Original Article

# Five-Year Lapsed: Review of Laparoscopic Myomectomy versus Open Myomectomy in Putrajaya Hospital

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## Abstract

**Study Objective:** This study aimed to investigate the morbidity of laparoscopic myomectomy (LM) versus open myomectomy (OM), including intraoperative blood loss, duration of surgery, hospital stay, and complications and to evaluate the criteria for selection of cases suitable for LM.
**Design:** This was a retrospective study.
**Setting:** This study was conducted at tertiary hospital.
**Participants:** The records of 67 women who underwent LM, 22 women who underwent OM, and 14 women who had laparo-conversion from January 2010 to November 2014 were reviewed.
**Measurement and Main Results:** Fibroids up to 10 cm were removed by LM, while most fibroids more than 10 cm were managed through OM. The number and weight of myomas are significantly associated with laparo-conversion, with a rate of 17%. Mean blood loss was significantly reduced in LM group than the OM and laparo-conversion groups. Duration of hospital stay was also significantly less in LM (2 ± 1 days) compared to both OM and laparo-conversion groups (3 ± 1 days). Most women underwent LM (88%) had no postoperative complications compared to OM (50%) and laparo-conversion (57.1%). The number of fibroids removed and duration of surgery was positively correlated with blood loss in the women who underwent myomectomy.
**Conclusion:** LM is an ideal surgical approach for removal of fibroids which are up to 10 cm diameter and <5 in number, while OM is useful for cases with multiple (5 or more), larger fibroids (>10 cm), and deeply located fibroids. Preoperative evaluation of the size and number of myomas is necessary to avoid laparo-conversion and to reduce intraoperative and postoperative complications.

**Keywords:** Laparo-conversion, laparoscopy myomectomy, laparotomy, myoma, open myomectomy

## Introduction

Fibroids (leiomyomas or myomas) are benign tumors that arise from smooth muscle cells. Fibroids are found commonly in the uterus and connective tissues. They constitute the most common benign tumors among women.[1] The pathogenesis of fibroids is associated with multiple factors including ovarian steroid hormones, growth factors, smooth muscle injury, and genetic predispositions.[1] Uterine fibroids commonly occur in women of reproductive age with an estimated rate of 20%–40%.[2] Uterine leiomyoma can be classified as intramural, submucosal, or subserosal. Leiomyomas are commonly asymptomatic. Approximately 25% of these patients have symptoms such as heavy uterine bleeding, pelvic pain, pelvic and urinary retention symptoms, and infertility and complications in pregnancy.[3] Treatment options for myoma include hysterectomy, myomectomy, uterine artery embolization, myolysis, and medical therapy.[4]

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Myomectomy is a uterine-preserving surgical treatment for women with symptomatic fibroids. It is done by open myomectomy (OM) or by minimally invasive techniques such as hysteroscopy and laparoscopic myomectomy (LM). LM is a less invasive method with minimal complications, and it has been established in recent years.[5] The selection of patients for medical therapy, noninvasive procedures, or surgery depends on an assessment of the size, number, and position of myomas.[6] OM involves surgical removal of the fibroids through an incision in the abdominal wall, closure of the resulting uterine dead space, and reconstitution of the remaining uterus. Some studies have reported transfusion rates of up to 20% during OM.[7]

Over the past 20 years, gynecological surgery has advanced to include minimally invasive techniques such as LM. LM is the removal of fibroids through a diathermy incision of the uterus, usually assisted by morcellation, with small keyhole incisions in the abdominal wall through which instruments under telescopic control are passed.[8] LM differs from OM, in which a large (approximately 12 cm) transverse incision is made along the abdomen, the fibroid excised, large sutures tied, and abdominal layers closed (usually a minimum of rectus sheath and skin layers). Evidence suggests that LM is associated with reduced morbidity compared to OM.[9] It is less invasive, associated with less postoperative pain, short hospital stay, and rapid recovery.[10] However, LM is one of the most challenging laparoscopic procedures as a greater degree of skill is required in laparoscopic suturing and operating time is frequently longer. Nevertheless, a study by Paul reported a single surgeon's experience of LM over a 16-year period that LM was comparable to OM with respect to the duration of surgery, blood loss, and incidence of complications.[11] LM is the subject of considerable debate. In specific for intramural myomata, the technique is reputed to be technically difficult, long, with more blood loss and it is said to have a high risk of conversion to OM.[12] Even with experienced surgeons, perioperative complications may occur, requiring time-consuming and costly conversion to an open procedure, either laparoscopic-assisted myomectomy or laparotomy. According to Dubuisson and Chapron, the key factors for a successful LM are small number and size of myoma and its location.[13]

The existing reports on LM are noncomparative single-center observational studies that have used a variety of patient selection criteria.[14,15] Due to these conflicting results, the current study is aimed to compare the morbidity of LM and OM techniques as well as to investigate factors which contribute to laparo-conversion.

## Methods

### Study subjects

In a retrospective study, the medical records of women who underwent myomectomy from January 2010 to November 2014 in Hospital Putrajaya were retrieved from our electronic medical records system. This study was approved by the Medical Research and Ethics Committee and the National Medical Research Registry (NMRR), Malaysia (NMRR-15-609-25319). Before the surgery, patients were informed about benefits and risks of LM, including the possible necessity to convert to OM during the surgery and the intraoperative and postoperative risks such as bleeding. For each patient, the total surgery time was recorded from the anesthesiology charts. Laparo-conversion was defined as the substitution of LM by OM for intraoperative complications or difficulties in completing the procedure. Laparo-conversion is measured in conversion rate (%). Intraoperative blood loss and length of hospital stay, in days of hospitalization after surgery, were noted.

### Myomectomy operative techniques

OM was performed using a standard procedure. An incision was made on the skin depending on the size, location, and expected difficulty. Myomas were enucleated after an incision was made on the uterus using myoma screw or manually. LM was performed through 3–4 ports. The telescopic port is the higher most usually in the umbilicus. The other 2 or 3 accessory trocars would be inserted sufficiently high enough to provide an easy approach to the myomas for the laparoscopic instruments. The uterus was always cannulated to allow correct exposure of the myomas and strong counter tractions during enucleation and suturing. Before incision of the uterus, vasopressin was injected into the planned uterus incision site for each fibroid to reduce bleeding, however, not in all cases. Some superficial pedunculated or subserous myoma may not need any vasoconstrictor. The incision was made over the suspected myoma area. The tissues were dissected using monopolar diathermy and scissors until the myoma plane was identified. Then, the myomas were removed using myoma screw with traction and countertraction forces. Once removed the void area was sutured with absorbable suture which can either be in two layers or 1 layer depending on the depth of the void cavity. The myomas were morcellated intracorporeally inside an endobag and removed through the laparoscopic incision. Glyconate monofilament absorbable suture was used for skin closure for some cases. This was to ensure proper apposition and leaving no gap for hematoma. The abdominal incision was closed after all of instruments used were completely removed.

### Statistical analysis

The clinical data of patients who underwent OM and LM were retrospectively analyzed. The data recorded comprised patient demographic information and clinical characteristics including age, weight, type, and size of myoma and myomectomy indications; and perioperative data including estimation of blood loss, duration of surgery, complications, and length of hospital stay. Patients' demographic, intraoperative, and postoperative data were compared between the LM, OM, and

laparo-conversion groups. Continuous data summarized as mean ± standard deviation and categorical data as number and percentage. Continuous data were compared through analysis of variance and categorical data compared through Pearson Chi-square test. Within-group comparisons were performed with the nonparametric Kruskal–Wallis test and the Mann–Whitney U test. Comparisons among the three groups were made, especially regarding operative time, number of fibroids, blood loss, and duration of surgery. Statistical analyses were performed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) with a two-sided $P < 0.05$ set to be statistically significant.

## Results

A total of 103 women who underwent myomectomy were included in the analysis. All patients were divided into three groups as follows: those who underwent LM ($n = 67$), OM ($n = 22$), and converted to OM (laparo-conversion) ($n = 14$). The demographic and clinical parameters are summarized in Table 1. The mean age of patients in LM, OM, and laparo-conversion was, respectively, 34.03 ± 5.42 years, 33.27 ± 5.48 years, and 33.27 ± 5.96 years. There were no significant differences between indications for myomectomy such as abdominal mass, menorrhagia, compression symptoms, dysmenorrhea, infertility, abdominal pain, on table referral, as well as a combination of more than 1 indication between all the groups. However, menorrhagia was the common indication for all myomectomy groups. Almost twice of the women in OM group had GnRH pretreatment compared to LM. The conversion rate to an OM from LM was 17% (14 out of 81 cases).

**Table 1: Demographic and clinical parameters of the study subjects**

| Characteristic | LM ($n=67$) | OM ($n=22$) | Laparoconversion ($n=14$) | *P* |
|---|---|---|---|---|
| Age, mean (SD) | 34.03±5.42 | 33.27±5.48 | 33.27±5.96 | 0.705 |
| Indications for surgery % ($n$) | | | | |
| Menorrhagia | 46.3 (31) | 45.4 (10) | 42.8 (6) | 0.098 |
| Abdominal mass | 16.4 (11) | 27.3 (6) | 42.8 (6) | |
| Infertility | 14.9 (10) | 9.1 (2) | 0 | |
| Compression symptoms | 13.4 (9) | 4.5 (1) | 0 | |
| Dysmenorrhea | 3.0 (2) | 0 | 0 | |
| Abdominal pain | 0 | 4.5 (1) | 7.1 (1) | |
| On table referral | 1.5 (1) | 0 | 0 | |
| Other symptoms | 4.5 (3) | 9.1 (2) | 0 | |
| GnRH treatment prior to surgery | 16.4 (11) | 31.8 (7) | 35.7 (5) | 0.14 |

Data are mean (SD) or % when specified. *$P<0.05$.
GnRH: Gonadotropin-releasing hormone agonists, LM: Laparoscopic myomectomy, OM: Open myomectomy, SD: Standard deviation

Characteristic of fibroids is shown in Table 2. Most fibroids up to 10 cm diameter were removed laparoscopically, while most fibroids more than 10 cm diameter were managed through laparotomy. All fibroids <5 cm diameters were removed by LM. Fibroids between 5 and 10 cm diameter were often removed by LM (77.4%) compared to OM. OM was the preferred technique for removal of fibroids more than 10 cm diameter compared to LM (48.4% vs. 29.0%). Laparo-conversion rates for fibroids size <5 cm, 5–10 cm, and >10 cm were 0%, 12.7% and 43.8%, respectively.

A higher percentage of single fibroids were removed by LM (71.9%) compared to OM (21.9%) and laparo-conversion (4%). Meanwhile, a higher percentage of 2, 3, and 4 fibroids was removed by LM (90.9%, 44.4%, and 57.1%, respectively) compared to OM and laparo-conversion. OM is highly useful in removing multiple fibroids of five or more compared to LM. Laparo-conversion rates for number of fibroids removed of 1, 2, 3, 4, and 5 were 8%, 9%, 33%, 33%, and 75%, respectively. A multiple logistic regression analysis [Table 3] showed that number and weight of myoma are factors which contribute to laparo-conversion.

**Table 2: Factors influencing the choice of the surgical procedures**

| Characteristic | LM ($n=67$) | OM ($n=22$) | Laparoconversion ($n=14$) | *P* | Laparoconversion rates (%) |
|---|---|---|---|---|---|
| Diameter of largest fibroid, % ($n$) | | | | | |
| <5 cm | 100 (10) | 0 | 0 | <0.001 | 0 |
| 5-10 cm | 77.40 (48) | 11.3 (7) | 11.3 (7) | | 12.7 |
| >10 cm | 29.0 (9) | 48.4 (15) | 22.60 (7) | | 43.8 |
| Number fibroid/s removed | | | | | |
| 1 ($n$=64) | 71.9 (46) | 21.9 (14) | 6.2 (4) | | 8 |
| 2 ($n$=11) | 90.9 (10) | 0 | 9.1 (1) | | 9 |
| 3 ($n$=9) | 44.4 (4) | 33.3 (3) | 22.3 (2) | | 33 |
| 4 ($n$=7) | 57.1 (4) | 14.3 (1) | 28.6 (2) | | 33 |
| 5 ($n$=4) | 25.0 (1) | 0 | 75.0 (3) | | 75 |
| 6 ($n$=2) | 100 (2) | 0 | 0 | | - |
| 7 ($n$=1) | 0 | 100 (1) | 0 | | - |
| >7 ($n$=5) | 0 | 60.0 (3) | 40.0 (2) | | 100% |

LM: Laparoscopic myomectomy, OM: Open myomectomy

**Table 3: Multiple logistic regression showing factors associated with laparo-conversion during myomectomy (uterus size, number of myoma, and weight of myoma)**

| | LM (*n*=67) | Laparo-conversion (*n*=14) | Adjusted OR | 95% CI | *P* |
|---|---|---|---|---|---|
| Uterus size (weeks) | 14 (median) | 17 (median) | 1.105 | 0.983-1.242 | 0.093 |
| Number of myoma | Single: 67.2% | Single: 28.6% | 1.00 | 1.865-67.151 | 0.008 |
| | Multiple: 32.8% | Multiple: 71.4% | 11.192 | | |
| Weight of myoma (g) | ≤500 g: 92.5% | ≤500 g: 42.9% | 1.00 | 2.957-104.499 | 0.002 |
| | >500 g: 7.50% | >500 g: 57.1% | 17.580 | | |

LM: Laparoscopic myomectomy, CI: Confidence interval, OR: Odds ratio

**Table 4: Intraoperative and postoperative data of the study subjects**

| | LM (*n*=67) | OM (*n*=22) | Laparo-conversion (*n*=14) | *P* |
|---|---|---|---|---|
| Blood loss (ml) | 406.60±339.55 | 1290.48±1163.57 | 1017.86±941.69 | <0.001 |
| Duration of surgery (min) | 170.28±66.70 | 135.73±70.40 | 159.57±70.47 | 0.122 |
| Duration of hospital stay (day) | 2±1 | 3±1 | 3±1 | <0.001 |
| Postoperative complications | | | | |
| Anemia | 6.0 (4) | 50 (11) | 42.9 (6) | 0.001 |
| Subcutaneous emphysema | 4.5 (3) | 0 | 0 | |
| No complications | 89.5 (60) | 50.0 (11) | 57.1 (8) | 0.003 |

LM: Laparoscopic myomectomy, OM: Open myomectomy

**Table 5: Association test to compare types of surgeries with estimated blood loss, duration of surgery, and duration of hospital stay**

| | LM (*n*=67) | OM (*n*=22) | Laparo-conversion (*n*=14) | *P* |
|---|---|---|---|---|
| EBL (ml) | 200 (IQR 350) | 700 (IQR 1175) | 550 (IQR 1625) | 0.001*<br>LM versus OM (*P*=0.001)#<br>LM versus Laparo-conversion (*P*=0.001)# |
| Duration of surgery (min) | 160 (IQR 100) | 110 (IQR 64) | 140 (IQR 101) | 0.028*<br>LM versus OM (*P*=0.017)# |
| Duration of hospital stay (days) | 2 (IQR 2) | 3 (IQR 3) | 2 (IQR 2) | 0.028*<br>LM versus OM (*P*=0.001)# |

*Kruskal–Wallis test, #*Post hoc* analysis, Mann–Whitney U-test. LM, Laparoscopic myomectomy, OM: Open myomectomy, IQR: Interquartile range, EBL: Estimated blood loss

Intraoperative and postoperative data of the study subjects are shown in Table 4. Mean estimated blood loss (EBL) was significantly reduced in LM group (406.60 ± 339.55 ml) than in the OM and laparo-conversion groups (1290.48 ± 1163.57 ml) and (1017.86 ± 941.69 ml), respectively, ($P < 0.001$). Duration of hospital stay was also significantly less in LM (2 ± 1 days) compared to both OM and laparo-conversion groups (3 ± 1 days) ($P < 0.001$). Duration of surgery was not significantly different between all the groups.

A higher percentage of women underwent OM had hemoglobin level <10 g/dL after surgery compared to LM and laparo-conversion groups ($P = 0.001$). Subcutaneous emphysema was reported in women underwent LM. Those who had no complications were significantly higher in LM group compared to OM and laparo-conversion groups ($P = 0.003$).

Correlation analysis was done between EBL, duration of surgery and duration of hospital stay with the three types of surgeries [Table 5]. *Post hoc* analysis showed that LM has significantly lower EBL compared to OM and laparo-conversion (both $P = 0.001$). LM has significantly longer duration of surgery ($P = 0.017$) but shorter duration of hospital stay ($P = 0.001$) compared to OM.

There was a significant decrease in the duration of LM performed to remove single fibroid between 2010–2012 and 2012–2014 [Table 6]. The mean duration of surgery for 30 cases performed in 2012–2014 was 154.60 ± 54.18 min, which was significantly shorter than that of the 16 cases performed in 2010–2011, 198.94 ± 79.0 min ($P = 0.016$).

## Discussion

All women who underwent myomectomy in this study had clinical symptoms such as menorrhagia, dysmenorrhea, abdominal mass, infertility and other symptoms which lead to reduced quality of life. This retrospective study revealed that morbidity outcomes between laparoscopy and OM

**Table 6: Mean duration of surgery for removal of single fibroid laparoscopically in 2010-2011 and 2012-2014**

| | 2010-2011 (*n*=16) | 2012-2014 (*n*=30) | *P* |
|---|---|---|---|
| Duration of surgery (min) | 198.94±79.00 | 154.60±54.18 | 0.016 |

are generally different. There were differences in fibroids characteristics, blood loss, duration of hospital stay, and postoperative complications. LM was commonly used to remove myoma as it has a better cosmetic result and faster recovery than the OM.

However, when dealing with large fibroids, potential surgical complications might challenge the surgeon's operative skills and patience. Currently, there is no clear-cut definition as to what is the maximum size of uterine fibroid should be considered for LM. The main factors in employing of LM are as follows: size of the fibroid, number of fibroids, the ability to secure hemostasis by laparoscopy, the removal of large fibroids out of the abdomen, the repair of the uterine incision, and the control of operative blood loss.

In this study, for all women with small fibroids (<5 cm diameter), LM was the best choice of surgery compared to OM. However, in substantial number of cases, LM can be performed in cases where the fibroids size was up to 10 cm diameter. In contrast, the majority of the OM procedures (68.2%) were performed to remove fibroids size >10 cm. Hence, LM was effective for removal of fibroids with up to 10 cm diameter, while OM should be performed in fibroids bigger than 10 cm.

The laparo-conversion rate in this study (17%) is within the range of many studies conducted worldwide (1.8%–41.4%).[15,16] In this study, laparo-conversions were mainly due to the presence of multiple fibroids more than 4 and size of fibroid more than 10 cm. This is in concordant with the size of fibroids removed for the laparo-conversion group in another study.[17] The difficulty faced during removal of large fibroid was due to minimal intraperitoneal space for manipulation during laparoscopy. Our data showed that laparo-conversion was required if there were more than four fibroids. This was similarly seen in a study involved 143 Caucasian women.[18] Another factor which contributes to the laparo-conversion rate in this study is the weight of the myoma.

Our morbidity analysis in this study favored LM in terms of blood loss, short duration of hospital stay, and less postoperative complications. This was similarly seen in many other studies.[7,16,17] More than 50% of women who underwent LM reported no postoperative complications, which is higher than those in the OM and laparo-conversion groups. Postoperative complications such as hemoglobin level <10 g/dL was common in women underwent OM. It should be noted that this was highly seen in women underwent OM in this study due to increased intraoperative blood loss in OM compared to LM. There are four cases with EBL of more than 2500 ml. The highest one is 4500 ml and this is due to a complicated surgery with moderate-severe adhesions involving the removal of 21 fibroids with a total weight of 1.38 kg. The surgery lasted for 340 min. Our data showed that a number of fibroids removed and increased duration of surgery was significantly associated with elevated intraoperative blood loss.

Duration of surgery between 2010–2012 and 2012–2014 shows that there was a significant reduction in the duration of LM performed to remove the single fibroid. This finding indicates the improvement of surgical skills in performing LM over 5-year period in surgeons.

Our study had several strengths and limitations. The number of patients converted from LM to OM is smaller in this study compared to larger series due to lack of collaboration as well as retrospective and prospective reviews. Despite recent infatuation in robotic myomectomies as one of the minimally invasive surgeries, the study participants were all LM and OM as it saves both time and money. Furthermore, our gynecologists have been well trained in laparoscopic surgical skills. Careful preoperative selection for LM and OM will eventually reduce laparo-conversion rate in patients undergo myomectomy, thereby reducing the duration of surgery and hospital stay.

## Conclusion

Our study showed both LM and OM are safe and reliable surgical methods with distinct surgical indications and outcomes. LM has several advantages over OM such as faster recovery and minimal risk; hence, LM should be the intended surgery. Preoperative evaluation of the size and number of myomas is necessary for careful selection of the patients to prevent laparo-conversion and to reduce the intraoperative and postoperative complications.

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### Conflicts of interest

There are no conflicts of interest.

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