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# Ultrasonographic Characters of Uterine Myoma as Predictors for Successful Laparoscopic Myomectomy at Mansoura University Hospital

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***Abstract***

***Background:*** *Myomectomy is the surgical procedure of choice for symptomatic myoma in the reproductive age, especially if future fertility is desired. LM is the surgical removal of uterine myoma through small incisions in the abdomen. It is an appropriate, if not preferred, alternative to abdominal myomectomy in well-selected patients since it offers shorter hospitalization, short recovery period and resumption of activities within 1–2 weeks, reduced risk of blood transfusion, and intraoperative adhesions .Aim: The aim of the current study was to determine the diagnostic accuracy of different ultrasonographic characters of uterine myoma in predicting success of laparoscopic myomectomy .**Methods:** The present study was prospective interventional study that was carried out on 35 cases with Chronic pelvic pain. All patients had radiological evaluation by TVS and TAS. All Laparoscopic myomectomies done under general anaesthesia. Outcomes included determining ultra-sonographic predictors for successful laparoscopic myomectomy as regards site, size, and character of Myoma, presence of capsule and line of separation around myoma .**Results:** The most common complain among the studied cases was bleeding followed by pain and lastly infertility. Regarding location, the most common site was posterior followed by fundal, then anterior and lastly at the cornu. Operative times, blood loss amount, method of extraction, need laparoscopic suturing, complications during surgery recovery and hospital stay after operation demonstrated significant relation with outcomes. Myoma characters, numbers and type demonstrated insignificant relation with outcomes .**Conclusion:** The current study concluded that, myoma characters, numbers and type could not be used as predictors for successful LM; outcomes. However, operative times, blood loss amount, complications during surgery recovery and hospital stay after operation were less in successful LM than in LAM; and laparoscopic suturing and morcellation have less time consumption and better results than LAM.*

***Keywords:*** *Myomectomy, Laparoscopic Myomectomy, Laparoscopic-Assisted Myomectomy, Minimally Invasive Surgery, Exploratory Laparotomy.*

## 1. Introduction

Myomectomy is the surgical procedure of choice for symptomatic myoma in the reproductive age, especially if future fertility is desired. Myomectomy may also be performed for those who desire to preserve their uterus for social, cultural, and psychological reasons, despite having completed family size. Although myomectomies have traditionally been executed through the abdominal route, advances in technology and modern-day laparoscopic instruments have brought about a rise in laparoscopic myomectomies (LMs).

Most frequent complications independent from surgeon's experience remain to be massive intraoperative bleeding and conversion to hysterectomy. The criteria, however, which constitute proper selection of patients for LM, are still a matter of debate. The first reported LM was done in 1979 by a German gynecologist, Dr. Kurt Semm. He already utilized intra- and extra-corporeal suturing though he received a lot of criticism for his innovations and novel procedures. Although there have been many new methods and tools that have arisen, the basic technique formulated by Dr. Semm still remains **[2, 3]**.

Myoma diagnosis has been substantially improved in the last decade, mainly due to higher sensitivity and specificity of imaging modalities and improved knowledge about how a myoma alters normal endometrial function. The frequency of myoma varies according to age, inheritance, and possibly body mass index **[4]**.

LM is performed by insertion of a 10-mm telescope in the umbilicus and using two to three 5-mm accessory ports. An incision is made through the uterine wall to the pseudocapsule of the myoma using a monopolar spatula. The cleavage plane of the myoma is then identified followed by enucleation of the mass using blunt and sharp dissection. The resulting defect is then repaired with continuous intracorporeal sutures using delayed absorbable or barbed sutures. The specimen is retrieved either by placing the specimen in a bag after which it is brought up to the largest port site and then morcellated either using a blade or scissors or with the use of a power morcellator **[3]**.

Laparoscopic-assisted myomectomy (LAM), on the other hand, is defined as the use of a mini-laparotomy (<5 cm length abdominal incision) to perform enucleation of the myoma, uterine closure, or specimen retrieval. In endoscopy centers where new technology and techniques for specimen retrieval abound, recourse to LAM is considered a conversion to an open procedure **[1]**.

Recent studies demonstrate that the complications after myomectomy have been increasing in the last decade **[5]**. This trend can partially be attributed to the shift toward childbearing at a later age. Problems with infertility, as well as progressively larger myomas that are also increasing in number, are more common in this age group. A growing number of gynecologists with unjustified confidence at myoma excision by minimally invasive surgery (MIS) without sufficient training in laparoscopic suturing and electromechanical morcellation might also be attributed to these statistics **[6]**. So, the aim of this work was to determine the ultrasonographic characters of uterine myoma as predictors for successful laparoscopic myomectomy.

## 2. Patients And Methods

This prospective interventional study was carried from 2020 to 2023 and included patients admitted to the Department of Obstetrics and Gynecology, Mansoura University and minimally invasive surgery Unit. This study included women aged between 20-45 years old, with chronic pelvic pain related to myoma after exclusion of other causes of pain, with abnormal uterine bleeding, with infertility requiring assisted reproductive technology, with recurrent IVF failure, with myoma size between 3-15 cm and with type 2-5 myoma according to FIGO classification. But we excluded women with recurrent myomas, with myoma type 0,1,2,8, with suspicion of malignancy, with any contraindication for laparoscopy as; medical conditions worsened with abdominal distension and Trendelenburg position for prolonged period and with anesthetic contraindications such as in some cardiac conditions.

### Methods

Full history was taken from all the patients including personal history, complaint, menstrual, obstetric, past history family history and present history, general and abdominal examination and local examination were done. All patients had radiological evaluation by TVS and TAS (in virgin patients). Type of Ultrasound device used was canon Toshiba Aplio model TUS-A500 and GE model GEHC 17-inch display model. Size of the myoma in centimetres, location of the myoma, and type of myoma, Prescence of capsule and determination of vascularity by Doppler were determined and compared to the

intraoperative findings. Full preoperative preparation (full CBC, liver function tests, serum creatinine, RBS, ECG) and anesthetic consultation were done.

**Technique**

All Laparoscopic myomectomies done under general anaesthesia with a 10-mm telescope (Karl Storz Endoscope, Tuttlingen, Germany) and (Richard Wolf-GYNECARE endoscope set) through one optic trocar located in the umbilicus and two 5-mm accessory trocars placed at right and left iliac region as regard to size of myoma +/- suprapubic trucar if needed. Glypressin or diluted ephedrine was used as injection at site of myoma before myomectomy. Monopolar and bipolar electrocoagulation were used for enucleation and haemostasis. The uterine wall defect was repaired by absorbable sutures vicryl type. Extraction of myoma was done either by morcellator with precautions and after written consent from the patient or by mini-laparotomy. Complications such as blood transfusion and pelvic organ injuries, as well as reasons for conversion to either LAM or exploratory laparotomy (EL) were also recorded. Conversion from laparoscopy to laparotomy was done in case of heavy bleeding while doing laparoscopic myomectomy difficult to be controlled, technical difficulties, very large fibroid and when technical difficulties encountered, and if patient withdraws her consent before operation.

**Ethical consideration**

Study protocol was submitted for approval by IRB faculty of medicine – Mansoura University. Approval of the mangers of the health care facilities in which the study was conducted. The purpose of this study was explained to all participants. Informed verbal and written consent were obtained from each participant sharing in the study. Women were counseled about merits and disadvantages of laparoscopic myomectomy and also will be counseled about possibility of conversion to laparotomy in case of difficulty to remove the myoma laparoscopically and in case of heavy bleeding.

**Outcomes**

Primary outcome included determining ultra-sonographic predictors for successful laparoscopic myomectomy as regards site (according to FIGO classification and determine which types will be easily done), size, and character of Myoma as regard presence of degeneration and calcification, and presence of capsule and line of separation around myoma or not. While, secondary outcomes included time of procedure, complications related to the technique, factors predicting technique failure, and blood loss and need for blood transfusion.

**Statistical Analysis**

Data analysis was performed by SPSS software, version 25 (SPSS Inc., PASW statistics for windows version 25. Chicago: SPSS Inc.). Qualitative data were described using number and percent. Quantitative data were described using median (minimum and maximum) for non-normally distributed data and mean± Standard deviation for normally distributed data after testing normality using Kolmogrov-Smirnov test. Significance of the obtained results was judged at the (≤0.05) level. Chi-Square, Fisher exact test tests were used to compare qualitative data between groups as appropriate. Mann Whitney U test was used to compare between 2 studied groups for non-normally distributed data. Student t-test was used to compare 2 independent groups for normally distributed data.

## 3. Results and Discussion

The present study is prospective interventional study that was carried out on 35 cases with Chronic pelvic pain related to myoma to determine the diagnostic accuracy of different ultrasonographic characters of uterine myoma in predicting success of laparoscopic. Table **(1)** shows that mean age of the studied cases was 36.77±4.61 ranging from 27 to 49 years, median gravidity was 2 ranging from 0 to 4, median parity was 2 ranging from 0 to 4, 91.4% are married. Of the studied cases; 12 have previous cesarean section; 5 once, 5 cases twice and 12 cases have CS three times, 57.1% of the studied cases complains of bleeding, 14.3% infertility and 28.6% pain, 60% of the studied cases have positive surgical history, 28.6% associated medical disease, 22.9% have infertility with infertility duration is 13.5 years ranging from 2 to 19 years. The median number of myomas was 1 ranging from 1 to 6, 51.4% of the myomas are located posterior, 42.9% fundal, 28.6% anterior, 5.7% cornu. Types of myoma were distributed as following; 42.9% hybrid type 2 to 5, 31.4% type 6, 17.1% type 4, 11.4% type 5, 8.6% type 7 and 2.9% type 3. Median size of largest diameter of the studied myomas is 6 ranging from 3 to 20 mm.

Of the studied myomas; 94.3% have capsule, 97.1% are vascular, 20%shows degeneration and 25.7% have calcifications.

**Table (1):** Demographic, obstetric history, Complaints, surgical and medical history of the studied cases

| | N=35 | % |
|---|---|---|
| Age / years<br>mean±SD (MIN-MAX) | 36.77±4.61 (27-49) | |
| Gravidity<br>median (min-max) | 2(0-4) | |
| Parity<br>median (min-max) | 2(0-4) | |
| Marital status<br>Single<br>Married | <br>3<br>32 | <br>8.6<br>91.4 |
| Number of previous cesarean sections<br>One<br>Two<br>Three | N=12<br>5<br>5<br>2 | <br>41.7<br>41.7<br>16.7 |
| Complaints | | |
| Bleeding | 20 | 57.1 |
| Infertility | 5 | 14.3 |
| Pain | 10 | 28.6 |
| Surgical history | 21 | 60.0 |
| Associated Medical history | 10 | 28.6 |
| Presence of infertility | 8 | 22.9 |
| Infertility duration<br>Median (min-max) | 13.5(2-19) | |
| Number of myoma<br>Median (min-max) | 1(1-6) | |
| Site | | |
| Anterior | 10 | 28.6 |
| Fundal | 15 | 42.9 |
| Posterior | 18 | 51.4 |
| Cornu | 2 | 5.7 |
| Type | | |
| 3<br>4<br>5<br>6<br>7<br>Hybrid 2-5 | 1<br>6<br>4<br>11<br>3<br>15 | 2.9<br>17.1<br>11.4<br>31.4<br>8.6<br>42.9 |
| Size | 6(3-20) | |
| Capsule | 33 | 94.3 |
| Vascularity | 34 | 97.1 |
| Degeneration | 7 | 20.0 |
| Calcifications | 9 | 25.7 |

Table (2) demonstrates that median operative time was 70 minutes ranging from 40 to 150 minutes, median amount of blood loss is 300 ml ranging from 100 to 1500 ml. Methods of myoma extraction is as following; 68.6% morcellation, 20% mini laparotomy, 5.7% laparotomy and 5.7% endobag, 80% need laparoscopic suturing. Of the studied cases 68.6% have no complications during surgery suturing recovery. Median hospital stay duration was 3 days ranging from 1 to 9 days. Laparoscopic success was detected among 74.3% and 25.7% laparoscopic assisted.

**Table (2):** Operative characters and complications during surgery recovery

| | N | % |
|---|---|---|
| Operative times (minutes)<br>median (min-max) | 70(40-150) | |
| Blood loss amount(ml)<br>median (min-max) | 300(100-1500) | |
| Method of extraction of myoma<br>Morcellation<br>Mini laparotomy<br>Laparotomy<br>Endobag | <br>24<br>7<br>2<br>2 | <br>68.6<br>20.0<br>5.7<br>5.7 |
| Need laparoscopic suturing | 28 | 80.0 |
| Complications during surgery recovery<br>No<br>technical problem of morcellation<br>Laparotomy broad pedicle high vascular<br>Large number of fibroids<br>Deep cavity - difficult suturing | <br>28<br>1<br>2<br>2<br>2 | <br>80.0<br>2.9<br>5.7<br>5.7<br>5.7 |
| Hospital stays after operation(days)<br>median (min-max) | 3.0(1-9) | |
| laparoscopic assisted<br>Success | 9<br>26 | 25.7<br>74.3 |

Table **(3)** illustrates no statistically significant difference between cases with laparoscopic assisted and those with successful laparoscopy as regard their age, gravidity, parity, marital status and number of previous CS, there was no statistically significant difference between studied groups as regard complaints including bleeding, infertility and pain. There was no statistically significant difference between studied groups as regard previous surgical history and medical history, there was no statistically significant difference between studied groups as regard presence of infertility and infertility duration.

Table **(4)** demonstrates no statistically significant difference between studied groups as regard number of myomas and site of myoma, no statistically significant difference between studied groups as regard type of studied myomas, no statistically significant difference between studied groups as regard myoma characters.

**Table (3):** Relation between demographic, obstetric characters, complaints, surgical, medical history, infertility history and outcomes of the studied cases

| | **laparoscopic assisted n=9(%)** | **Success N=26(%)** | **Test of significance** | **P value** |
|---|---|---|---|---|
| **Age / years** | 37.33±5.81 | 36.58±4.23 | t=0.419 | 0.678 |
| **Gravidity** | 2(0-4) | 2(0-4) | Z=0.954 | 0.340 |
| **Parity** | 1(0-4) | 2(0-4) | Z=1.13 | 0.260 |
| **Marital status**<br>**Single**<br>**Married** | <br>0<br>9(100.0) | <br>3(11.5)<br>23(88.5) | FET=1.14 | 0.553 |
| **Number of previous cesarean sections** | 2(2-2) | 2(1-3) | Z=0.469 | 0.639 |
| **Complaints** | | | | |
| Bleeding | 4(44.4) | 16(61.5) | $\chi^2$=3.59 | 0.166 |
| Infertility | 3(33.3) | 2(7.7) | | |
| Pain | 2(22.2) | 8(30.8) | | |
| **Surgical history** | 6(66.7) | 15(57.7) | $\chi^2$=0.224 | 0.636 |
| **Associated Medical history** | 1(11.1) | 9(34.6) | $\chi^2$=1.81 | 0.179 |
| **Infertility history** | | | | |
| Presence of infertility | 3(33.3) | 5(19.2) | $\chi^2$=0.754 | 0.385 |

| | | | | |
|---|---|---|---|---|
| Infertility duration | 15(3-15) | 12(2-19) | Z=0.153 | 0.879 |

t: Student t test, Z: Mann Whitney U test, $\chi^2$=Chi-Square test, FET: Fisher exact test
Parameters described as mean±SD, median (min-max), number (percentage)

**Table (4):** Relation between number, site, type, chanceries of myoma and outcome of the studied cases.

| | laparoscopic assisted n=9 | Success N=26 | Test of significance | P value |
|---|---|---|---|---|
| Number of myoma | 1(1-6) | 1(1-6) | Z=0.431 | 0.666 |
| Site | | | | |
| Anterior | 3(33.3) | 7(26.9) | $\chi^2$=0.135 | 0.714 |
| Fundal | 3(33.3) | 12(46.2) | $\chi^2$=0.449 | 0.503 |
| Posterior | 6(66.7) | 12(46.2) | $\chi^2$=1.13 | 0.289 |
| Cornu | 0 | 2(7.7) | FET=0.734 | 1.0 |
| Type | | | | |
| 3 | 0 | 1(3.8) | FET=0.356 | 1.0 |
| 4 | 3(33.3) | 3(11.5) | FET=2.24 | 0.162 |
| 5 | 0 | 4(15.4) | FET=1.56 | 0.553 |
| 6 | 3(33.3) | 8(30.8) | $\chi^2$=0.02 | 0.886 |
| 7 | 1(11.1) | 2(7.7) | FET=0.1 | 1.0 |
| Hybrid 2-5 | 4(44.4) | 11(42.3) | FET=0.012 | 1.0 |
| Characters | | | | |
| Size (mm) | 8(4-20) | 5(3-8) | Z=1.82 | 0.073 |
| Capsule | 9(100) | 24(92.3) | FET=0.734 | 1.0 |
| Vascularity | 9(100) | 25(96.2) | FET=0.356 | 1.0 |
| Degeneration | 3(33.3) | 4(15.4) | FET=1.35 | 0.246 |
| Calcifications | 1(11.1) | 8(30.8) | $\chi^2$=1.35 | 0.245 |

$\chi^2$=Chi-Square test, Z: Mann Whitney U test, FET: Fisher exact test

Table **(5)** shows a statistically significant higher median operative time is detected among laparoscopic assisted group than successful cases (80 versus 60 minutes). Median blood loss is higher among laparoscopic assisted than successful cases (700 versus 300 ml). A statistically significant difference was detected between studied groups as regard method of myoma extraction with 77.8% mini laparotomy and 22.2% laparotomy versus 92.3% of successful cases by morcellation and 7.7% endobag for laparoscopic assisted and successful cases respectively. A statistically significant difference was detected between studied groups as regard need for laparoscopic suturing with 92.3% of successful cases versus 44.4% of cases with laparoscopic assisted. There was statistically significant difference between studied groups as regard complications and hospital stay after operation. None of successful cases have complications. Mean hospital stay after operation was higher mean laparoscopic assisted than successful cases.

**Table (5):** Relation between operative characters, complications and outcome of the studied cases.

| | laparoscopic assisted n=9 | Success N=26 | Test of significance | P value |
|---|---|---|---|---|
| Operative times(minutes) | 80(60-150) | 60(40-150) | Z=2.17 | 0.03* |
| Blood loss amount(ml) | 700(200-1500) | 300(100-1000) | Z=2.78 | 0.0005* |
| Method of extraction of myoma<br>Morcellation<br>Mini laparotomy<br>Laparotomy<br>Endobag | <br>0<br>7(77.8)<br>2(22.2)<br>0 | <br>24(92.3)<br>0<br>0<br>2(7.7) | MC=35 | P<0.001* |
| Need laparoscopic suturing | 4(44.4) | 24(92.3) | FET=9.57 | P=0.002* |
| Complications | | | | |

| | | | | |
|---|---|---|---|---|
| Complications during surgery recovery | | | | |
| No | 2(22.2) | 26(100.0) | | |
| Technical problem of morcellation | 1(11.1) | 0 | | |
| Laparotomy broad pedicle high vascular | 2(22.2) | 0 | MC=25.28 | <0.001* |
| Large number of fibroids | 2(22.2) | 0 | | |
| Deep cavity - difficult suturing | 2(22.2 | 0 | | |
| Hospital stay after operation (days) | | | | |
| mean±SD | 4.0±1.12 | 2.77±0.65 | t=4.03 | <0.001* |

Z: Mann Whitney U test, FET: Fisher exact test, MC: Monte Carlo test, *statistically significant

**Discussion**

Myomectomy is the surgical procedure of choice for symptomatic myoma in the reproductive age, especially if future fertility is desired. Myomectomy may also be performed for those who desire to preserve their uterus for social, cultural, and psychological reasons, despite having completed family size. Although myomectomies have traditionally been executed through the abdominal route, advances in technology and modern-day laparoscopic instruments have brought about a rise in laparoscopic myomectomies (LMs) [1].

LM is the surgical removal of uterine myoma through small incisions in the abdomen. It is an appropriate, if not preferred, alternative to abdominal myomectomy in well-selected patients since it offers shorter hospitalization, short recovery period and resumption of activities within 1–2 weeks, reduced risk of blood transfusion, and intraoperative adhesions [2].

LM is performed by insertion of a 10-mm telescope in the umbilicus and using two to three 5-mm accessory ports. An incision is made through the uterine wall to the pseudocapsule of the myoma using a monopolar spatula. The cleavage plane of the myoma is then identified followed by enucleation of the mass using blunt and sharp dissection. The resulting defect is then repaired with continuous intracorporeal sutures using delayed absorbable or barbed sutures. The specimen is retrieved either by placing the specimen in a bag after which it is brought up to the largest port site and then morcellated either using a blade or scissors or with the use of a power morcellator [3].

The risks and benefits of LM are controversial due to the procedure being reputably difficult with long operating times, requiring a steeper learning curve, and having a high risk of conversion to laparotomy. Difficulties encountered include identification of the cleavage plane, which may provoke increased blood loss and difficulty in apposition of the resulting defect in the myometrium due to its depth, length, and location [7].

Conversion to laparotomy is more time- and cost-consuming than deciding on an open procedure from the outset. Hence, being able to identify the characteristics of patients who have a higher probability of having a successful LM can aid in patient selection. This will not only help avoid unnecessary expenses for the patient, but also prevent further complications [1]. Thus, the aim of the current study was to determine the diagnostic accuracy of different ultrasonographic characters of uterine myoma in predicting success of laparoscopic myomectomy.

This was a prospective interventional carried out on a total of 35 cases with Chronic pelvic pain related to myoma from 2020 to 2023 who were admitted to the Department of Obstetrics and Gynecology, Mansoura University and minimally invasive surgery Unit (specialized unit concerned with laparoscopy and hysteroscopy operations.

Regarding demographic and obstetric history, the current study demonstrated that; the mean age of the studied cases is 36.77±4.61 ranging from 27 to 49 years, median gravidity is 2 ranging from 0 to 4, median parity is 2 ranging from 0 to 4, 91.4% are married. Of the studied cases; 12 have previous cesarean section; 5 once, 5 cases twice and 12 cases have CS three times. Regarding complain, the most common complain among the studied cases was bleeding followed by pain and lastly infertility. In the current prospective interventional study, Laparoscopic success was achieved among 74.3% while 25.7% was laparoscopic assisted. Moreover, demonstrated no statistically significant difference between studied groups as regard number of myoma. On the other hand, in a prior study included patients who

underwent either robotic (RM), laparoscopic (LM), or abdominal (OM) myomectomy, significantly more myomas were excised in the OM group than in the RM and LM groups [8].

Myomas are detected in 70% of uteri after hysterectomy, where multiple myomas are present in more than 80% of cases [9]. Myoma prevalence was largely underestimated in previous epidemiological studies that focused mostly on symptomatic women [10, 11]. By using more advanced non-invasive imaging techniques, such as 3D-4D ultrasonography (US) screening on the general population, epidemiological studies have become more accurate over the past two decades [10, 12].

Concerning, ultrasonographic characters, the current study demonstrated that median number of myomas are 1 ranging from 1 to 6, 51.4% of the myomas are located posterior, 42.9% fundal, 28.6% anterior, 5.7% cornu. Types of myoma are distributed as following; 42.9% hybrid type 2 to 5, 31.4% type 6, 17.1% type 4, 11.4% type 5, 8.6% type 7 and 2.9% type 3. Median size of largest diameter of the studied myomas is 6 ranging from 3 to 20 cm. Of the studied myomas; 94.3% have capsule, 97.1% are vascular, 20%shows degeneration and 25.7% have calcifications.

Also, Zimmermann and his colleagues have demonstrated that; Women with a diagnosis of uterine fibroids reported significantly more often about bleeding symptoms than women without a diagnosis: heavy bleedings (59.8% vs. 37.4%), prolonged bleedings (37.3% vs. 15.6%), bleeding between periods (33.3% vs. 13.5%), frequent periods (28.4% vs. 15.2%), irregular and predictable periods (36.3% vs. 23.9%). Furthermore, women with diagnosed uterine fibroids reported significantly more often about the following pain symptoms: pressure on the bladder (32.6% vs. 15.0%), chronic pelvic pain (14.5% vs. 2.9%), painful sexual intercourse (23.5% vs. 9.1%) and pain occurring mid-cycle, after and during menstrual bleeding (31.3%, 16.7%, 59.7%, vs. 17.1%, 6.4%, 52.0%). 53.7% of women reported that their symptoms had a negative impact on their life in the last 12 month, influencing their sexual life (42.9%), performance at work (27.7%) and relationship & family (27.2%) [13].

As regards, type of myoma, the current study demonstrated that; no statistically significant difference was recorded between studied groups as regard type of studied myomas.in fact submucus fibroids were excluded from our literature depending on doing laparoscopic myomectomy from FIGO type 3 to 7 and FIGO type 0.1.2 were excluded.

On the other hand, Martinez and Domingo have displayed that; there was a significant association between the type of myoma and procedure. Intramural and subserous myomas were associated with successful LM, while submucous myomas were associated with conversion to either LAM or EL [1]. Dubuisson and his colleagues have displayed that; the best prediction model included factors that were found to be independently related to the risk of conversion of Laparoscopic myomectomy to an open procedure which include intramural type (adjusted OR = 4.3; 95% CI = 1.3–14.5) [7].

As regards, myoma characters, the current study demonstrated that; no statistically significant difference was recorded between studied groups as regard myoma characters (size, capsule, vascularity, degeneration, calcifications). Likewise, there were no statistically significant difference as regards number of and site of myoma. In contrast, in a prior study, the number and weight of myomas were significantly associated with laparo-conversion, with a rate of 17% [14].

Additionally, in the current trial, there was no statistically significant difference between studied groups as regard the site of myoma with more anterior and posterior location in successful laparoscopic group. This came in the same line with Martinez and Domingo, who have displayed that; There was no significant association between the size of the myoma or its location to the procedure performed [1].

In addition, Bucu and Domingo have revealed that; size and location were not associated with either LM or open procedure; however, this conclusion may be limited by the small sample size. A large-scale multi-center prospective study may be necessary to validate the role of the proposed predictors to prevent unplanned conversion to an open procedure thereby reducing cost and increasing safety of LM [15].

Dubuisson and his colleagues have displayed that; the best prediction model included factors that were found to be independently related to the risk of conversion of Laparoscopic myomectomy to an open procedure which include size 50 mm at US (adjusted OR = 10.3; 95% CI = 2.8–37.9) and anterior location (adjusted OR = 3.4; 95% CI = 1.3–9.0) [7]. But Dubuisson and his colleagues stated that because the anterior wall of the uterus is less accessible to the operative trocars, particularly during the repair of the uterine defect, an anterior site has a higher probability of conversion [7].

Conversely, in a previous study, Successful LM was demonstrated to be correlated with the type of myoma, in particular subserous and intramural myoma, while submucous myoma was demonstrated to

have a higher probability of conversion to LAM or EL [1]. This could be explained by as they are easily accessible and situated outside of the uterus, subserous myomas are the best form for LM. These myomas are easily enucleated, and one or two layers of suturing can be sufficient to repair the superficial defect. The laparoscopic removal of intramural myomas is reliant upon the depth of invasion [16]. Another explanation is that suturing a deep hysterotomy may be challenging for big intramural myomas that span the entire myometrium, particularly if they include a submucous component. This is because multiple layers may be needed [17]. This could lead to insufficient uterine healing, which could cause uterine rupture in later pregnancies or hematoma formation just after the procedure [18]. While skilled surgeons may be able to suture the uterus laparoscopically, there is ongoing discussion on uterine closure, with some authors stressing that LM is insufficient to repair the uterus in cases of deep invasion myomas [1].

With regard to complications, the current study demonstrated that there was a statistically significant difference between studied groups as regard complications and hospital stay after operation. None of successful cases have complications. Mean hospital stay after operation is higher mean laparoscopic assisted than successful cases. In terms of the relation between operative characters and outcomes the present demonstrated that there was a statistically significant higher median operative time is detected among laparoscopic assisted group than successful cases (80 versus 60 minutes). Median blood loss is higher among laparoscopic assisted than successful cases (700 versus 300 ml). A statistically significant difference is detected between studied groups as regard method of myoma extraction with 77.8% mini laparotomy and 22.2% laparotomy versus 92.3% of successful cases by morcellation and 7.7% endobag for laparoscopic assisted and successful cases respectively. A statistically significant difference is detected between studied groups as regard need for laparoscopic suturing with 92.3% of successful cases versus 44.4% of cases with laparoscopic assisted. Furthermore, in the current work, statistically significant higher operative time and blood loss were detected among laparoscopic assisted group than successful cases. Despite those results showed no statistically significant difference between the two groups as regard myoma size, it showed larger size in LA group.

Similarly, in a prior five year trial, the mean blood loss was significantly reduced in LM group than the OM and laparo-conversion groups [14]. In the same way, Martinez and Domingo found that laparoscopic assisted group showed prolonged operative time and more Hb drop and attributed it to significant larger size of myoma in LA group than successful group [1].

In contrary to present results, a prior study demonstrated that the RM group had a significantly larger myoma size and higher weight than the LM and OM groups. However, the operative time was significantly higher in the RM group than in the OM and LM groups, although no difference was observed between the OM and LM groups [8].

Of note, results showed that size of myoma was significantly associated with operative time and postoperative hemoglobin drop [2]. It is likely for a large myoma to be associated with increased operative time since a large mass would take a longer time to cleave and enucleate. Greater hemoglobin drop can also be explained by the highly distended perimyomatous vasculature brought about by bulk compression of the mass, thus increasing the risk of intraoperative hemorrhage [7]. Likewise, in another study, median (range) surgical time and blood loss were both significantly less in the LM group than in the OM group (100 min [73–120 min] versus 120 min [90–146 min], and 100 mL [100–200 mL] versus 150 mL [100–305 mL], respectively) [19].

Moreover, in the current work, it showed a statistically significant difference is detected between studied groups as regard method of myoma extraction with 77.8% mini laparotomy and 22.2% laparotomy versus 92.3% of successful cases by morcellation and 7.7% endobag for laparoscopic assisted and successful cases respectively.

Similarly, Sinha and his colleagues successfully performed enucleation by morcellation while the myoma is still attached to the uterine corpus with or without prior devascularization [18]. Other studies employed internal crushing and retrieval through colpotomy, but this was shown to increase recuperation time [1, 20].

Concerning the relation between complications and outcomes, the current study illustrated that there was a statistically significant difference between studied groups as regard complications and hospital stay after operation. None of successful cases have complications. Mean hospital stay after operation is higher mean laparoscopic assisted than successful cases.

This came in the same line with Twijnstra and his colleagues who have displayed that; surgical experience also predicted the successful outcome of laparoscopic hysterectomy with respect to adverse events (P=0.036,) [21].

What is more, in the present study, there was a statistically significant difference between studied groups as regard complications and hospital stay after operation. None of successful cases have complications. Hospital stay after operation was higher in laparoscopic assisted than successful cases. Similarly, in another study in Putrajaya Hospital, most women underwent LM (88%) had no postoperative complications compared to OM (50%) and laparo-conversion (57.1%). The duration of hospital stay was also significantly less in LM (2 ± 1 days) compared to both OM and laparo-conversion groups (3 ± 1 days) (D'Silva et al., 2018). Also, in a previous study, data showed that converted cases were associated with more intraoperative blood loss and a longer hospital stay compared with LM or planned AM (Sandberg et al., 2016).

Besides, in the current trial, it showed a statistically significant difference is detected between studied groups as regard need for laparoscopic suturing with 92.3% of successful cases versus 44.4% of cases with laparoscopic assisted. Parallel to these result, prior studies demonstrated that Multilayer suturing, which calls for a trained and experienced surgeon, can be used to accomplish uterine closure. Self-locking barbed sutures are an innovation that makes the procedure easier to carry out. In order to prevent tissue necrosis and preserve the integrity of the tissue that needs to be mended, bipolar coagulation must be used carefully. This will ensure that wounds heal properly. Suturing in several layers without using too much tension yields the best results [1].

## Conclusion

The current study concluded that, myoma characters, numbers and type could not be used as predictors for successful LM; outcomes. However, operative times, blood loss amount, complications during surgery recovery and hospital stay after operation were less in successful LM than in LAM; and laparoscopic suturing and morcellation have less time consumption and better results than LAM. however, this conclusion may be limited by the small sample size. A large-scale multicentric prospective study is necessary to validate the role of the proposed predictors to prevent unplanned conversion to an open procedure and reduce cost and increase safety of LM.

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