Delivery

Although the count of postoperative pregnancy was 15 (from 12 pregnant women), only 73.3% of them (11/15) resulted in a live birth. The details of patients doing not well were two patients were stillborn and one experienced a miscarriage. There were no cases of uterine rupture or placenta accrete.

As a rule, planned cesarean sections are performed on post-LA patients; however, vaginal delivery was performed for two patients during the early period.

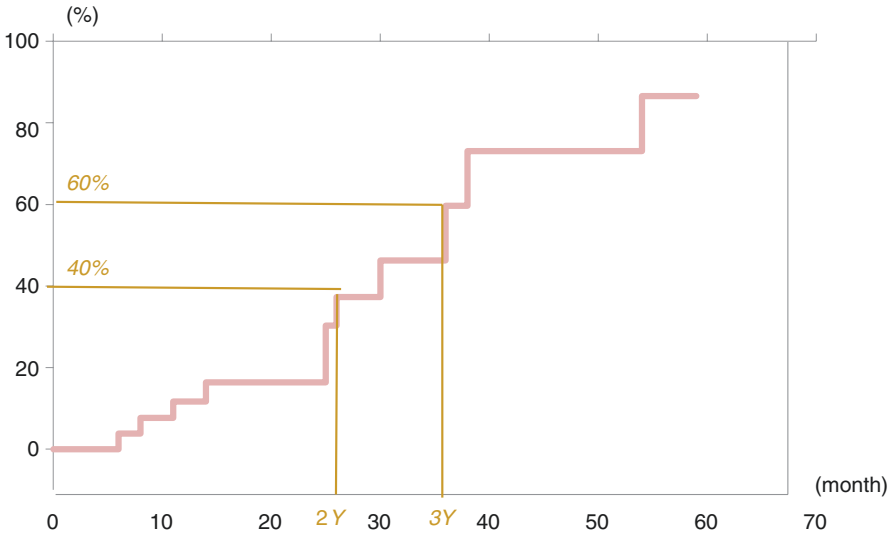


**Fig. 11.7** Cumulative pregnancy rate after LA. At 2 years postoperatively, approximately 40% of patients had conceived and, at 3 years postoperatively approximately 60% of patients were pregnant

## 11.5 Discussion

Adenomyosis is a disorder often affecting woman in their late reproductive years who have already finished childbearing. Therefore hysterectomy has been a common surgical treatment. However, because of the recent trend of marrying later in life and having fewer children, the incidence of adenomyosis in unmarried and nulligravid women is increasing, and there is a higher demand for adenomyomectomy to conserve fertility and the uterus.

To be different from uterine fibroid, adenomyosis is a condition where the endometrial tissue has penetrated the uterine muscle layer and the boundary between the lesion and normal muscle layer is unclear. Therefore LA requires techniques for excising the adenomyotic tissue and reconstructing the remaining muscle layer after removing adenomyoma.

Adenomyomectomy is an operative procedure that requires time for the excision of adenomyotic tissue with unclear boundaries and the suturing process. Therefore controlling bleeding is an important factor. Preoperative administration of GnRH agonists to decrease uterine blood flow and vasopressin administration during the surgery is effective to control bleeding [4]. However, the boundary between adenomyotic tissue and the normal muscle layer may become even more unclear by administration of GnRHa; we usually use it only for cases of focal adenomyosis on the posterior uterine wall with suspicious existence of DIE.

We usually choose the surgical method according to the type classified by position of adenomyosis: exteriorly growing and interiorly growing one to conserve as much of the normal muscle layer as possible to avoid the postoperative uterine rupture during pregnancy. Besides it should be able to contribute to decrease the remnant of adenomyotic tissue.

We considered that WR removing adenomyotic tissue together with the surrounding serosal membrane is applicable to exteriorly growing type adenomyosis that the adenomyotic nodule occurred close to the serosal membrane but the extent of adenomyotic nodule excision is limited. On the other hand, DF is suitable for interiorly growing type adenomyosis that it appeared close to the endometrium while preserving the normal muscle layer on the serosal site as flaps to counteract the loss of myometrium.

The reports on LA are not so much; Wood [5] and Morita [6] reported for the wedge-shaped excision methods using laparoscopy, and Chung [7] were mentioned as robot-assisted one. Furthermore, laparoscopic DF was reported by Takeuchi [8] to modify the laparotomy techniques mentioned by Hyamus [9] and Osada [10]. After that, double or triple flap method for diffuse-type adenomyosis was reported by Huang [11].

LA requires time for adenomyoma removal and uterine reconstruction and is significantly more difficult to perform compared with laparoscopic myomectomy of similar size. However, we considered that with proficiency in the operative procedures, it is possible to operate on adenomyosis with a maximum size of 7–8 cm and uterine size equivalent to about 12 weeks of pregnancy.

As far as observing of above indication, our method for focal adenomyosis is effective and safe. There is no complication during surgery and related symptoms to adenomyosis like dysmenorrhea or hypermenorrhea have decreased considerably after surgery. Postoperative observations of the wound area by MRI and second-look laparoscopy have indicated that sufficient wound healing is possible even if the muscle layer is overlaid on the normal serosal membrane. In our cases, only one patient with wound thinning was observed by leakage an indigo carmine used for chromotubation at second look laparoscopy. She underwent debridement and reconstructive surgery by laparoscopy immediately.

Twelve of the 31 infertile patients (58.8%) who underwent LA conceived after surgery and 11 women (73.3%) out of them delivered normally in term. None of these cases experienced uterine rupture during pregnancy or delivery. But it is necessary to ensure that there is sufficient uterine wall strength to withstand pregnancy and labor after conservative surgery of uterus. This procedure should be attempted by surgeons with sufficient experience in laparoscopic myomectomy [12] or mastered suturing skill under laparoscopy.

### Conclusion

LA was suggested to be safe and useful for minimally invasive surgery to conserving fertility and suffering from various related symptoms to adenomyosis. However unlike laparoscopic myomectomy, there are few reports of conservative LA and little data on indication and surgical performance. Further investigation on operative procedures and postoperative management of LA is necessary. Laparoscopic myomectomy is now widespread, and techniques for enucleation and suturing under laparoscopy are developing rapidly [13]. By applying laparoscopic myomectomy techniques, we believe we have established a safer and more effective technique for LA.

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