Short-term quality of life after myomectomy for uterine fibroids from the COMPARE-UF Fibroid Registry

Shannon K. Laughlin-Tommaso, MD, MPH; Di Lu, MS; Laine Thomas, PhD; Michael P. Diamond, MD; Kedra Wallace, PhD; Ganesa Wegienka, PhD; Anissa I. Vines, PhD, MS; Raymond M. Anchan, MD; Tracy Wang, MD, MHS; G. Larry Maxwell, MD; Vanessa Jacoby, MD, MAS; Erica E. Marsh, MD, MSCI; James B. Spies, MD; Wanda K. Nicholson, MD, MPH; Elizabeth A. Stewart, MD; Evan R. Myers, MD, MPH

BACKGROUND: Uterine fibroids may decrease quality of life in a significant proportion of affected women. Myomectomy offers a uterine-sparing treatment option for patients with uterine fibroids that can be performed abdominally, laparoscopically (with or without robotic assistance), and hysteroscopically. Quality of life information using validated measures for different myomectomy routes, especially hysteroscopic myomectomy, is limited.

OBJECTIVE: To compare women's perception of their short-term health-related quality of life measures and reported time to return to usual activities and return to work for different routes of myomectomy.

MATERIALS AND METHODS: Comparing Options for Management: Patient-centered Results for Uterine Fibroids (COMPARE-UF) is a prospective nationwide fibroid registry that enrolled premenopausal women seeking treatment for uterine fibroids at 8 clinical sites. For this analysis, we included women undergoing hysteroscopic, abdominal, or laparoscopic myomectomy who completed the postprocedure questionnaire scheduled between 6 and 12 weeks after surgery. Health-related quality of life outcomes, such as pain, anxiety, and return to usual activitie, were assessed for each route. The hysteroscopic myomectomy group had large differences in demographics, fibroid number, and uterine size compared to the other groups; thus, a direct comparison of quality of life measures was performed only for abdominal and laparoscopic approaches after propensity weighting. Propensity weighting was done using 24 variables that included demographics, quality of life baseline measures, and fibroid and uterine measurements.

RESULTS: A total of 1206 women from 8 COMPARE-UF sites underwent myomectomy (338 hysteroscopic, 519 laparoscopic, and 349 abdominal). All women had substantial improvement in short-term health-related quality of life and symptom severity scores, which was not different among groups. Average symptom severity scores decreased about 30 points in each group. Return to usual activities averaged 0 days (interquartile range, 0—14 days) for hysteroscopic myomectomy, 21 days (interquartile range, 14—28 days) for laparoscopic myomectomy, and 28 days (interquartile range, 14—35 days) for abdominal myomectomy. After propensity adjustment, quality of life outcomes in the laparoscopic and abdominal myomectomy groups were similar except for more anxiety in the laparoscopic myomectomy group and slightly more pain in the abdominal myomectomy group. After propensity weighting, return to usual activities favored laparoscopic compared to abdominal procedures; median time was the same at 21 days, but the highest quartile of women in the abdominal group needed an additional week of recovery (interquartile range,14.0—28.0 for laparoscopic versus 14.0—35.0 for abdominal, $P < .01$). Time to return to work was also longer in the abdominal arm (median, 22 days; interquartile range, 14—40 days, versus median, 42; interquartile range, 27—56).

CONCLUSION: Women who underwent myomectomy had substantial improvement in health-related quality of life, regardless of route of myomectomy. After propensity weighting, abdominal myomectomy was associated with a nearly 2-week longer time to return to work than laparoscopic myomectomy.

Key words: fibroids, hysteroscopy, laparoscopy myomectomy, quality of life

Uterine fibroids (also called leiomyomas) are a leading cause of morbidity and surgery among reproductive-aged women.[1] Symptomatic fibroids can have a substantial impact on quality of life.[2] Myomectomy has been shown to treat symptoms, to improve quality of life, and to improve fertility outcomes[3] and can be approached abdominally, laparoscopically (with or without robotic assistance), or hysteroscopically.[4]

Quality of life measures are increasingly used for newer and nonsurgical fibroid procedures, but validated measures are less commonly reported on traditional myomectomy, especially for hysteroscopic myomectomy.[5] A 2018 meta-analysis was unable to report 12-month quality of life among the 6 studies on hysteroscopic myomectomy.[5] Similarly, a comparative effectiveness review on the management of uterine fibroids reported insufficient evidence that myomectomy reduced bleeding and low strength of evidence for improved quality of life.[4]

The Comparing Options for Management: Patient-centered Results for Uterine Fibroids (COMPARE-UF) is a large prospective nationwide registry that provides a broader view of the usual care of patients with UF, rather than the restricted groups in randomized controlled trials. Using standardized baseline questionnaires and fibroid imaging data abstraction, we are able to directly compare patient-selected procedures. In this analysis, we compare the 6- to 12-week postprocedure health-related quality of life (HRQOL) measures and return to work or return to

Cite this article as: Laughlin-Tommaso SK, Lu D, Thomas L, et al. Short-term quality of life after myomectomy for uterine fibroids from the COMPARE-UF Fibroid Registry. Am J Obstet Gynecol 2020;222:345.e1-22.

AJOG at a Glance

Why was this study conducted?

COMPARE-UF is a multicenter prospective registry for evaluating outcomes of fibroid treatments. In this analysis, we evaluate the 6- to 12-week post-myomectomy quality of life measures for the different routes including hysteroscopic, laparoscopic, and abdominal myomectomy.

Key findings

Among the 1200 women in this analysis, substantial improvements in quality of life were reported in each of the myomectomy route groups. Time to return to work was shortest for the hysteroscopy route and longest for the abdominal route.

What does this add to what is known?

The study shows that hysteroscopic myomectomy was associated with good reduction of bleeding symptoms and, surprisingly, also a reduction in bulk symptoms. In addition, median time to normal activities was similar between women undergoing laparoscopic and abdominal myomectomy, but return to work was 20 days earlier in the laparoscopic arm.

usual activities for 3 myomectomy routes: abdominal, laparoscopic (with or without robotic assistance), and hysteroscopic.

Materials and Methods

Compare-UF is an ongoing multi-site national registry of women with symptomatic fibroids enrolled at 8 clinic centers across the United States (Mayo Clinic, INOVA Health System, Brigham and Women's, University of Mississippi Medical Center, University of California Fibroid Network, Henry Ford Health System, University of Michigan, and University of North Carolina) that prospectively compares the effectiveness of different surgical options for UF (including hysterectomy, myomectomy, focused ultrasound ablation, and uterine artery ablation) on patient-reported outcomes postoperatively and annually in follow-up. The full methods of the COMPARE-UF registry have been previously published.[6] Women were eligible for inclusion if they were between 18 and 54 years old, were premenopausal, were English speaking, and had clinical documentation of uterine fibroids in the previous 12 months and were scheduled to undergo a procedural intervention for fibroids. Exclusion criteria included suspected or known cancer at a pelvic site and previous hysterectomy; other prior uterine or fibroid procedures did not exclude women from participating. Trained site coordinators screened women for eligibility using the clinical and operative schedules; informed consent was obtained in-person, by telephone, or through a secure, password protected, Web-based portal (SignalPath, LLC, Durham, NC). The registry was reviewed and approved by the Duke University Institutional Review Board for the Duke Clinical Research Institute (DCRI) Research Data and Coordinating Center (Durham, NC) and by the review boards at each of the 8 clinical recruitment sites.

For this analysis, we included women who underwent a hysteroscopic, abdominal, or laparoscopic myomectomy (comprising those who had a laparoscopic procedure with or without robotic assistance). The choice of myomectomy route was a decision between the patient and her provider and was independent of the COMPARE-UF study protocols. All surgical procedures were performed according to professional standards at each clinical site. Women were excluded from this analysis if they had a vaginal myomectomy, did not complete the short-term post-procedure follow-up HRQOL variables, or were missing information on route of myomectomy (Figure 1).

Outcome measures

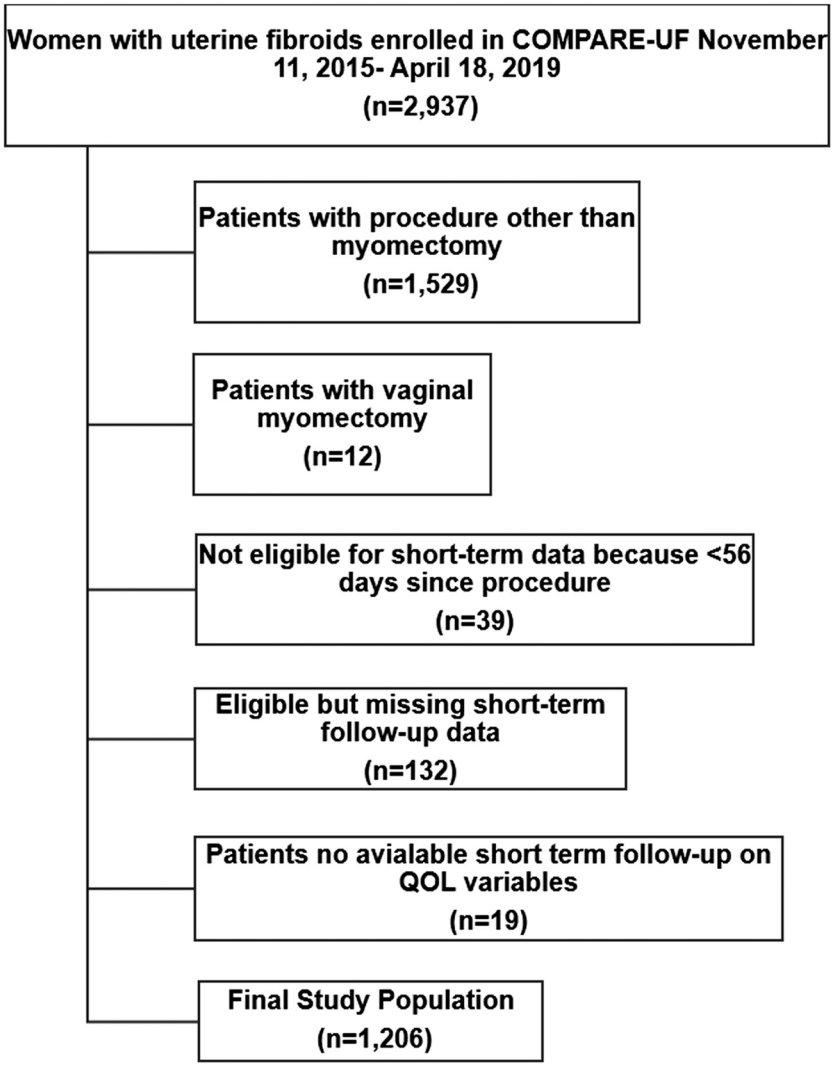
The baseline survey was provided on paper, in electronic form in the Web-based portal, or by telephone interview; it included questions on self-reported socio-demographics, medical history, fibroid history, current and prior fibroid therapies and procedures, and reproductive history. Per the COMPARE-UF protocol, the baseline survey was completed prior to the time of the uterine fibroid procedure.

The postprocedure survey contained short-term HRQOL measures as well as questions on return to work, return to usual activities, and rehospitalizations. The survey was to be completed 6−12 weeks after the procedure through the Web-based portal or via a telephone interview with the DCRI Research Call Center.

Reminders were sent to participants to complete the postprocedure surveys. The DCRI site coordinator made attempts to contact participants by telephone who appeared lost to follow-up. Standardized measures included in the baseline and postprocedure surveys included the validated general (EQ-5D) and uterine fibroid−specific (UFS-QOL) measures. The UFS-QOL includes 6 subscales of health-related measures (concern, activities, energy/mood, control, self-consciousness, and sexual function), which are summed into the HRQOL total, with higher scores indicating better HRQOL. The UFS-QOL also has a symptom severity score that is the first 8 questions related mainly to bleeding and bulk symptoms (lower scores indicate fewer symptoms). To descriptively categorize patient symptoms, we classified patients as having "bleeding symptoms" if their response was "somewhat" or greater "distress" on any of the following UFS-QOL questions: heavy bleeding during the patient's menstrual period, passing blood clots during the menstrual period, fluctuation in the duration of the menstrual period compared to previous cycle, or fluctuation in the length of the monthly cycle compared to previous cycles. Similarly, symptoms were characterized as "bulk symptoms" if the patient's response was "somewhat" or greater levels of distress on either of the UFS-QOL questions: feeling tightness or pressure in your pelvic area, frequent urination during

FIGURE 1

Flow chart for the COMPARE-UF patients included in the analysis. *COMPARE-UF,* Comparing Options for Management: Patient-centered Results for Uterine Fibroids



Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

the daytime hours. A visual analogue scale (VAS) is part of the EQ-5D and evaluates overall wellness (0 = worst possible, 100 = best possible). Any postprocedure hospitalization associated with the procedure or with fibroid symptoms was self-reported. The number of weeks before a patient reported that she could return to usual activities was recorded as a categorical variable ranging from 0 to 5 weeks and converted to days for analysis. The number of days to return to work was a time-to-event endpoint.

Imaging data measurements

All ultrasound and/or magnetic resonance imaging reports were sent to a central data abstraction center where data collection forms were entered. Total number of fibroids measured in the uterus was recorded when available. Fibroid volume was measured using the prolate ellipsoid formula (0.523*dimension 1*dimension2*dimension3) for each fibroid; total fibroid volume was calculated based on the number of fibroids and the individual fibroid volumes. Average fibroid dimension for each fibroid (up to 8) was calculated as the sum of the 3 fibroid dimensions divided by 3; the average fibroid dimension per patient was calculated as the sum of all the average fibroid dimensions divided by the number of fibroids measured per patient. Finally, the uterine volume was also calculated using the prolate ellipsoid formula using the 3 dimensions of the uterus.

Statistical analysis

For baseline patient characteristics, continuous variables were reported as medians with 25th and 75th percentiles (interquartile range [IQR]), and categorical variables as counts and percentages. To compare across groups, Kruskal–Wallis tests were performed for continuous variables and χ^2 tests for categorical variables. Unadjusted outcomes were reported for all 3 procedural routes. Although we initially intended to compare outcomes among all 3 routes, the profound differences in important variables for propensity adjustment, particularly demographic and fibroid/uterine volumes, were too great between the hysteroscopic myomectomy group and the other 2 groups to perform meaningful propensity adjustment. Hysteroscopic myomectomy patients are different in many key baseline factors such that they cannot be made comparable to the other 2 groups through propensity score methods. This likely reflects the fact that most patients who are candidates for a laparoscopic or open procedure would not be candidates for a purely hysteroscopic approach, and vice versa. Thus, we have provided unadjusted baseline and short-term outcome results for the hysteroscopic approach, but have performed a direct comparison of the laparoscopic and abdominal groups.

Laparoscopic vs abdominal approaches

To compare laparoscopic and abdominal approaches, propensity scores were estimated by logistic regression (ie, probability of receiving abdominal myomectomy). Potential confounders for inclusion in the propensity model

TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in the COMPARE-UF Study (N = 1206)

	Hysteroscopic myomectomy n = 338	Laparoscopic/robotic myomectomy n = 519	Abdominal myomectomy n = 349	*P* value
Age, y	41.0 (35.0–47.0)	37.0 (33.0–41.0)	37.0 (33.0–41.0)	<.01
Race				
Other	52 (15.4%)	106 (20.6%)	68 (19.5%)	.01
Black	127 (37.7%)	204 (39.6%)	161 (46.1%)	
White	158 (46.9%)	205 (39.8%)	120 (34.4%)	
Hispanic or Latino	35 (10.7%)	27 (5.3%)	25 (7.3%)	.02
Time since diagnosis with fibroid symptoms, y	3.0 (1.0–6.0)	3.0 (1.0–6.0)	3.0 (1.0–7.0)	.14
Prior pregnancies, 1+ vs 0	234 (69.6%)	254 (49.8%)	150 (43.5%)	<.01
Prior number of pregnancies, categorized				
>3	70 (29.9%)	34 (13.4%)	29 (19.3%)	<.01
3	35 (15.0%)	36 (14.2%)	18 (12.0%)	
2	73 (31.2%)	66 (26.0%)	42 (28.0%)	
1	56 (23.9%)	118 (46.5%)	61 (40.7%)	
0	102 (30.4%)	256 (50.2%)	195 (56.5%)	
Body mass index	28.4 (23.9–34.4)	26.5 (22.6–31.9)	27.0 (23.4–33.4)	<.01
Currently using birth control	243 (71.9%)	369 (71.1%)	240 (68.8%)	.64
Medical history (based on high blood pressure, diabetes, asthma, thyroid problems, and blood clots in legs or lungs)	169 (50.4%)	186 (36.4%)	126 (36.3%)	<.01
High blood pressure	68 (20.3%)	79 (15.5%)	49 (14.1%)	.07
Diabetes	25 (7.5%)	13 (2.6%)	10 (2.9%)	<.01
Asthma	63 (18.9%)	73 (14.4%)	48 (13.9%)	.13
Thyroid problems	54 (16.3%)	65 (12.8%)	35 (10.2%)	.06
Blood clots in legs or lungs	10 (3.0%)	4 (0.8%)	4 (1.2%)	.03
Endometriosis	23 (6.9%)	42 (8.3%)	25 (7.2%)	.74
Smoking history	25 (7.5%)	20 (3.9%)	15 (4.3%)	.05
Alcohol use including wine and/or beer	254 (89.1%)	405 (90.4%)	260 (87.8%)	.54
Marijuana/pot/cannabis use				
Never	222 (66.3%)	342 (67.3%)	247 (71.2%)	.35
In the past	91 (27.2%)	121 (23.8%)	77 (22.2%)	
Currently	22 (6.6%)	45 (8.9%)	23 (6.6%)	
Prior procedures	70 (20.9%)	89 (17.3%)	67 (19.4%)	.42
Prior abdominal myomectomy	23 (6.9%)	31 (6.0%)	27 (7.8%)	.60
Prior laparoscopic or robotic myomectomy	10 (3.0%)	21 (4.1%)	16 (4.6%)	.53
Prior focused ultrasound	3 (0.9%)	2 (0.4%)	2 (0.6%)	.64

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in the COMPARE-UF Study (N = 1206) *(continued)*

	Hysteroscopic myomectomy n = 338	Laparoscopic/robotic myomectomy n = 519	Abdominal myomectomy n = 349	*P* value
Prior endometrial ablation	4 (1.2%)	4 (0.8%)	1 (0.3%)	.39
Prior radiofrequency ablation	0 (0.0%)	0 (0.0%)	1 (0.3%)	.29
Prior UAE	2 (0.6%)	2 (0.4%)	4 (1.2%)	.39
Primary source of insurance				
Private	282 (84.4%)	443 (86.0%)	286 (82.7%)	.41
Other	52 (15.6%)	72 (14.0%)	60 (17.3%)	
Total fibroid volume, cm^3, among patients with imaging data	16.4 (5.3–38.0)	222.6 (77.8–427.4)	380.2 (162.7–727.9)	<.01
Average fibroid diameter, cm, among patients with imaging data	2.5 (1.8–3.5)	5.2 (3.6–7.3)	6.1 (4.5–8.9)	<.01
No. of fibroids measured, among patients with imaging data	1.0 (1.0–3.0)	2.0 (1.0–3.0)	2.0 (1.0–4.0)	<.01
Uterine volume, cm^3, among patients with imaging data	181.4 (113.7–310.1)	438.6 (225.3–711.2)	805.2 (449.7–1,312.6)	<.01
Discomfort during intercourse	117 (34.6%)	203 (39.3%)	165 (47.3%)	<.01
Pelvic pain requiring medications	136 (40.2%)	179 (34.6%)	132 (37.8%)	.24
Pelvic pain not during or during menstrual periods				
Both times	69 (20.4%)	119 (23.0%)	87 (24.9%)	.10
Not during periods	6 (1.8%)	10 (1.9%)	5 (1.4%)	
During periods	55 (16.3%)	49 (9.5%)	39 (11.2%)	
No	208 (61.5%)	339 (65.6%)	218 (62.5%)	
Frequent urination	121 (35.8%)	297 (57.4%)	217 (62.2%)	<.01
Bleeding history[a]	304 (89.9%)	382 (73.9%)	273 (78.2%)	<.01

COMPARE-UF, Comparing Options for Management: Patient-centered Results for Uterine Fibroids; *UAE*, uterine artery embolization.

[a] Bleeding history is defined as the composite of menstrual periods that last 7 or more days, heavy bleeding during periods, and bleeding and spotting between periods under the uterine fibroid history.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

were identified a priori by the investigators and included the following: age, race/ethnicity, insurance type, time since diagnosis of fibroids, prior procedures, prior pregnancies, presence of medical comorbidities, alcohol use, marijuana use (current or ever), adenomyosis, endometriosis, bleeding history, total fibroid volume, number of fibroids measured, uterine volume, pain/discomfort at baseline, and scores on the UFS-QOL components at baseline. Linearity of continuous variables was checked before fitting the model. A model using a flexible spline function of uterine volume was fit. Overlap weights were used to estimate the average treatment effect among the overlap population, and the balance in covariates was assessed using the standardized difference. Excellent balance in covariate means were observed between laparoscopic and abdominal myomectomy after weighting.

Missing data on the covariates were handled by imputation using the full conditional specification method in SAS PROC MI. All potentially important confounders and additional variables available in the COMPARE-UF data set were included, as well as the outcome variables in the imputation process. However, outcomes were not imputed. The missing rate for each variable is reported in Supplementary Table 1 and is generally very low. The exception was 15% missing on alcohol use and 10–25% missing on imaging variables. The analysis was conducted by single imputation, as prior comparisons to multiple imputation showed no difference.

Linear regression for the continuous endpoints and logistic regression for binary endpoints at baseline and short-term follow-up in the weighting adjusted population were used. For the ordinal endpoint (EQOL 5D-5L component scales), a proportional odds model was used for increasing levels of HRQOL. For the time-to-event endpoint (time from procedure to

TABLE 2

Baseline and short-term quality of life outcomes by the surgical route among myomectomy patients before weighting

Measure	Hysteroscopic myomectomy n = 338	Laparoscopic/robotic myomectomy n = 519	Abdominal myomectomy n = 349
Baseline			
UFS-QOL score: Concern	38.9 (28.5)	51.0 (34.0)	46.0 (31.7)
UFS-QOL score: Activities	51.7 (29.6)	54.9 (29.0)	53.0 (28.7)
UFS-QOL score: Energy/mood	50.2 (28.0)	52.3 (28.2)	49.8 (27.3)
UFS-QOL score: Control	51.3 (27.2)	51.2 (28.0)	48.5 (26.3)
UFS-QOL score: Self-conscious	53.9 (33.4)	49.2 (32.0)	38.2 (30.9)
UFS-QOL score: Sexual function	51.7 (35.3)	55.9 (34.1)	51.9 (34.7)
UFS-QOL score: HRQL total, sum of 6 subscale scores	49.1 (26.4)	52.6 (26.0)	48.7 (25.6)
UFS-QOL score: Symptom severity	53.2 (24.5)	49.2 (24.8)	52.4 (25.2)
Bleeding outcomes[a]	92.3% (310)	78.3% (404)	81.3% (283)
Bulk symptoms[a]	63.6% (213)	80.6% (416)	83.5% (289)
Visual analogue scale score	72.7 (19.9)	74.5 (17.5)	72.5 (18.6)
Posttreatment outcomes			
UFS-QOL score: Concern	69.4 (31.3)	78.5 (27.8)	79.0 (27.9)
UFS-QOL score: Activities	76.5 (27.0)	74.7 (25.2)	72.8 (26.3)
UFS-QOL score: Energy/mood	74.5 (27.2)	76.3 (24.9)	75.1 (26.0)
UFS-QOL score: Control	75.6 (27.4)	77.9 (24.4)	76.9 (27.0)
UFS-QOL score: Self-conscious	72.2 (32.5)	73.7 (28.4)	70.6 (29.7)
UFS-QOL score: Sexual function	70.3 (33.5)	70.7 (31.3)	67.0 (33.7)
UFS-QOL score: HRQL total, sum of 6 subscale scores	73.9 (26.1)	75.9 (22.5)	74.5 (24.1)
UFS-QOL score: Symptom severity	22.3 (20.1)	20.0 (17.2)	19.5 (16.5)
Bleeding outcomes[a]	50.6% (164)	45.5% (231)	40.9% (139)
Bulk symptoms[a]	31.5% (106)	32.4% (167)	35.7% (124)
Visual analogue scale score	79.4 (18.4)	82.7 (14.6)	83.3 (14.5)
Unable to perform usual daily activities in days	0.0 (0.0—14.0)	21.0 (14.0—28.0)	28.0 (14.0—35.0)
Return to work in days	4.0 (3.0—10.0)	21.0 (14.0—39.0)	42.0 (28.0—56.0)
Hospitalized for postprocedure problem or fibroid symptoms[a]	1.3% (4)	3.1% (15)	4.3% (14)

Numbers represent mean (standard deviation) for continuous measures [median (25th—75th percentile)] for inability to perform usual activities in days and return to work in days among patients who worked full-time or part-time.

HRQOL, health-related quality of life; *QOL*, quality of life; *UFS*, uterine fibroid specific.

Numbers represent percentage (n) for binary measures.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

return to work) among the weighting adjusted population, a Cox proportional hazards model was used and weighted Kaplan—Meier curve was shown. In all analyses, a robust empirical variance estimator was used to account for potential clustering of patients within the same site, and the estimation of propensity weights.

Results

Baseline characteristics

A total of 1206 women from 8 COMPARE-UF sites underwent myomectomy (349 abdominal, 519 laparoscopic, and 338 hysteroscopic) during the study period (Figure 1). Women undergoing either laparoscopic or abdominal myomectomy were significantly younger than women undergoing hysteroscopic myomectomy

(Table 1). In addition, women in the hysteroscopic myomectomy group had higher body mass index, were more likely to have a history of smoking, and had more concurrent medical comorbidities than women in the other groups. Women who had hysteroscopic myomectomy were also more likely to have had a venous thromboembolism. Women undergoing abdominal myomectomy were more likely to be of black race/ethnicity (46.1%). Among all women, the median time from diagnosis to index myomectomy for this study was 3 years, and approximately 20% of the women had had a prior fibroid procedure.

Baseline symptoms

In their baseline survey, more women in the hysteroscopic myomectomy group reported an abnormal bleeding history compared with other routes (89.9% hysteroscopic, 78.2% abdominal, and 73.9% laparoscopic) (Table 1). Discomfort during intercourse was highest in the abdominal myomectomy group (47.3%), but pelvic pain during and between menstrual periods was similar in all 3 groups. VAS scores at baseline were high (72−75) (Table 2). On the UFS-QOL, both the HRQOL and the symptom severity scores were similar between all groups, with only slightly more "concern" in the hysteroscopic group and more "self-consciousness" reported in the abdominal myomectomy group. Mobility, ability to perform usual activities, and anxiety/depression on the EQ-5D were similar between groups at baseline, whereas pain was most significant for women in the abdominal myomectomy group (Supplementary Table 2).

Baseline imaging

At baseline, women who underwent abdominal myomectomy had significantly higher total fibroid volume (median, 380 cm^3; IQR, 163−728 cm^3) than women undergoing laparoscopic (223 cm^3; IQR, 78−428 cm^3) or hysteroscopic (16 cm^3; IQR, 5−38 cm^3) myomectomy (Table 1). Similarly, average fibroid dimensions and uterine volumes were greater in the abdominal myomectomy group (Table 1). Measured fibroid number was not different in the laparoscopic and abdominal groups, but was lower in the hysteroscopic group.

Postprocedure results

Unadjusted results for hysteroscopic myomectomy

The postprocedure survey was completed at a median of 56 days (IQR, 40−83 days). Women who underwent hysteroscopic myomectomy had major improvements from baseline in UFS-QOL HRQOL and symptom severity scores (Table 2). Average symptom severity went from 53.2 (standard deviation [SD], 24.5) at baseline to 22.3 (SD, 20.1) at postprocedure. The proportion of women reporting bleeding symptom distress as measured by the composite score also decreased from 92.3% to 50.6%, and bulk symptom distress was reduced by half. EQ-5D showed improvements in the mobility, self-care, and usual activities domains. However, a similar proportion of women in all groups reported an increase in feeling pain/discomfort and anxiety/depression was observed (Supplementary Table 2). The average number of days until women returned to usual activities was at 0 (IQR, 0−14) days. Four women (1.3%) were hospitalized for postprocedure problems or additional fibroid symptoms. Median return to work for hysteroscopic myomectomy was 4 days (IQR, 3−10 days), which was shorter than that for either the laparoscopic myomectomy (21 days; IQR, 14−39) or the abdominal myomectomy (42 days; IQR, 28−56) (Figure 2A).

Comparison of laparoscopic and abdominal myomectomy

On direct comparison after propensity weighting, improvements in UFS-QOL were substantial in both groups and did not differ on most HRQOL measures (Table 3). Women in the laparoscopic group had less improvement in the "concern" and "self-consciousness" subscales. The domains of activities, energy/mood, control, and sexual function all improved to a similar extent. The average symptom severity scores were not different after the procedures. Bleeding symptoms were reported by fewer women following abdominal myomectomy, but bulk symptoms and VAS scores were similar between groups. Return to normal activities was faster for the majority of women in the laparoscopic group compared with those in the abdominal group. Although the median times were the same at 21 days (Table 3), the upper quartile of women needed an additional week of recovery in the abdominal arm; on mean return to activities time, this equated to 3.2 (95% confidence interval, 1.3, 5.1) days earlier in women in the laparoscopic arm than in women in the abdominal arm (Table 3). Hospitalizations occurred in 3.9% and 3.8%, respectively. On the EQ-5D, women in the abdominal group were more likely to report "slight pain or discomfort" but less likely to report feeling "slightly anxious or depressed" (Supplementary Table 3). After propensity weighting, return to work in the abdominal myomectomy group was 20 days later than in the laparoscopic myomectomy group (Figure 2B).

Comment

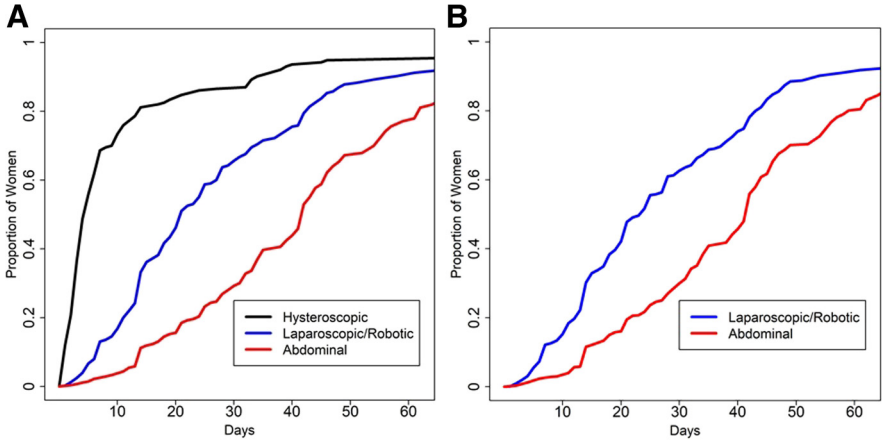
Principal findings

Myomectomy was highly effective in all 3 surgical route groups, showing substantial improvements in short-term HRQOL 6−12 weeks after the procedure. Average symptom severity scores decreased from 50 to 20, which is consistent with prior studies of fibroid treatment.[5,7−10] On direct comparison, postprocedure HRQOL results were similar in the laparoscopic and abdominal groups, with small differences seen in pain/discomfort, anxiety/depression symptoms, and concern.

The study also confirmed clinical experience that women who undergo hysteroscopic myomectomy return to work and usual activities more quickly than those who undergo laparoscopic or abdominal myomectomy. On direct comparison after propensity weighting, women in the laparoscopic myomectomy group returned to usual activities on average 3 days before women in the abdominal group, but returned to work

FIGURE 2

A, Kaplan–Meier curve of the proportion of women who returned to work over number of days postmyomectomy before propensity adjustment in the COMPARE-UF Study (N = 1206). B, Kaplan–Meier curve of the proportion of women who returned to work over the number of days postmyomectomy after propensity adjustment in the COMPARE-UF Study (N =1206). *COMPARE-UF,* Comparing Options for Management: Patient-centered Results for Uterine Fibroids



Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

20 days before women in the abdominal group. Returning to work is likely influenced by procedural complications, postprocedure instructions for time off, disability coverage, and patient needs or desires to return to work. In contrast, returning to activities may be more of a personal choice. The comparison between returning to work and returning to activities is limited, however, because it is more difficult to provide an exact date on which women report returning to usual activities. Finally, our questionnaire categorized this time to return to usual activities into weeks following the procedure (reported out in days), a variable that may be improved in future studies

Results in the context of what is known

In prior studies comparing route of myomectomy, most women returned to full activities in about 2 weeks after laparoscopic or robotic approaches.[11,12] However, 1 prior prospective observational study noted that 40% of women returned to work more than 8 weeks after laparoscopic myomectomy, which was associated with how long it took the women to reportedly "feel back to normal."[13] The authors hypothesized that laparoscopic surgery was anticipated to shorten recovery, but the greater complexity of laparoscopic procedures performed now may actually result in longer time for recovery. Open surgical approaches were associated with longer length of stay in hospital, more pain medication use, higher VAS scores, and longer times before return to work.[14–17] In 1 study, 74% of women who had undergone a mini-laparotomy had a full recovery by postoperative day 15 compared with 90% in the laparoscopic arm.[14] Most of these studies included fewer women or were from a single institution.

Our study included more than 300 women who had a hysteroscopic myomectomy. Despite lower total fibroid volume and number, women in our hysteroscopic group had a baseline quality of life and symptoms similar to those of women in the laparoscopic and abdominal groups. More than one-third reported pain with intercourse, pain during the menstrual cycle, and frequent urination, which are typical components of bulk symptoms. As expected, bleeding symptoms were common and improved postprocedure in nearly 50% of women. Long-term results may show a greater improvement in bleeding, as women were likely to only have had 1 or 2 menstrual periods before completion of the follow-up questionnaire. Surprisingly, bulk symptoms also improved with hysteroscopic myomectomy. A prior study with an average follow-up of 40 months demonstrated 94% satisfaction after hysteroscopic myomectomy, indicating that this route may be highly beneficial for women with submucosal fibroids.[18]

In addition to bleeding and bulk symptoms, myomectomy was associated with improved sexual function and energy, and a reduction in feelings of concern, anxiety/depression, and self-consciousness. These findings are in line with prior studies that found significant improvements in sexual function and general health.[3,7,19,20]

Clinical implications

Although route of surgery affects time to return to work and usual activities, women undergoing myomectomy for symptomatic fibroids achieve substantial improvements in quality of life within several months of their procedure regardless of route. The extent to which recovery was affected by differences among providers in preoperative education, availability of postdischarge resources, or other supportive measures posttreatment is unclear, and is an area for future research.

Strengths and limitations

In this analysis of the prospective COMPARE-UF registry, direct comparison of procedures in more than 1200 women from 8 geographically diverse sites across the United States was possible because of standardized baseline questionnaires and data abstraction procedures for imaging data. At baseline, we found that women in the laparoscopic and abdominal groups did not

TABLE 3

Baseline and short-term quality of life outcomes between abdominal myomectomy and laparoscopic/robotic myomectomy in the propensity weighting–adjusted population in the COMPARE-UF Study (N = 1206)[a]

Measure	Laparoscopic/robotic myomectomy[b]	Abdominal myomectomy	Estimate (95% CI)	*P* value
Baseline				
UFS-QOL score: Concern	47.9 (33.3)	48.0 (31.4)	0.2 (−3.2, 3.5)	.93
UFS-QOL score: Activities	53.5 (28.7)	54.6 (28.5)	1.1 (−3.7, 5.9)	.65
UFS-QOL score: Energy/mood	50.6 (28.0)	50.6 (27.1)	−0.1 (−3.9, 3.7)	.98
UFS-QOL score: Control	49.4 (27.6)	49.4 (26.3)	−0.0 (−4.2, 4.1)	.99
UFS-QOL score: Self-conscious	42.0 (30.4)	42.2 (31.4)	0.2 (−5.6, 6.0)	.94
UFS-QOL score: Sexual function	52.9 (34.2)	52.9 (34.3)	−0.0 (−6.3, 6.3)	1.00
UFS-QOL score: HRQL total, sum of 6 subscale scores	50.0 (25.5)	50.4 (25.4)	0.4 (−3.4, 4.2)	.83
UFS-QOL score: Symptom severity	51.2 (25.0)	51.7 (24.9)	0.5 (−2.4, 3.4)	.74
Bleeding outcomes[c]	80.1%	81.2%	1.1 (0.8, 1.4)	.55
Bulk symptoms[c]	83.5%	82.3%	0.9 (0.7, 1.2)	.53
Visual analogue scale score	73.9 (17.8)	72.6 (18.5)	−1.3 (−4.5, 1.9)	.42
Posttreatment outcomes				
UFS-QOL score: Concern	77.6 (28.1)	81.1 (26.4)	3.5 (1.4, 5.6)	<.01
UFS-QOL score: Activities	73.5 (25.5)	73.2 (26.1)	−0.3 (−3.7, 3.0)	.85
UFS-QOL score: Energy/mood	75.3 (25.2)	75.5 (25.5)	0.2 (−2.6, 2.9)	.91
UFS-QOL score: Control	77.0 (24.8)	77.5 (26.3)	0.5 (−1.9, 3.0)	.67
UFS-QOL score: Self-conscious	70.7 (29.7)	72.3 (28.6)	1.6 (−0.0, 3.2)	.05
UFS-QOL score: Sexual function	69.2 (31.4)	67.5 (33.4)	−1.7 (−6.9, 3.4)	.50
UFS-QOL score: HRQL total, sum of 6 subscale scores	74.7 (23.0)	75.4 (23.4)	0.7 (−1.7, 3.0)	.57
UFS-QOL score: Symptom severity	19.5 (16.9)	19.4 (16.3)	−0.0 (−1.7, 1.7)	1.00
Bleeding outcomes[c]	45.6%	39.2%	0.8 (0.6, 0.9)	<.01
Bulk symptoms[c]	31.7%	35.8%	1.2 (0.9, 1.7)	.29
Visual analogue scale score	83.1 (14.7)	83.0 (14.4)	−0.1 (−1.3, 1.1)	.87
Unable to perform usual daily activities in days[d,e]	21.0 (14.0–28.0) 19.7 (10.8)	21.0 (14.0–35.0) 22.8 (10.4)	0.8 (0.7, 0.9) 3.2 (1.3, 5.1)	<.01 <.01
Return to work in days[f]	22.0 (14.0–40.0)	42.0 (27.0–56.0)	0.5 (0.4, 0.6)	<.01
Hospitalized for postprocedure problem or fibroid symptoms[c]	3.9%	3.8%	1.0 (0.5, 2.1)	.93

CI, confidence interval; *HRQOL*, health-related quality of life; *QOL*, quality of life; *UFS*, uterine fibroid specific.

[a] Numbers represent mean (standard deviation) and difference in mean from a linear regression model, adjusted by propensity weighting; [b] Laparoscopic/robotic myomectomy is reference group; [c] Numbers represent percentage and odds ratio from a logistic regression model, adjusted by propensity weighting; [d] Numbers represent median (25th–75th) for inability to perform usual activities in days in the first row, hazard ratio from a Cox regression model, and *P* value from the log-rank test, adjusted by propensity weighting; [e] Numbers in the second row represent mean (standard deviaiton) and linear regression model, adjusted by propensity weighting; [f] Numbers represent median (25th–75th) and hazard ratio from a Cox regression model for return to work in days among patients who worked full-time or part-time, adjusted by propensity weighting.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

differ significantly in demographics and HRQOL measures. As expected, women undergoing abdominal myomectomy had larger uterine size and fibroid volumes. By contrast, women in the hysteroscopic myomectomy group differed significantly from the other 2 groups with respect to baseline demographics and fibroid/uterine size, but had similar baseline HRQOL scores.

Limitations to our study include the lack of information on patient–provider

decisions on type of myomectomy route. Given the overlap in uterine and fibroid size in both groups, factors other than fibroid number, size, or location may play a role, including whether the patient had prior abdominal surgery or how the patient feels about tissue removal techniques in laparoscopic cases. We did not have access to the number of cases that involved extension of an incision or morcellation or the counseling that preceded surgical choices. These factors may limit the ability to directly compare groups. We also did not have information on the length of surgery, which may have an impact on recovery. Finally, we limited inclusion to English-speaking patients only for the purposes of questionnaire completion, which may limit generalizability; in addition, all participating centers are located in the United States, so generalizability outside of the United States may also be limited.

Missing data

We compared the 132 women with missing follow-up data to the 1206 in the final study population (Supplementary Table 4). Total fibroid volume, uterine volume, and average fibroid dimensions were similar, although women who had missing follow-up data were more likely to be of black race/ethnicity (53% vs 41%), were less likely to have private insurance (76% vs 85%), and reported more pelvic pain (48% vs 37%).

Conclusions

Myomectomy is highly effective for symptomatic uterine fibroids, with substantial improvement in short-term HRQOL. Although laparoscopic approaches have traditionally been associated with faster recovery, the time to return to usual activities was only slightly shorter than that in the abdominal approach group; however, women returned to work significantly earlier in the laparoscopy group. ■

Acknowledgments

The authors gratefully acknowledge the enrolling clinical centers and collaborators: Atlanta Fibroid Center of Atlanta Interventional Institute: John C. Lipman, MD, Principal Investigator; Brigham and Women's and Affiliated Hospitals: Raymond M. Anchan, MD, PhD, Principal Investigator, Serene S. Srouji, MD, Antonio R. Gargiulo, MD (Massachusetts General Hospital), John C. Petrozza MD (Beth Israel Deaconess Medical Center); University of California Fibroid Network: Vanessa Jacoby, MD, Principal Investigator (UC-San Francisco), Ram Parvataneni, MD, MPH (UC-Los Angeles), Erica Oberman, MD (UC-Los Angeles), Naghmeh Salamat Saberi, MD (UC-Irvine), Shira Varon, MD (UC-San Diego), L. Elaine Waetjen, MD (UC-Davis); Henry Ford Health System: Ganesa Wegienka, PhD, Principal Investigator; Inova Health: George L. Maxwell, MD, Principal Investigator, Abbas Shoberi, MD; Mayo Clinic: Elizabeth A. Stewart, MD, Principal Investigator, Shannon Laughlin-Tommaso, MD, Bijan Borah, PhD, Joyce Balls-Berry, PhD; Satellite Site Investigators: Jennifer Bantz, MD, Paul Matigbay, MD, Gokhan Anil, MD, Jason Dewitt, MD; Michigan Medicine (University of Michigan): Erica E. Marsh, MD, Principal Investigator; University of Mississippi Medical Center: Kedra Wallace, PhD, Principal Investigator, J. Preston Parry, MD; UNC Health Care (The University of North Carolina at Chapel Hill): Wanda Nicholson, MD, Principal Investigator, Andrea Knittel, MD, Anissa Vines, PhD, Lauren Schiff, MD, Stephen Loehr, MD; Department of Defense: Ryan Heitling, DO, LTC, MC, Madigan Army Medical Center; William Catherino, MD PhD, Uniformed Services University of Health Sciences; Gary Levy, MD Division of Reproductive Endocrinology and Infertility, Department of Obstetrics and Gynecology, Tripler Army Medical Center.

References

1. Stewart EA, Laughlin-Tommaso SK, Catherino WH, Lalitkumar S, Gupta D, Vollenhoven B. Uterine fibroids. Nat Rev Dis Primers 2016;2:16043.

2. Stewart EA, Nicholson WK, Bradley L, Borah BJ. The burden of uterine fibroids for African-American women: results of a national survey. J Womens Health (Larchmt) 2013;22:807–16.

3. Dilek S, Ertunc D, Tok EC, Cimen R, Doruk A. The effect of myomectomy on health-related quality of life of women with myoma uteri. J Obstet Gynaecol Res 2010;36:364–9.

4. Hartmann KE, Fonnesbeck C, Surawicz T, et al. Management of uterine fibroids. comparative effectiveness review no. 195. (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290-2015-00003-I.) AHRQ Publication no. 17(18)-EHC028-EF. Rockville, MD: Agency for Healthcare Research and Quality; December 2017.

5. Sandberg EM, Tummers F, Cohen SL, van den Haak L, Dekkers OM, Jansen FW. Reintervention risk and quality of life outcomes after uterine-sparing interventions for fibroids: a systematic review and meta-analysis. Fertil Steril 2018;109:698–707.

6. Stewart EA, Lytle BL, Thomas L, et al. The Comparing Options for Management: PAtient-centered REsults for Uterine Fibroids (COMPARE-UF) registry: rationale and design. Am J Obstet Gynecol 2018;219:95.e1–10.

7. Takmaz O, Ozbasli E, Gundogan S, et al. Symptoms and health quality after laparoscopic and robotic myomectomy. J Soc Laparoend 2018;22:e2018.00030.

8. Froeling V, Meckelburg K, Schreiter NF, et al. Outcome of uterine artery embolization versus MR-guided high-intensity focused ultrasound treatment for uterine fibroids: long-term results. Eur J Radiol 2013;82:2265–9.

9. Jacoby VL, Kohi MP, Poder L, et al. PROMISe trial: a pilot, randomized, placebo-controlled trial of magnetic resonance guided focused ultrasound for uterine fibroids. Fertil Steril 2016;105:773–80.

10. Laughlin-Tommaso S, Barnard EP, AbdElmagied AM, et al. FIRSTT study: randomized controlled trial of uterine artery embolization vs focused ultrasound surgery. Am J Obstet Gynecol 2019;220:174.

11. Tsuzuki Y, Tsuzuki S, Wada S, Fukushi Y, Fujino T. Recovery of quality of life after laparoscopic myomectomy. J Obstet Gynaecol Res 2019;45:176–81.

12. Kikuchi I, Takeuchi H, Shimanuki H, et al. Questionnaire analysis of recovery of activities of daily living after laparoscopic surgery. J Minim Invasive Gynecol 2008;15:16–9.

13. Huff KO, Aref-Adib M, Magama Z, Vlachodimitropoulou EK, Oliver R, Odejinmi F. Returning to work after laparoscopic myomectomy: a prospective observational study. Acta Obstet Gynecol Scand 2018;97:68–73.

14. Alessandri F, Lijoi D, Mistrangelo E, Ferrero S, Ragni N. Randomized study of laparoscopic versus minilaparotomic myomectomy for uterine myomas. J Minim Invasive Gynecol 2006;13:92–7.

15. Mais V, Ajossa S, Guerriero S, Mascia M, Solla E, Melis GB. Laparoscopic versus abdominal myomectomy: a prospective, randomized trial to evaluate benefits in early outcome. Am J Obstet Gynecol 1996;174:654–8.

16. Holzer A, Jirecek ST, Illievich UM, Huber J, Wenzl RJ. Laparoscopic versus open myomectomy: a double-blind study to evaluate postoperative pain. Anesth Analg 2006;102:1480–4.

17. Shen Q, Chen M, Wang Y, et al. Effects of laparoscopic versus minilaparotomic myomectomy on uterine leiomyoma: a meta-analysis. J Minim Invasive Gynecol 2015;22:177–84.

18. Polena V, Mergui JL, Perrot N, Poncelet C, Barranger E, Uzan S. Long-term results of hysteroscopic myomectomy in 235 patients. Eur J Obstet Gynecol Reprod Biol 2007;130:232–7.

19. Radosa JC, Radosa CG, Mavrova R, et al. Postoperative quality of life and sexual function in premenopausal women undergoing laparoscopic myomectomy for symptomatic fibroids: a prospective observational cohort study. PLoS One 2016;11:e0166659.

20. Ertunc D, Uzun R, Tok EC, Doruk A, Dilek S. The effect of myoma uteri and myomectomy on sexual function. J Sex Med 2009;6:1032–8.

Author and article information

From the Departments of Obstetrics and Gynecology and Surgery (Drs Laughlin-Tommaso and Stewart), Mayo Clinic, Rochester, MN; Department of Biostatistics and Bioinformatics (Dr Thomas), Duke University School of Medicine, Durham, NC; Duke Clinical Research Institute (Ms Lu and Drs Thomas and Wang), Durham, NC; Department of Obstetrics and Gynecology (Dr Diamond), Augusta University, Augusta, GA; Department of Obstetrics and Gynecology (Dr Wallace), University of Mississippi Medical Center, Jackson, MS; Department of Public Health Sciences (Dr Wegienka), Henry Ford Health System, Detroit, MI; Department of Epidemiology (Dr Vines), Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC; Division of Reproductive Endocrinology and Infertility (Dr Anchan), Department of Obstetrics, Gynecology and Reproductive Biology, Brigham and Women's Hospital, Boston, MA; Division of Cardiology (Dr Wang), Department of Medicine, Duke University School of Medicine, Durham, NC; Department of Obstetrics and Gynecology and the Women's Health Integrated Research Center (Dr Maxwell), Inova Health System; Department of Obstetrics, Gynecology and Reproductive Sciences (Dr Jacoby), University of California, San Francisco, CA; Division of Reproductive Endocrinology and Infertility (Dr Marsh), Department of Obstetrics and Gynecology, University of Michigan, Ann Arbor, MI; Department of Radiology (Dr Spies), Georgetown University School of Medicine, Washington, DC; Department of Obstetrics & Gynecology (Dr Nicholson), Center for Women's Health Research, and Center for Health Promotion and Disease Prevention, University of North Carolina, Chapel Hill, NC; Division of Reproductive Sciences (Dr Meyers), Department of Obstetrics & Gynecology, Duke University School of Medicine, Durham, NC.

Received June 20, 2019; revised Sept. 12, 2019; accepted Sept. 30, 2019.

The following authors report consulting or advisory roles with pharmaceutical companies developing products for the treatment of uterine leiomyomata: S.K.L.T., Allergan; E.E.M., Allergan; E.A.S., AbbVie, Bayer, and Myovent; E.M., AbbVie, Allergan, and Bayer. S.K.L.-T. and M.D. also report institutional grants from Bayer. The other authors report no conflict of interest. None of the authors have any financial relationships directly relevant to the manuscript topic.

This project was supported by grant number P50HS023418 from the Agency for Healthcare Research and Quality.

The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of from the Agency for Healthcare Research and Quality.

Clinical Trial number: NCT02260752, clinical trials.gov

Corresponding author: Shannon K. Laughlin-Tommaso, MD MPH. laughlintommaso.shannon@mayo.edu

SUPPLEMENTARY TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in COMPARE-UF Study

Variable	Hysteroscopic myomectomy		Laparoscopic/robotic myomectomy		Abdominal myomectomy		*P* value
	n	Value	n	Value	n	Value	
Age, y							<.01
Median	338	41.0	519	37.0	349	37.0	
25th		35.0		33.0		33.0	
75th		47.0		41.0		41.0	
Mean		41.0		37.2		36.9	
SD		7.3		5.9		5.9	
Min		20.0		18.0		23.0	
Max		54.0		53.0		54.0	
Missing (%)	0	0.0	0	0.0	0	0.0	
Race							.01
Other	52	15.4	106	20.4	68	19.5	
Black	127	37.6	204	39.3	161	46.1	
White	158	46.7	205	39.5	120	34.4	
Missing	1	0.3	4	0.8	0	0.0	
Hispanic or Latino							.02
Yes	35	10.4	27	5.2	25	7.2	
No	293	86.7	481	92.7	318	91.1	
Missing	10	3.0	11	2.1	6	1.7	
Time since diagnosis with fibroid symptoms, y							.14
Median	330	3.0	503	3.0	340	3.0	
25th		1.0		1.0		1.0	
75th		6.0		6.0		7.0	
Mean		4.8		4.7		5.1	
SD		5.9		5.1		5.2	
Min		0.0		0.0		0.0	
Max		29.0		32.0		28.0	
Missing (%)	8	2.4	16	3.1	9	2.6	
Prior pregnancies, 1+ vs 0							<.01
Yes	234	69.2	254	48.9	150	43.0	
No	102	30.2	256	49.3	195	55.9	
Missing	2	0.6	9	1.7	4	1.1	
No. of prior pregnancies							<.01
>6	13	3.8	7	1.3	3	0.9	
6	8	2.4	2	0.4	3	0.9	
5	24	7.1	8	1.5	3	0.9	
4	25	7.4	17	3.3	20	5.7	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in COMPARE-UF Study *(continued)*

Variable	Hysteroscopic myomectomy		Laparoscopic/robotic myomectomy		Abdominal myomectomy		*P* value
	n	Value	n	Value	n	Value	
3	35	10.4	36	6.9	18	5.2	
2	73	21.6	66	12.7	42	12.0	
1	56	16.6	118	22.7	61	17.5	
0	102	30.2	256	49.3	195	55.9	
Missing	2	0.6	9	1.7	4	1.1	
Body mass index							<.01
Median	327	28.4	493	26.5	333	27.0	
25th		23.9		22.6		23.4	
75th		34.4		31.9		33.4	
Mean		30.2		28.2		28.8	
SD		9.1		7.3		7.2	
Min		17.0		14.2		16.5	
Max		77.3		58.0		53.2	
Missing (%)	11	3.3	26	5.0	16	4.6	
Currently using birth control							.64
Yes	243	71.9	369	71.1	240	68.8	
No	95	28.1	150	28.9	109	31.2	
Medical history, based on high blood pressure, diabetes, asthma, thyroid problems, and blood clots in legs or lungs							<.01
Yes	169	50.0	186	35.8	126	36.1	
No	166	49.1	325	62.6	221	63.3	
Missing	3	0.9	8	1.5	2	0.6	
High blood pressure							.07
Yes	68	20.1	79	15.2	49	14.0	
No	267	79.0	430	82.9	298	85.4	
Missing	3	0.9	10	1.9	2	0.6	
Diabetes							<.01
Yes	25	7.4	13	2.5	10	2.9	
No	309	91.4	496	95.6	337	96.6	
Missing	4	1.2	10	1.9	2	0.6	
Asthma							.13
Yes	63	18.6	73	14.1	48	13.8	
No	271	80.2	435	83.8	297	85.1	
Missing	4	1.2	11	2.1	4	1.1	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in COMPARE-UF Study *(continued)*

Variable	Hysteroscopic myomectomy		Laparoscopic/robotic myomectomy		Abdominal myomectomy		*P* value
	n	Value	n	Value	n	Value	
Thyroid problems							.06
Yes	54	16.0	65	12.5	35	10.0	
No	278	82.2	443	85.4	309	88.5	
Missing	6	1.8	11	2.1	5	1.4	
Blood clots in legs or lungs							.03
Yes	10	3.0	4	0.8	4	1.1	
No	324	95.9	502	96.7	340	97.4	
Missing	4	1.2	13	2.5	5	1.4	
Endometriosis							.74
Yes	23	6.8	42	8.1	25	7.2	
No	310	91.7	467	90.0	322	92.3	
Missing	5	1.5	10	1.9	2	0.6	
Smoking history							.05
Yes	25	7.4	20	3.9	15	4.3	
No	310	91.7	490	94.4	332	95.1	
Missing	3	0.9	9	1.7	2	0.6	
Alcohol, including wine and/or beer, used							.54
Yes	254	75.1	405	78.0	260	74.5	
No	31	9.2	43	8.3	36	10.3	
Missing	53	15.7	71	13.7	53	15.2	
Marijuana/pot/ cannabis used							.35
Never	222	65.7	342	65.9	247	70.8	
In the past	91	26.9	121	23.3	77	22.1	
Currently	22	6.5	45	8.7	23	6.6	
Missing	3	0.9	11	2.1	2	0.6	
Prior procedures							.42
Yes	70	20.7	89	17.1	67	19.2	
No	265	78.4	424	81.7	279	79.9	
Missing	3	0.9	6	1.2	3	0.9	
Prior abdominal myomectomy							.60
Yes	23	6.8	31	6.0	27	7.7	
No	312	92.3	482	92.9	319	91.4	
Missing	3	0.9	6	1.2	3	0.9	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in COMPARE-UF Study *(continued)*

Variable	Hysteroscopic myomectomy n	Hysteroscopic myomectomy Value	Laparoscopic/robotic myomectomy n	Laparoscopic/robotic myomectomy Value	Abdominal myomectomy n	Abdominal myomectomy Value	*P* value
Prior laparoscopic or robotic myomectomy							.53
Yes	10	3.0	21	4.0	16	4.6	
No	325	96.2	492	94.8	330	94.6	
Missing	3	0.9	6	1.2	3	0.9	
Prior focused ultrasound							.64
Yes	3	0.9	2	0.4	2	0.6	
No	332	98.2	511	98.5	344	98.6	
Missing	3	0.9	6	1.2	3	0.9	
Prior endometrial ablation							.39
Yes	4	1.2	4	0.8	1	0.3	
No	331	97.9	509	98.1	345	98.9	
Missing	3	0.9	6	1.2	3	0.9	
Prior radiofrequency ablation							.29
Yes	0	0.0	0	0.0	1	0.3	
No	335	99.1	513	98.8	345	98.9	
Missing	3	0.9	6	1.2	3	0.9	
Prior UAE							.39
Yes	2	0.6	2	0.4	4	1.1	
No	333	98.5	511	98.5	342	98.0	
Missing	3	0.9	6	1.2	3	0.9	
Primary source of insurance							.41
Private	282	83.4	443	85.4	286	81.9	
Other	52	15.4	72	13.9	60	17.2	
Missing	4	1.2	4	0.8	3	0.9	
Total fibroid volume, among patients with imaging data							<.01
Median	240	16.4	380	222.6	253	380.2	
25th		5.3		77.8		162.7	
75th		38.0		427.4		727.9	
Mean		71.5		318.5		587.3	
SD		367.4		457.7		836.2	
Min		0.1		2.1		0.3	
Max		5230.0		6794.9		9989.4	
Missing (%)	24	9.1	43	10.2	23	8.3	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in COMPARE-UF Study *(continued)*

Variable	Hysteroscopic myomectomy		Laparoscopic/robotic myomectomy		Abdominal myomectomy		*P* value
	n	Value	n	Value	n	Value	
Average fibroid dimension, cm, among patients with imaging data							<.01
Median	240	2.5	380	5.2	253	6.1	
25th		1.8		3.6		4.5	
75th		3.5		7.3		8.9	
Mean		2.8		5.6		7.0	
SD		1.8		2.6		3.6	
Min		0.6		1.1		0.9	
Max		21.7		15.2		27.1	
Missing (%)	24	9.1	43	10.2	23	8.3	
No. of fibroids measured, among patients with imaging data							<.01
Median	253	1.0	412	2.0	273	2.0	
25th		1.0		1.0		1.0	
75th		3.0		3.0		4.0	
Mean		2.0		2.5		2.6	
SD		1.4		1.7		1.7	
Min		1.0		1.0		1.0	
Max		7.0		10.0		10.0	
Missing (%)	11	4.2	11	2.6	3	1.1	
Uterine volume, among patients with imaging data							<.01
Median	227	181.4	321	438.6	216	805.2	
25th		113.7		225.3		449.7	
75th		310.1		711.2		1,312.6	
Mean		251.3		553.3		959.3	
SD		224.5		511.3		716.1	
Min		48.7		22.2		58.4	
Max		1765.1		4438.8		4242.6	
Missing (%)	37	14.0	102	24.1	60	21.7	
Discomfort during intercourse							<.01
Yes	117	34.6	203	39.1	165	47.3	
No	221	65.4	314	60.5	184	52.7	
Missing	0	0.0	2	0.4	0	0.0	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 1

Baseline patient characteristics by the surgical route among myomectomy patients in COMPARE-UF Study *(continued)*

Variable	Hysteroscopic myomectomy		Laparoscopic/robotic myomectomy		Abdominal myomectomy		*P* value
	n	Value	n	Value	n	Value	
Pelvic pain requiring medications							.24
Yes	136	40.2	179	34.5	132	37.8	
No	202	59.8	338	65.1	217	62.2	
Missing	0	0.0	2	0.4	0	0.0	
Pelvic pain not/during periods							.10
Both times	69	20.4	119	22.9	87	24.9	
Not during periods	6	1.8	10	1.9	5	1.4	
During periods	55	16.3	49	9.4	39	11.2	
No	208	61.5	339	65.3	218	62.5	
Missing	0	0.0	2	0.4	0	0.0	
Frequent urination							<.01
Yes	121	35.8	297	57.2	217	62.2	
No	217	64.2	220	42.4	132	37.8	
Missing	0	0.0	2	0.4	0	0.0	
Bleeding history[a]							<.01
Yes	304	89.9	382	73.6	273	78.2	
No	34	10.1	135	26.0	76	21.8	
Missing	0	0.0	2	0.4	0	0.0	

COMPARE-UF, Comparing Options for Management: Patient-centered Results for Uterine Fibroids; *Max,* maximum; *Min,* minimum; *SD,* standard deviation; *UAE,* uterine artery embolization; *25th,* 25th percentile; *75th,* 75th percentile.

[a] Bleeding history is defined as the composite of menstrual periods that last 7 or more days, heavy bleeding during periods, and bleeding and spotting between periods under the uterine fibroid history.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

SUPPLEMENTARY TABLE 2

Baseline and short-term results for the EQ-5D (presented as binary proportions) by the surgical route among myomectomy patients before weighting in the COMPARE-UF Study (n = 1206 women)

EQ-5D % without problems	Hysteroscopic myomectomy n = 338	Laparoscopic/robotic myomectomy n = 519	Abdominal myomectomy n = 349
Baseline			
Mobility	84.0% (283)	86.8% (448)	81.4% (281)
Self-care	94.4% (319)	95.9% (495)	96.5% (332)
Usual activities	71.3% (241)	67.6% (348)	66.3% (228)
Pain/discomfort	35.8% (121)	26.4% (136)	19.7% (68)
Anxious/depressed	43.6% (147)	40.0% (205)	39.5% (136)
Posttreatment			
Mobility	89.3% (299)	89.4% (463)	86.2% (299)
Self-care	95.2% (318)	97.5% (503)	96.5% (335)
Usual activities	82.9% (184)	74.8% (270)	66.2% (149)
Pain/discomfort	63.3% (212)	54.0% (278)	43.5% (150)
Anxious/depressed	62.7% (210)	61.8% (319)	69.9% (242)

Numbers are % (n).

COMPARE-UF, Comparing Options for Management: Patient-centered Results for Uterine Fibroids.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

SUPPLEMENTARY TABLE 3

Baseline and short-term results for the EQ-5D between abdominal myomectomy and laparoscopic/robotic myomectomy in the weighting adjusted population in the COMPARE-UF Study (n = 868 women)

EQ-5D scale	I am/ I have...	Laparoscopic/ robotic myomectomy	Abdominal myomectomy	*P* value
1-1 Mobility at baseline	Confined to bed	0.0%	0.7%	.14
	Severe problems in walking about	1.9%	1.1%	
	Moderate problems in walking about	4.4%	3.5%	
	Some problems in walking about	7.3%	12.3%	
	No problems in walking about	86.3%	82.4%	
1-2 Self-care at baseline	Severe problems washing or dressing myself	0.5%	0.9%	.34
	Moderate problems washing or dressing myself	1.2%	0.6%	
	Slight problems washing or dressing myself	3.3%	2.4%	
	No problems washing or dressing myself	95.0%	96.2%	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 3

Baseline and short-term results for the EQ-5D between abdominal myomectomy and laparoscopic/robotic myomectomy in the weighting adjusted population in the COMPARE-UF Study (n = 868 women) *(continued)*

EQ-5D scale	I am/ I have...	Laparoscopic/ robotic myomectomy	Abdominal myomectomy	*P* value
1-3 Usual activities at baseline	Unable to perform my usual activities	0.5%	0.7%	.89
	Severe problems doing my usual activities	2.8%	2.1%	
	Moderate problems doing my usual activities	9.0%	9.8%	
	Slight problems doing my usual activities	21.4%	21.6%	
	No problems doing my usual activities	66.2%	65.8%	
1-4 Pain/discomfort at baseline	Extreme pain or discomfort	5.3%	2.7%	.49
	Severe pain or discomfort	11.5%	9.6%	
	Moderate pain or discomfort	23.2%	32.4%	
	Slight pain or discomfort	36.8%	35.6%	
	No pain or discomfort	23.2%	19.7%	
1-5 Anxious/depressed at baseline	Extremely anxious or depressed	2.0%	2.6%	.71
	Severely anxious or depressed	6.0%	7.0%	
	Moderately anxious or depressed	23.9%	17.3%	
	Slightly anxious or depressed	30.0%	36.0%	
	Not anxious or depressed	38.2%	37.1%	
2-1 Mobility at short-term follow up	Confined to bed	0.1%	0.0%	.26
	Severe problems in walking about	0.8%	0.5%	
	Moderate problems in walking about	1.8%	1.0%	
	Some problems in walking about	8.3%	12.4%	
	No problems in walking about	89.0%	86.2%	
2-2 Self-care at short-term follow up	Severe problems washing or dressing myself	0.5%	0.0%	.16
	Moderate problems washing or dressing myself	0.5%	1.4%	
	Slight problems washing or dressing myself	1.6%	2.4%	
	No problems washing or dressing myself	97.5%	96.2%	

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020. *(continued)*

SUPPLEMENTARY TABLE 3

Baseline and short-term results for the EQ-5D between abdominal myomectomy and laparoscopic/robotic myomectomy in the weighting adjusted population in the COMPARE-UF Study (n = 868 women) *(continued)*

EQ-5D scale	I am/ I have...	Laparoscopic/ robotic myomectomy	Abdominal myomectomy	*P* value
2-3 Usual activities at short-term follow up	Unable to perform my usual activities	0.1%	0.0%	.18
	Severe problems doing my usual activities	0.2%	0.5%	
	Moderate problems doing my usual activities	6.7%	6.9%	
	Slight problems doing my usual activities	18.4%	26.6%	
	No problems doing my usual activities	74.7%	66.0%	
2-4 Pain/discomfort at short-term follow up	Extreme pain or discomfort	0.7%	0.0%	.02
	Severe pain or discomfort	1.7%	2.2%	
	Moderate pain or discomfort	9.8%	12.0%	
	Slight pain or discomfort	35.3%	42.4%	
	No pain or discomfort	52.6%	43.4%	
2-5 Anxious/depressed at short-term follow up	Extremely anxious or depressed	0.9%	0.3%	.02
	Severely anxious or depressed	3.0%	2.0%	
	Moderately anxious or depressed	9.2%	6.0%	
	Slightly anxious or depressed	24.7%	23.9%	
	Not anxious or depressed	62.1%	67.9%	

Numbers represent percentages and *P* values from a proportional odds model, adjusted by propensity weighting.

COMPARE-UF, Comparing Options for Management: Patient-centered Results for Uterine Fibroids.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

SUPPLEMENTARY TABLE 4

Comparison of women missing follow-up data to the final study population in the COMPARE-UF Study

	Missing follow-up n = 132	Final study population N = 1206
Age, y	37.0 (33.0–42.5)	38.0 (33.0–43.0)
Race		
Other	24 (18.3%)	226 (18.8%)
Black	70 (53.4%)	492 (41.0%)
White	37 (28.2%)	483 (40.2%)
Hispanic or Latino	11 (8.8%)	87 (7.4%)
Time since diagnosis with fibroid symptoms, y	3.0 (1.0–9.0)	3.0 (1.0–7.0)
Prior pregnancies, 1+ vs 0	76 (58.9%)	638 (53.6%)
No. of prior pregnancies		
>3	15 (11.6%)	133 (11.2%)
3	10 (7.8%)	89 (7.5%)
2	22 (17.1%)	181 (15.2%)
1	29 (22.5%)	235 (19.7%)
0	53 (41.1%)	553 (46.4%)
Body mass index	29.0 (24.2–32.9)	27.2 (23.2–33.2)
Currently using birth control	75 (56.8%)	852 (70.6%)
Medical history, based on high blood pressure, diabetes, asthma, thyroid problems, and blood clots in legs or lungs	57 (43.8%)	481 (40.3%)
High blood pressure	29 (22.3%)	196 (16.5%)
Diabetes	10 (7.8%)	48 (4.0%)
Asthma	21 (16.2%)	184 (15.5%)
Thyroid problems	12 (9.2%)	154 (13.0%)
Blood clots in legs or lungs	4 (3.1%)	18 (1.5%)
Endometriosis	15 (11.6%)	90 (7.6%)
Smoking history	14 (10.8%)	60 (5.0%)
Alcohol, including wine and/or beer, use	91 (87.5%)	919 (89.3%)
Marijuana/pot/cannabis use		
Never	88 (67.7%)	811 (68.2%)
In the past	32 (24.6%)	289 (24.3%)
Currently	10 (7.7%)	90 (7.6%)
Prior procedures	17 (12.9%)	226 (18.9%)
Prior abdominal myomectomy	4 (3.0%)	81 (6.8%)
Prior laparoscopic or robotic myomectomy	8 (6.1%)	47 (3.9%)
Prior focused ultrasound	0 (0.0%)	7 (0.6%)
Prior endometrial ablation	2 (1.5%)	9 (0.8%)
Prior radiofrequency ablation	0 (0.0%)	1 (0.1%)
Prior UAE	0 (0.0%)	8 (0.7%)
Primary source of insurance		
Private	100 (76.3%)	1011 (84.6%)
Other	31 (23.7%)	184 (15.4%)

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.

(continued)

SUPPLEMENTARY TABLE 4

Comparison of women missing follow-up data to the final study population in the COMPARE-UF Study *(continued)*

	Missing follow-up n = 132	Final study population N = 1206
Total fibroid volume, among patients with imaging data	145.3 (12.9–355.8)	156.6 (33.0–415.8)
Average fibroid dimension, cm, among patients with imaging data	4.3 (2.4–7.6)	4.5 (2.9–6.8)
No. of fibroids measured, among patients with imaging data	1.0 (1.0–3.0)	2.0 (1.0–3.0)
Uterine volume, among patients with imaging data	345.3 (155.0–782.6)	381.2 (186.4–761.2)
Discomfort during intercourse	57 (43.2%)	485 (40.3%)
Pelvic pain requiring medications	65 (49.2%)	447 (37.1%)
Pelvic pain not/during periods		
Both times	44 (33.3%)	275 (22.8%)
Not during periods	1 (0.8%)	21 (1.7%)
During periods	18 (13.6%)	143 (11.9%)
No	69 (52.3%)	765 (63.5%)
Frequent urination	77 (58.3%)	635 (52.7%)
Bleeding history[a]	107 (81.1%)	959 (79.7%)

COMPARE-UF, Comparing Options for Management: Patient-centered Results for Uterine Fibroids; *UAE*, uterine artery embolization.

[a] Bleeding history is defined as the composite of menstrual periods that last 7 or more days, heavy bleeding during periods, and bleeding and spotting between periods under the uterine fibroid history.

Laughlin-Tommaso et al. Quality of life after myomectomy. Am J Obstet Gynecol 2020.