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Feasibility of single step hysteroscopic myomectomy: fibroid size is the most significant factor based on data from a single centre and surgeon

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ABSTRACT

Background: Uterine fibroids are the most common benign solid neoplasms of the uterus. Hysteroscopy represents the gold standard treatment for submucosal fibroids.

Objectives: The aim of this study was to retrospectively analyse all consecutive symptomatic patients diagnosed with the International Federation of Gynecology and Obstetrics G0-G3 fibroids who underwent hysteroscopic myomectomy, to identify factors that may influence the feasibility of single step myomectomy.

Methods: The study included all consecutive symptomatic patients, diagnosed with G0-G3 fibroid. Surgical procedure was performed by a single experienced surgeon. All patients underwent postoperative hysteroscopic control 30-40 days after the procedure.

Main Outcomes Measures: Evaluation of feasibility of hysteroscopic myomectomy in a single surgical step.

Results: One hundred and twenty-five patients were included. In 97 women (77.6%) the fibroid was removed in one single step; 28 patients (22.4%) had a residual fibroid. Of these patients, in 10 cases (35.7%) the residual fibroid was removed during the office hysteroscopic control, 16 (57.2%) and 2 (7.1%) patients required II- and III-time myomectomy, respectively. 85.6% of patients did not need a second time surgery under general anaesthesia. At univariate and multivariate analysis, diameter was found to be the parameter most related to single-step fibroid removal with P=0.001 and P<0.001 respectively. For G0-3 fibroids <3 cm in 72% (66/92) of cases the 15 Fr mini-resectoscope was used with one step myomectomy in 89.4% of cases.

Conclusions: In expert hands, single step hysteroscopic myomectomy is feasible for G0-3 fibroids. The possibility to use miniaturized instruments for myomectomy may improve the surgical outcomes and prevent intra- and post-operative complications, in particular uterine perforation by avoiding cervical dilation. Further studies are needed to evaluate the true efficacy of 15 Fr mini-resectoscope in the removal of G0-G3 fibroids <3 cm.

What is New? Hysteroscopic myomectomy in a single surgical step is feasible for G0-G3 fibroids, with diameter being the only independent factor influencing the success of the procedure. In expert hands, the success rate of single step myomectomy by using miniaturized instruments in fibroids ≤3 cm, is 89.4%.

Keywords: Fibroid, myoma, hysteroscopy, myomectomy

This study was presented as an abstract at the 2024 Hartus Congress.

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Introduction

Uterine fibroids (leiomyomas) are the most common benign solid neoplasms of the uterus.[1]

The prevalence varies widely (4.5%-68.6%) due to factors such as ethnicity; it may be underestimated because they can be asymptomatic.[2,3]

The most widely used classification system is the 2011 classification of the International Federation of Gynecology and Obstetrics (FIGO). This classification was updated in 2018, with G3 fibroids now being classified as submucosal myomas.[4]

Submucosal fibroids are typically the most symptomatic and are often associated with abnormal uterine bleeding (AUB). They can also cause pelvic pain or subfertility.[5]

Advancements in technology have made direct visualization of the uterine cavity essential for the diagnosis and treatment of intrauterine pathologies. Hysteroscopy is currently considered the gold standard for the treatment of submucosal fibroids.[6]

According to the Consensus of the Global Community of Hysteroscopy (GCH) Scientific Committee, type 0-1 fibroids are more likely to be removed in a single surgical step, while type 2 fibroids may require multiple steps.[7] The optimal surgical approach for type 3 fibroids has not yet been definitively established.[5]

Therefore, clinicians should be encouraged to publish their findings until prospective studies are available. In this context, our study seeks to identify the key factors influencing the feasibility of performing hysteroscopic myomectomy as a single-step procedure. We present our data, which includes a standardized diagnostic and therapeutic approach, as well as an analysis of patient characteristics and the conditions that determine the success of a one-step procedure in patients with symptomatic submucosal fibroids (G0-3), all of whom consecutively underwent hysteroscopic myomectomy under the care of a single surgeon.

Methods

Study Design and Population

This was a retrospective review of consecutive symptomatic patients diagnosed with FIGO G0-G3 fibroids who underwent surgical treatment by a single operator (U.C.) during the period between January 2021 and November 2023, in the Digital Hysteroscopic Clinic (DHC) Class Hysteroscopy of Rome. Patients were identified from hospital DHC records. Prior to starting patient enrolment, the study protocol obtained the approval from the Fondazione Policlinico Universitario Agostino Gemelli IRCCS Ethics Committee (approval no: 6659, date: 11.04.2024).

Patients' records were checked individually, and data were collected. Only patients who underwent pre- and post-operative evaluation at our DHC were included. Exclusion criteria included asymptomatic patients; preoperative positive pregnancy test; severe comorbidity or concomitant uterine malformation.

All patients underwent pre-operative work-up, including ultrasound and hysteroscopy simultaneously followed by sonohysterography to reliably attribute the fibroid FIGO grade.[4]

Oral progestin therapy or gonadotrophin-releasing hormone analogues (GnRH-a) were considered for all patients based on the fibroid size, from 1 to 3 months before surgery. Fibroids <4 cm underwent oral progestin therapy (acetate norethisterone 5 mg or desogestrel 75 mcg/day). Fibroids >4 cm underwent GnRH-a (acetate leuprorelin 3.75 mg every 28 days). Some patients did not receive pre-operative hormonal therapy due to comorbidities that made its use infeasible or because of the caregiver's decision.

The surgical procedures were carried out by a single experienced surgeon (U.C.) under general anaesthesia, according to an ambulatory model of care.[8] The surgeon selected the instrument to use based on the patients' (previous deliveries or uterine surgeries, fertility desire, access to the uterine cavity) and the fibroids' characteristics (grade, site and dimension of the lesion). Instruments used included Bipolar 26 and 15 Fr Resectoscopes, 5 mm Bettocchi hysteroscope (Karl Storz, Tuttlingen, Germany) with 5 Fr instruments and/or tissue removal device (TRD) (Truclear Elite Mini, Medtronic). The uterine cavity was distended with saline solution (0.9% NaCl) provided through an electronic irrigation system (Endomat, Karl Storz, Tuttlingen, Germany). The parameters used were continuous flow between 200 and 400 mL/min; intrauterine pressure between 100 and 140 mmHg. Strict intraoperative monitoring of fluid balance was performed. Antibiotic prophylaxis was never administered. Surgical techniques included slicing and enucleation, used alone or in combination.[6]

Type 0 fibroids were resected using the classical slicing technique using a bipolar diathermic loop of a 26 Fr (Figure 1) or 15 Fr resectoscope, progressively excising the lesion from the free surface to the base.

Types 1-3 fibroids were resected with a bipolar loop of a 26 Fr or 15 Fr resectoscope (Figure 2), using the slicing technique for the intracavitary component, followed by cold loop mobilization and enucleation of the intramural component using Mazzon cold loop technique.[9] Mazzon et al.[9], and completing resection with the slicing technique. In patients of reproductive age with G2-3 fibroids and minimal intracavitary involvement, a technique was employed to minimize the loss of the overlying endometrium. This approach involved making a small incision in the endometrium covering the fibroid to expose the cleavage plane between the pseudo capsule

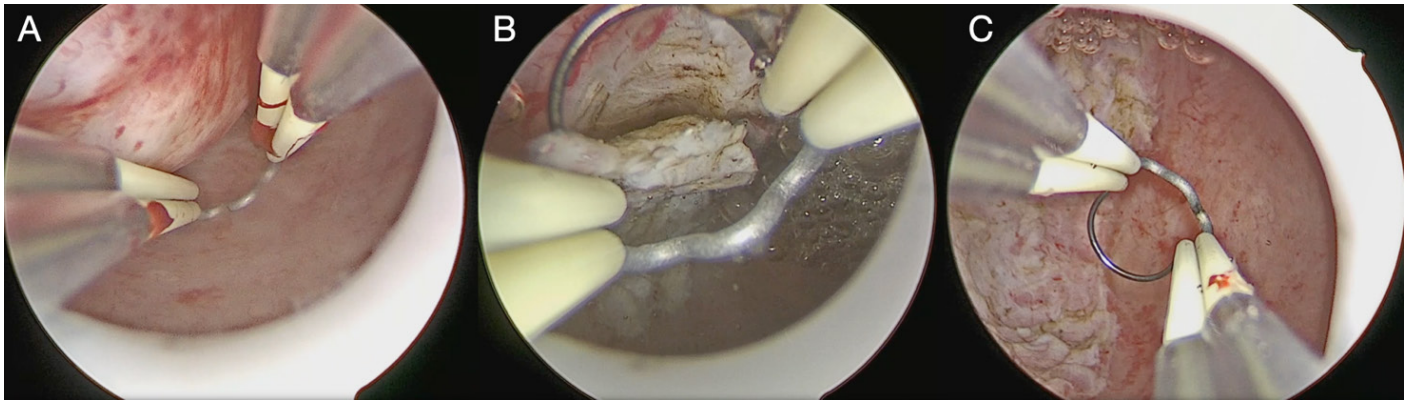

Figure 1. Myomectomy of a 3 cm G0 fibroid using a bipolar diathermic loop of a 26 Fr resectoscope. A and B) Slicing technique using the 90° loop. C) Fibroid fovea after its complete removal.

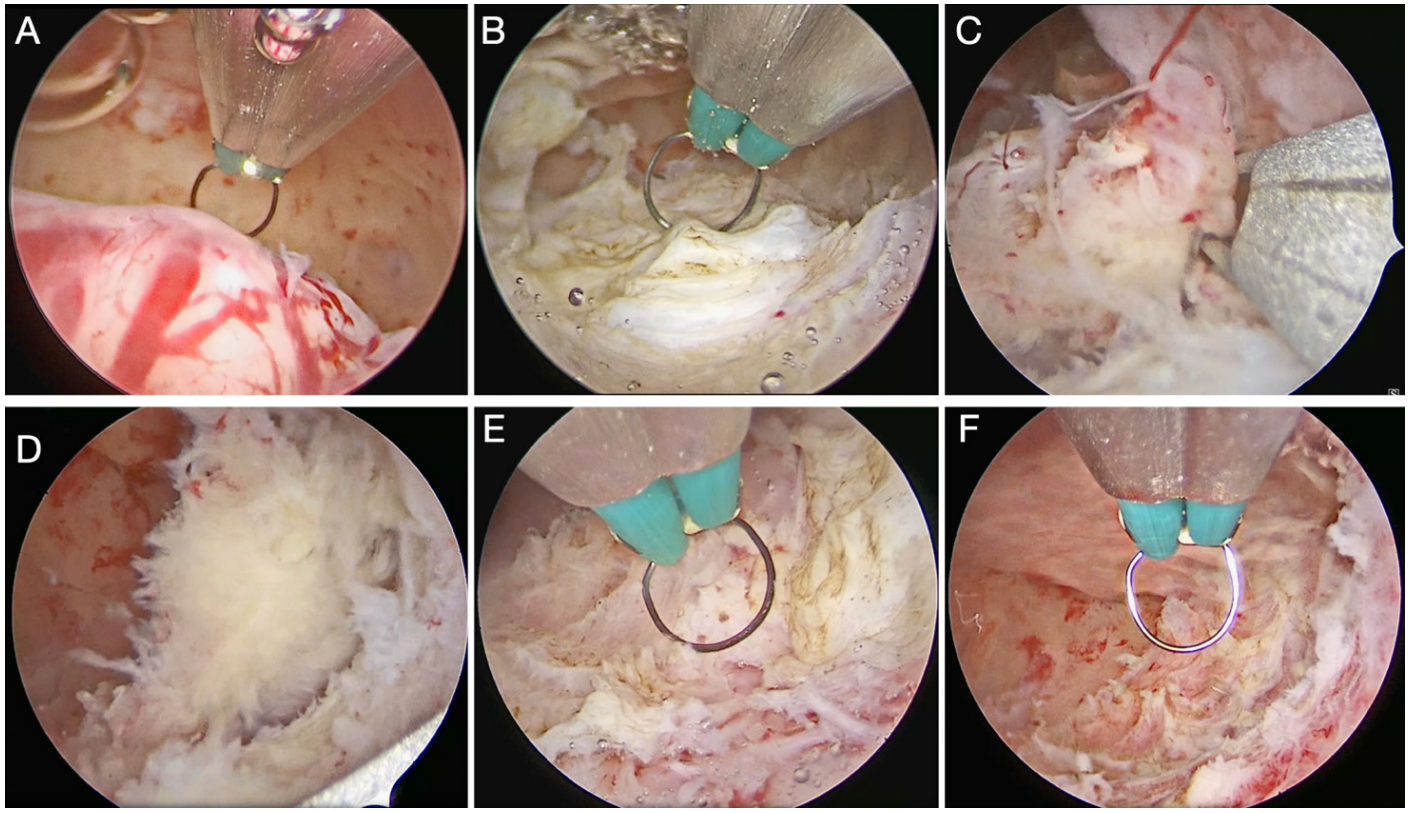

Figure 2. Myomectomy of a 2 cm G1 fibroid using a 15 Fr bipolar mini-resectoscope. A and B) Removal of the intracavitary portion using the slicing technique with a 90° loop. C) Cold loop mobilization and enucleation of the intramural component using Mazzon cold loop technique. D) Vision of the intramural portion of the fibroid exteriorized in the uterine cavity. E) Completion of the resection with 90° loop. F) Fibroid fovea after its complete removal.

and the myometrium, thereby preserving the surrounding healthy endometrium.[10]

In case of fundal fibroid, the Collins loop of the 15 Fr mini-resectoscope was used, modifying the technique described by Lasmar et al.[6] to enucleate the fibroid and then dissect it once almost completely in the uterine cavity (Figure 3).

In a minority of cases, removal of the fibroid was performed using a Bettocchi hysteroscope and a TRD. This technique was used in patients motivated to perform the procedure without anaesthesia. Miniaturized 5 Fr instruments were used to separate the fibroid from the surrounding myometrium. TRD was used to "morcellate" the fibroid from the uterine cavity (Figure 4). Moreover, this technique was limited to small fibroids ≤20 mm.

All patients underwent an office hysteroscopic control 30-40 days after the procedure.

Statistical Analysis

Data analysis was mainly descriptive. Categorical items were summarized by absolute counts and percentages while quantitative variables were reported as median and range. A logistic regression model was implemented to analyse associations between patients, fibroids and therapy features and the need for multiple steps procedures; odds ratios (OR) and their 95% confidence intervals were reported.

Results

One hundred and fifty-two patients underwent hysteroscopic myomectomy by the same surgeon (U.C.). Twenty-seven patients were excluded for missing pre- and/or post-operative evaluation at our DHC. One hundred and twenty-five patients were included in our analysis.

The median age was 43 years old. The most frequent symptoms were AUB in 66.4% (83/125) and infertility in 30.4% (38/125) of patients.

Of the 38 patients with infertility, 6 (15.8%) had previous miscarriages of which 4 were recurrent. The median diameter of fibroids (considering the largest one in cases of multiple fibroids) was 20 mm (5-65) and the median number of fibroids was 1 (1-6).

Patients' characteristics were reported in Table 1.

In 97 women (77.6%) the fibroid has been removed in one single step; 28 patients (22.4%) had a residual fibroid at hysteroscopic control. Of these patients, in 10 cases (35.7%) the residual fibroid has been removed during the office hysteroscopic control. No intrauterine adhesions

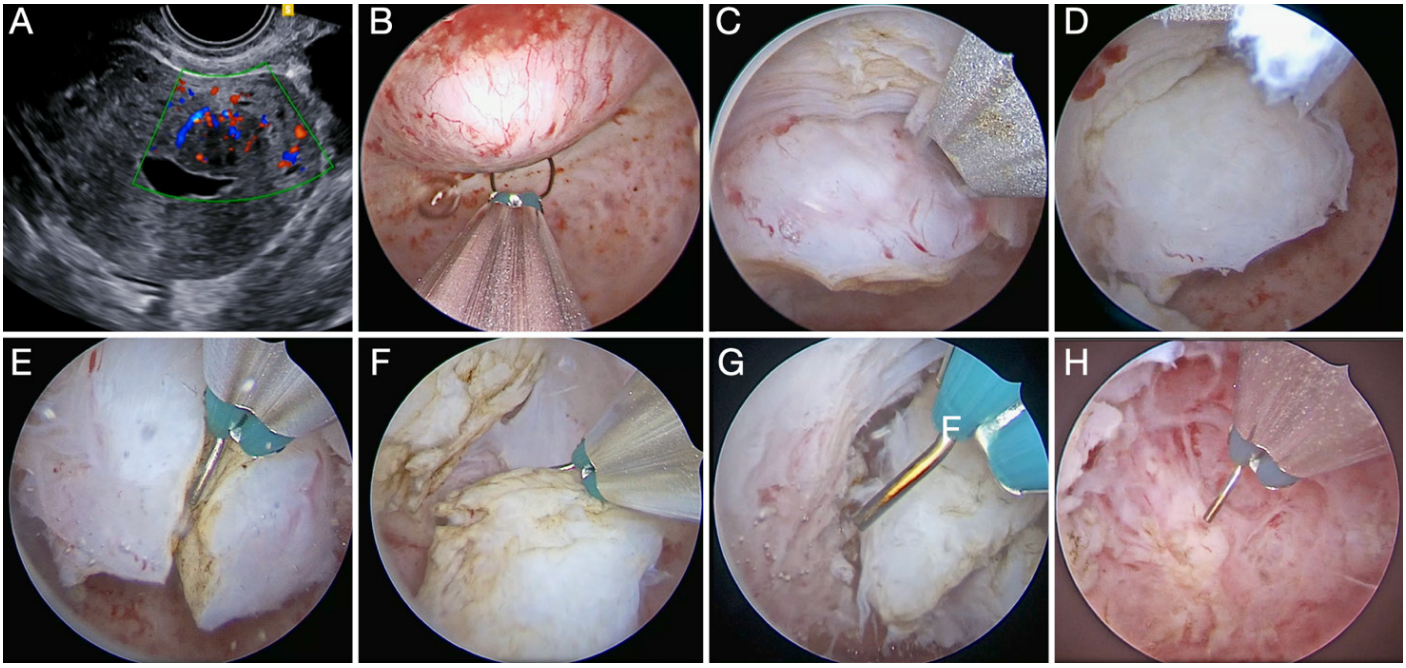

Figure 3. Myomectomy of a 2 cm G2 antero-fundal fibroid using a 15 Fr bipolar mini-resectoscope. A) Ultrasonographic vision of the intramural component of thefibroid. B) Removal of the intracavitary portion using the slicing technique with a 90° loop. C) Cold loop mobilization and enucleation of the intramural component using Mazzon cold loop technique. D) Vision of the intramural portion of the fibroid exteriorized in the uterine cavity. E-G) Use of Collins loop to cut and dissect the fundal part of the fibroid from the surrounding myometrium. H) Fibroid fovea after its complete removal.

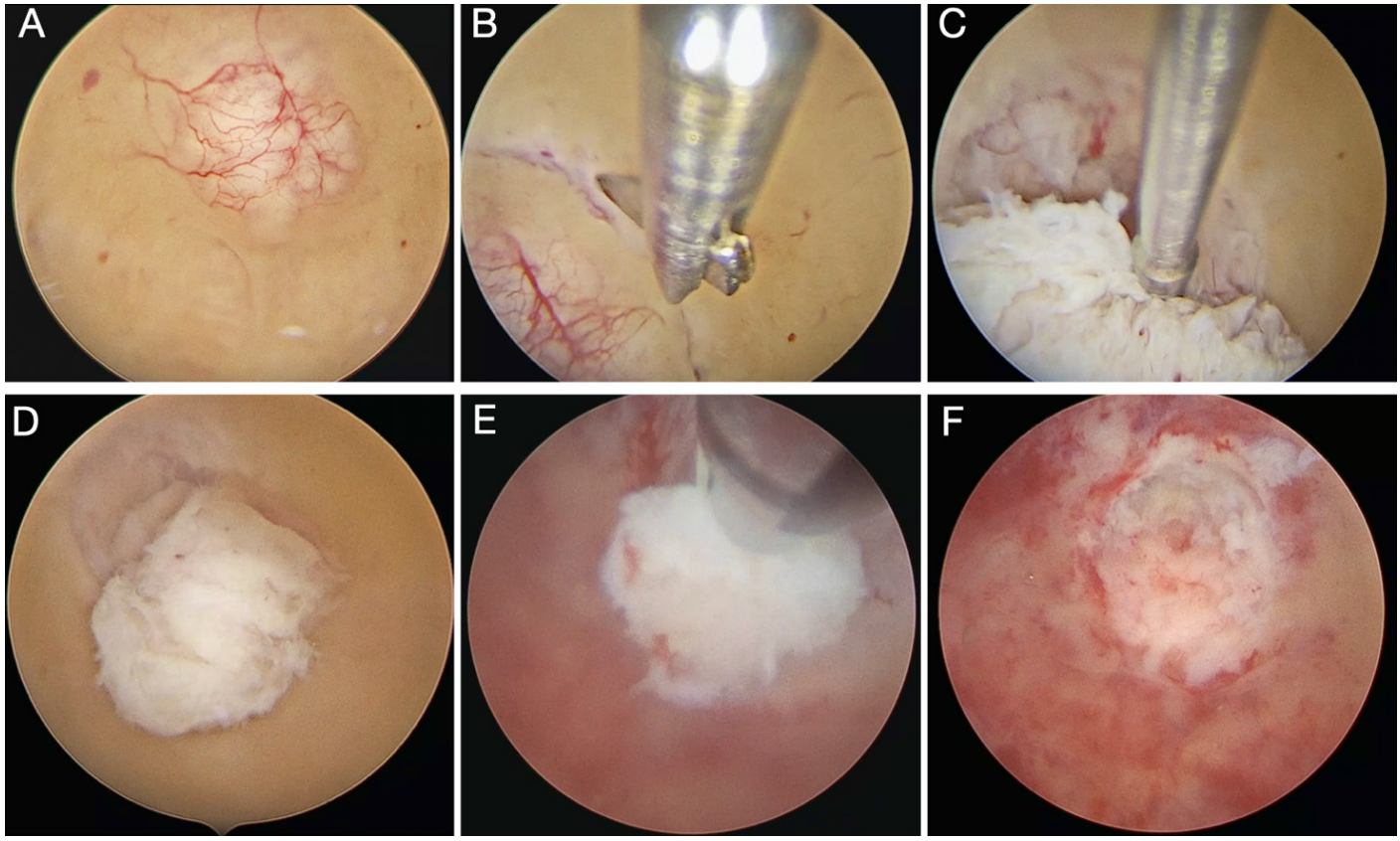

Figure 4. Myomectomy of a 1 cm G3 fundal fibroid using a 5 mm hysteroscope and a TRD. A) Visualization of the fundal lesion. B and C) Use of 5 Fr scissors to separate the fibroid from the surrounding myometrium. D) Vision of fibroid completely exteriorized in the uterine cavity. E) Use of dense tissue blade of TRD to "morcellate" the fibroid from the uterine cavity. F) Fibroid fovea after its complete removal.

TRD: Tissue removal device.

were found to office hysteroscopic controls. Sixteen/28 (57.2%) and 2/28 (7.1%) patients required II- and III-surgical step, respectively. Consequently, 85.6% (107/125) of patients did not need a second surgical time, but the fibroid was removed in one single step (97/125) or the residual fibroid was removed the office hysteroscopic control (10/125). Only 14.4% of patients (18/125) needed a second surgical step under anaesthesia. The median size of fibroid removed in one single step was 20 mm (5-65 mm) whereas fibroids that needed multiple step procedures measured 30 mm (15-52 mm) (Table 1).

To identify factors that may influence the feasibility of hysteroscopic myomectomy in one-step, our population was stratified according to the variables that may affect the surgical outcomes (Table 2).

The number of fibroids did not seem to affect the removal in one or multiple steps. The size (maximum diameter of the larger fibroid), the FIGO grade and the site seem to influence the possibility to perform multiple steps procedures. In particular, the 93.75% (15/16) of patients who needed a second time surgery and the 100% (2/2) who needed a third time surgery, presented with fibroid >2 cm. For the FIGO grade, the 37.1% (36/97) of patients were affected by G2 fibroids in case of single step myomectomy, which increased to 80% (8/10), 62.5% (10/16) and 100% (2/2) for residual fibroids removed during office hysteroscopic control, second step surgery and third step surgery, respectively. Regarding fibroids' site, patients who underwent single step procedures had more frequently anterior or posterior fibroids: the fibroid was anterior in 33% (32/97) of cases and posterior in the 38,1% (37/97). Patients who underwent 2 and 3 steps myomectomy had fundal localization in 31.3% (5/16) and 50% (1/1) respectively. The pre-operative pharmacological preparation affects the surgical outcomes: the 43.8% (7/16) of patients who underwent second step surgery was not under hormonal therapy prior to the hysteroscopic myomectomy.

Table 1. Characteristics of: all patients (n=125); patients who underwent myomectomy in a single surgical step (n=97); patients in which the residual fibroid was removed during the office hysteroscopic control (n=10); patients who underwent two steps hysteroscopic myomectomy (n=16); patients who underwent three steps hysteroscopic myomectomy (n=2).

Characteristics	All n=125	One step n=97	Office n=10	Two steps n=16	Three steps n=2
Age (years) median (range)	43 (25-68)	45 (27-68)	40.5 (49-25)	41 (49-34)	40.5 (40-41)
Parity					
Nulliparous	64 (51.2%)	45 (46.4%)	6 (60.0%)	12 (75.0%)	1 (50.0%)
Spontaneous abortion	11 (12.8%)	8 (8.2%)	1 (10.0%)	1 (6.2%)	1 (50.0%)
TOP	1 (2.4%)	-	-	1 (6.2%)	-
Spontaneous delivery	29 (23.2%)	25 (25.8%)	2 (20.0%)	2 (12.6%)	-
Caesarean section	20 (15.2%)	19 (19.6%)	1 (10.0%)	-	-
Previous surgery					
None	77 (61.6%)	55 (56.7%)	7 (70.0%)	14 (87.5%)	1 (50.0%)
Yes, at least one surgery	48 (38.4%)	42 (43.3%)	3 (30.0%)	2 (12.5%)	1 (50.0%)
Caesarean section	20	19	1	-	-
HSC myomectomy	17	14	-	2	1
LPS/LPT myomectomy	9	6	3	-	-
Other	6	6	-	-	-
Symptoms					
AUB	83 (66.4%)	67 (69%)	5 (50.0%)	11 (68.7)	-
Pelvic pain	2 (1.6%)	2 (2.1%)	-	-	-
Infertility	38 (30.4%)	26 (26.8%)	5 (50.0%)	5 (31.3)	2 (100.0%)
Multiple miscarriages	2 (1.6%)	2 (2.1%)	-	-	-
Therapy					
None	57 (45.6%)	48 (49.5%)	2 (20.0%)	7 (43.7%)	-
Yes	68 (54.4%)	49 (50.5%)	8 (80.0%)	9 (56.3%)	2 (100.0%)
Oral EP	61 (89.7%)	48 (97.9%)	6 (75.0%)	6 (66.7%)	1 (50.0%)
GnRH-a	7 (10.3%)	1 (2.1%)	2 (25.0%)	3 (33.3%)	1 (50.0%)
Instrument					
5 mm hysteroscope	7 (5.6%)	7 (7.2%)	-	-	-
15 Fr bipolar miniresectoscope	70 (56.0%)	60 (61.9%)	4 (40.0%)	6 (37.5%)	-
26 Fr bipolar resectoscope	44 (35.2%)	26 (26.8)	6 (60.0%)	10 (62.5%)	2 (100%)
Tissue removal device	4 (3.2%)	4 (4.1%)	-	-	-
Number of fibroids					
1	95 (76.0%)	73 (75.3%)	8 (80.0%)	12 (75.0%)	2 (100%)
>1	30 (24.0%)	24 (24.7%)	2 (20.0%)	4 (25.0%)	-
Maximum diameter (mm) (median, range)	20 (5-65)	20 (5-65)	26 (15-40)	30 (15-52)	39 (30-48)
FIGO grade					
0	25 (20.0%)	24 (24.7%)	-	1 (6.3%)	-
1	37 (29.6%)	31 (32.0%)	1 (10.0%)	5 (31.2%)	-
2	56 (44.8%)	36 (37.1%)	8 (80.0%)	10 (62.5%)	2 (100%)
3	7 (5.6%)	6 (6.2%)	1 (10.0%)	-	-
Site					
Anterior	38 (30.4%)	32 (33.0%)	3 (30.0%)	3 (18.8%)	-
Lateral	16 (12.8%)	13 (13.4%)	-	3 (18.8%)	-
Posterior	47 (37.6%)	37 (38.2%)	5 (50.0%)	4 (25.0%)	1 (50.0%)
Fundal	21 (16.8%)	13 (13.4%)	2 (20.0%)	5 (31.2%)	1 (50.0%)
Isthmic	3 (2.4%)	2 (2.0%)	-	1 (6.2%)	-

TOP: Termination of pregnancy, HSC: Hysteroscopic, LPS: Laparoscopic, LPT: Laparotomic, AUB: Abnormal uterine bleeding, EP: Estro-progestins, GnRH-a: Gonadotrophin-releasing hormone analogues, FIGO: The International Federation of Gynecology and Obstetrics.

Table 2. Patients' stratification according to the fibroids' characteristics: number, size, site, FIGO grade, pre-operative pharmacological preparation.

n=125	One step myomectomy n=97	Office hysteroscopy n=10	Two steps myomectomy n=16	Three steps myomectomy n=2
No of fibroids				
=1	73 (75.3 %)	8 (80.0%)	12 (75.0%)	2 (100.0%)
=2	18 (18.5%)	1 (10.0%)	2 (12.5%)	-
=3	6 (6.2%)	-	2 (12.5%)	-
=4	-	-	-	-
=5	-	-	-	-
=6	-	1 (10.0%)	-	-
Maximum diameter (mm)				
<20	34 (35.0%)	1 (10.0%)	1 (6.2%)	-
≥20	63 (65.0%)	9 (90.0%)	15 (93.8%)	2 (100.0%)
Site*				
Lateral right	6 (6.2%)	-	2 (12.5%)	-
Lateral left	7 (7.2%)	-	1 (6.2%)	-
Anterior	32 (33.0%)	3 (30.0%)	3 (18.8%)	-
Fundal	13 (13.4%)	2 (20.0%)	5 (31.3%)	1 (50.0%)
Isthmus	2 (2.1%)	-	1 (6.2%)	-
Posterior	37 (38.1%)	5 (50.0%)	4 (25.0%)	1 (50.0%)
FIGO grade*				
0	24 (24.7%)	-	1 (6.2%)	-
1	31 (32.0%)	1 (10.0%)	5 (31.3%)	-
2	36 (37.1%)	8 (80.0%)	10 (62.5%)	2 (100.0%)
3	6 (6.2%)	1 (10.0%)	-	-
No therapy	48 (49.5%)	2 (20.0%)	7 (43.8%)	-
Oral	48 (49.5%)	6 (60.0%)	6 (37.5%)	1 (50.0%)
GnRH-a	1 (1.0%)	2 (20.0%)	3 (18.7%)	1 (50.0%)

*Of the largest fibroid, FIGO: International Federation of Gynecology and Obstetrics, GnRH-a: Gonadotrophin-releasing hormone analogues.

Table 3 stratifies patient's population according to the instruments used during surgery, describing for each category interesting and potential influencing factors.

The 26 Fr bipolar resectoscope was used in the 35.2% (44/125) of total cases. In the 93.2% (41/44) of cases in which a 26 Fr resectoscope was used, the fibroid was >2 cm and the localization of the fibroid was posterior in the 43.2% (19/44) of cases, with grade G2 fibroid in the 45.5% (20/44) of patients. The median fibroid maximum diameter treated with 26Fr resectoscope was 33.7 (range 15-65) mm. The median procedure time was 33.3 (range 17-67) minutes. A residual fibroid was found in the 41% (18/44) of cases.

The 15 Fr bipolar mini-resectoscope was used in the 56% (70/125) of total cases. In the 64.3% (45/70) of cases in which a 15 Fr mini-resectoscope was used, the fibroid was >2 cm and the localization of the fibroid was anterior and posterior in the 38.6% (27/70) and 35.7% (25/70) of cases respectively, with grade G2 fibroid in the 48.6% (34/70) of patients. The median fibroid maximum diameter treated with 15Fr mini-resectoscope was 19.5 (range 9-32) mm. The median procedure time was 28.8 (range 6-64) minutes. A residual fibroid was found in the 14.3% (10/70) of cases.

According to our findings about the fibroid size, we decided to perform a sub-analysis in which the instruments used for the removal of fibroids ≤3 cm were evaluated, excluding the ones >3 cm. The fibroids ≤3 cm were 92/125. In 72% (66/92) of cases of fibroids ≤3 cm, a 15Fr mini-resectoscope was used; in 16% (15/92) of cases, a 26Fr resectoscope was used; in 12% (11/92), a 5 mm hysteroscope with 5 Fr instruments and/or a TRD were

Table 3. Instruments used during surgery accordingly to the main variables.

	5 mm hysteroscope 7/125 (5.6%)	15 Fr mini-resectoscope 70/125 (56%)	26 Fr resectoscope 44/125 (35.2%)	Tissue removal device 4/125 (3.2%)
No of fibroids				
=1	7 (100.0%)	48 (68.6%)	36 (81.8%)	4 (100.0%)
>1	-	22 (31.4%)	8 (18.2%)	-
Maximum diameter				
<20	6 (85.7%)	25 (35.7%)	3 (6.8%)	2 (50.0%)
≥20	1 (14.3%)	45 (64.3%)	41 (93.2%)	2 (50.0%)
Site*				
Lateral right	-	4 (5.7%)	4 (9.1%)	-
Lateral left	2 (28.6%)	6 (8.6%)	-	-
Anterior	2 (28.6%)	27 (38.6%)	7 (15.9%)	2 (50.0%)
Fundal	2 (28.6%)	8 (11.4%)	11 (25.0%)	-
Isthmus	-	-	3 (6.8%)	-
Posterior	1 (14.2%)	25 (35.7%)	19 (43.2%)	2 (50.0%)
FIGO grade**				
0	3 (42.9%)	10 (14.3%)	10 (22.7%)	2 (50.0%)
1	3 (42.9%)	18 (25.7%)	14 (31.8%)	1 (25.0%)
2	1 (14.2%)	34 (48.6%)	20 (45.5%)	1 (25.0%)
3	-	8 (11.4%)	-	-
Residual myoma				
No	7 (100.0%)	60 (85.7%)	26 (59.0%)	4 (100.0%)
Yes	-	10 (14.3%)	18 (41.0%)	-
Maximum diameter				
Median (range)	11.6 (6-20)	19.5 (9-32)	33.7 (15-65)	16.2 (10-20)
Time of procedure (minutes)				
Median, range	13.1 (6-21)	28.8 (6-64)	33.3 (17-67)	25.2 (10-38)

**Of the largest fibroid, FIGO: International Federation of Gynecology and Obstetrics.

used. In this population, when a 15 Fr mini-resectoscope was used, the fibroid was removed in one single surgical step in the 89.4% (59/66).

The fibroids >3 cm were 33/125. In the 97% (32/33) of these cases, the 26 Fr resectoscope was used.

In our population, no intraoperative (fluid overload or perforation) and postoperative complications were described.

Univariate analysis showed that diameter and pre-operative hormonal therapy are the parameters most related to single-step fibroid removal, with P=0.001 and P=0.019, respectively. Diameter is the only parameter that is confirmed also on multivariate analysis (P<0.001) (Table 4).

Discussion

In our cohort 85.6% of patients did not require a second-step myomectomy under anaesthesia. In 77.6% of cases the myomectomy was completed during the first surgical step and in 8% of cases during the office hysteroscopic control. Only 14.4% of patients needed a second surgical step. The need of multiple steps is more frequent in fibroids >2 cm, in FIGO grade 2 fibroids and in fundal location. In case of fibroids ≤3 cm, a 15Fr mini-resectoscope was used in the 72% of cases. In these patients, the myomectomy was completed in one surgical step in 89.4% of cases.

Our findings align with the GCH Scientific Committee Consensus, emphasizing the need of a thorough preoperative assessment using combined approach with transvaginal ultrasound and hysteroscopy.[7] This permits

Table 4. Factors associated with multiple steps procedures.

	Univariate OR (95% CI)	Multivariate OR (95% CI)
Therapy	*P*=0.019	-
No	Ref.	-
Oral	0.93 (0.30-2.83)	-
GnRH-a	9.52 (1.75-51.77)	-
Number of fibroids	*P*=0.85	-
1	Ref.	-
>1	0.89 (0.27-2.94)	-
Maximum diameter (mm)	*P*=0.001	*P*<0.001
	1.08 (1.03-1.13)	1.08 (1.03-1.13)
Maximum FIGO grade	*P*=0.14	
0-1	Ref.	
2-3	2.20 (0.77-6.28)	
Time of surgery (min)	*P*=0.075	-
	1.03 (1.00-1.07)	-

GnRH-a: Gonadotrophin-releasing hormone analogues, FIGO: International Federation of Gynecology and Obstetrics, OR: Odds ratio, CI: Confidence interval.

to perform also sonohysterography during the same step. The water distension allows to accurately evaluate the fibroid's extent in the uterine wall.

These findings highlight the importance of performing an office hysteroscopy 30-40 days after the main procedure to evaluate the uterine cavity and to eventually remove residual fibroid during this step.

The fibroids' number did not significantly affect the removal in one or multiple steps. The size, the FIGO grade and the site influenced the possibility to perform multiple steps procedures, but fibroid diameter was the only statistically significant parameter, even in multivariate analysis, related to single-step fibroid removal (*P*<0.001).

Regarding preoperative therapy, univariate analysis suggests that the use of GnRH-a negatively impacts the feasibility of performing surgery in a single step. However, when stratified by fibroid diameter, it is evident that patients treated with GnRH-a tend to have larger fibroids. Specifically, patients who did not receive preoperative hormonal therapy had fibroids with a median diameter of 21.1 mm at the time of surgery, those treated with oral therapy had a median diameter of 24.8 mm, and those treated with GnRH-a had fibroids with a median diameter of 40.3 mm. Therefore, although patients treated with GnRH-a appear more likely to require a multi-step procedure, these same patients also have larger fibroids. Since fibroid diameter is the only independent factor, influencing our primary outcome in this case series, it is not possible to definitively assess the true efficacy of presurgical GnRH-a treatment.

In the literature, different studies suggest that GnRH-a can facilitate surgery by reducing operative time, endometrial thickness, and fluid absorption,[11] but recent systematic reviews and meta-analyses indicate that GnRH-a does not significantly improve surgical outcomes.[12] In our study, the efficacy of GnRH-a is influenced by the bias of fibroid size, the most significant prognostic factor impacting the primary outcome.

Based on our experience and published data, pharmacological preparation, even with progestin alone, is essential in reducing endometrial thickness, improving intrauterine vision, reducing bleeding, and operative time.[13]

Our data described the possibility to remove the 72% of submucosal fibroids ≤3 cm with a 15 Fr mini-resectoscope, completing the procedure in one surgical step in 89.4% of cases. Previous studies showed one step complete resection rate with mini-resectoscope of 39.5%.[14] The technique standardization in our set-up offers a high success rate. The 97% of fibroids >3 cm were removed with a 26 Fr bipolar resectoscope.

Although the average fibroid volume in the 26 Fr group is significantly larger compared to the 15 Fr group (with diameters of 33.7 mm versus 19.5 mm), the operative time was only 4.5 minutes longer. While cervical dilation adds extra time, one advantage of the 26 Fr resectoscope is its larger loop. However, we acknowledge that the experienced operator using the 15 Fr mini-resectoscope is able to maintain a relatively short operative time due to their familiarity with the technique. This, however, may not be the case for less experienced operators, which could lead to longer procedure times. We recommend reserving the use of the 26 Fr resectoscope for fibroids larger than 3 cm. As also noted by Clark et al.[15], smaller-diameter operative hysteroscopes should be used whenever possible to minimize cervical trauma.

Our data shows no intraoperative and postoperative complications.

It is essential for all women of childbearing age to preserve the endometrial surface as much as possible by using surgical techniques[10] and instruments that minimize thermal damage to the greatest extent.[15]

The cold loop technique is critical for deeply intramural fibroids (G2-G3) with a thin myometrial free margin. This technique prevents uterine perforation, reduces thermal damage and the risk of intrauterine adhesions formation.[7,16]

To our knowledge, this is the first paper, in which the use of 15 Fr mini-resectoscope Collins loop was described to treat fundal fibroids. This technique was described by Lasmar et al.[6] using a 26 Fr resectoscope. This technique enhances the possibility to remove G2-3 fundal fibroids with few millimetres free myometrial margin, lowering the possibility of perforation.

Study Limitations

All the procedures were performed by the same surgeon. On one hand, this eliminate the variability seen in other studies where multiple operators are involved especially of non-comparable experience. On the other hand, this is a limit because the surgeon experience may affect the study reproducibility.

Another limit is the retrospective nature, resulted in some missing data or not perfectly standardized procedures, as the missing hormonal pre-operative therapy in a group of patients. Additionally, the sample size could affect the results' statistical significance, as the power was limited.

Hysteroscopic myomectomy is one of the most complex intrauterine surgeries, with potentially serious complications. In expert hands, it may be considered an effective and safe procedure.

Safety in myomectomy is made by a good preoperative evaluation and a correct operative act.

Further studies are needed to better understand the importance of preoperative hormonal preparation and which instrument use in relation with fibroid size, position and grade.

Conclusion

Hysteroscopic myomectomy in a single surgical step is feasible and should be the goal to reduce complications and increase patient satisfaction. Our data shows that fibroid diameter is the only independent factor determining the feasibility of performing the procedure in a single surgical step. Preoperative progestin therapy reduces endometrial thickness, enhancing intrauterine vision and facilitating complete fibroid removal. More studies are needed to evaluate the effectiveness of GnRH-a.

The ability to perform myomectomy with miniaturized instruments is crucial to avoid cervical dilation and reduce uterine perforation, minimizing damage to the surrounding endometrium, a key objective in patients of childbearing age. Further studies are needed to evaluate the true efficacy of 15 Fr mini-resectoscope in the removal of G0-G3 fibroids <3 cm.

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