

Radiofrequency Volumetric Thermal Ablation of Fibroids and Laparoscopic Myomectomy: Long-Term Follow-up From a Randomized Trial

Radiofrequenz-volumetrische Thermoablation von Myomen und Laparoskopische Myomektomie: Langzeit-Follow-up einer randomisierten Studie

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Key words

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- laparoscopic myomectomy
- fibroids
- laparoscopic ultrasound
- Accessa

Schlüsselwörter

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Abstract



Aims: Laparoscopic myomectomy (LM) has been the gold standard treatment for uterine fibroids in women desiring uterine conservation. To evaluate a new fibroid treatment modality – radiofrequency volumetric thermal ablation (RFVTA) – we compare 12-month results in women who had symptomatic uterine fibroids and who were randomized to laparoscopic ultrasound-guided RFVTA or LM.

Materials and Methods: Our study is a 1 : 1 parallel, randomized, prospective, single-center, longitudinal, comparative analysis of RFVTA to LM for fibroid treatment in women ≥ 18 years of age who desired uterine conservation. Fifty women were randomized intraoperatively to RFVTA (n = 25) or to LM (n = 25) after laparoscopic ultrasound mapping of the uterus.

Results: Post surgery, ablation and myomectomy subjects took pain medications for 4 days (range: 1–46) and 7 days (range: 1–83 days) respectively (p = 0.60). Ablation and myomectomy subjects missed 10.0 workdays (range: 2–86 days) and 17.0 workdays (range: 7–30 days) (p = 0.28), resumed normal activities in 20.5 days (range: 5–103 days) versus 28.0 days (range: 10–42 days) (p = 0.86) respectively. Mean symptom severity scores decreased (improved) by –7.8 for the ablation subjects and by –17.9 for the myomectomy subjects (p = 0.16). Health-related quality of life improved (increased) by 7.5 and 13.1, respectively, for the two groups (p = 0.46). Two myomectomy subjects had pregnancies that ended in a Cesarean delivery and a vaginal delivery of healthy infants. Two pregnancies in the RFVTA group ended in full-term vaginal deliveries of healthy infants.

Conclusions: Early postoperative recovery and twelve-month results attest to similar clinical benefits from RFVTA and LM.

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Zusammenfassung



Zielsetzung: Die laparoskopische Enukleation von Myomen (LM) war bislang der Goldstandard bei Frauen mit Wunsch nach Uteruserhalt. Wir evaluieren die ultraschallgesteuerte thermale volumetrische Radiofrequenzablation (RFVTA) als eine neue Therapieoption: die 12-Monats-Ergebnisse von Patientinnen, die aufgrund symptomatischer Uterusmyome in die Therapiearme RFVTA oder LM randomisiert wurden, werden verglichen.

Material und Methoden: Es handelt sich um eine 1 : 1 parallele, longitudinale, randomisiert prospektive Single-Center-Vergleichsanalyse zwischen RFVTA und LM bei Frauen ≥ 18 Jahren mit Wunsch nach Uteruserhalt. Nach laparoskopisch gesteuertem Ultraschall-Mapping des Uterus wurden insgesamt 50 Frauen intraoperativ in die beiden Arme RFVTA (n = 25) oder LM (n = 25) randomisiert.

Ergebnisse: Nach Ablation und Myomektomie nahmen die Patientinnen für 4 (1–46 d) bzw. 7 Tage (1–83 d) Schmerzmittel ein (p = 0,60), fehlten 10 (2–86 d) bzw. 17 Arbeitstage (7–30 d) (p = 0,28) und kehrten nach 20,5 (5–103 d) vs. 28,0 Tagen (10–42 d) (p = 0,86) wieder zu ihren normalen Aktivitäten zurück. Im Mittel sank der Schweregrad der Symptome um –7,8 (RFVTA) und um –17,9 (LM) (p = 0,16). Die gesundheitsbezogene Lebensqualität verbesserte sich um 7,5 bzw 13,1 (p = 0,46). Zwei Schwangerschaften traten nach Myomektomie ein und resultierten in einer Sectio und einer vaginalen Entbindung mit unauffälligen Kindern. Zwei Schwangerschaften im RFVTA-Arm führten zu vaginalen Spontanpartus ebenfalls unauffälliger Neugeborener.

Conclusio: Die rasche postoperative Erholungsphase und die 12-Monats-Ergebnisse lassen auf einen ähnlichen klinischen Nutzen der neuen RFVTA-Methode im Vergleich zur LM schließen.

Précis



Twelve-month qualitative results indicate similar efficacy, quality of life, and safety for both laparoscopic ultrasound-guided radiofrequency volumetric thermal ablation of fibroids and laparoscopic myomectomy.

Introduction



Hysterectomy for symptomatic fibroid treatment is prevalent in parts of Europe and in the United States [1]. However, European and U.S. patients are increasingly seeking uterine-sparing therapy and fertility conservation [2]. Minimally invasive options – such as ultrasound-guided laparoscopic myomectomy, uterine artery embolization, and magnetic resonance-guided focused ultrasound – are becoming popular among patients and their gynecologists [3]. Laparoscopic myomectomy (LM) has long been considered the gold standard treatment of symptomatic uterine fibroids in women desiring uterine conservation and fertility [4–6]. Advantages of LM over abdominal myomectomy include reduced blood loss, decreased postoperative pain, shorter hospital stay, and more rapid recovery [7]. However, the technical challenges of multilayer laparoscopic suturing require skill and experience, as well as extirpation of any deep intramural fibroids or fibroids located near the fallopian tubes with consequent uterotomy and myometrial scars.

A newer minimally invasive, outpatient, uterine-sparing approach to fibroid treatment has been described in the literature: laparoscopic radiofrequency volumetric thermal ablation (RFVTA, the Acessa™ Procedure, Halt Medical, Inc., Brentwood, California USA) [8–10]. Previously reported 3-month results from a large, multicenter trial of RFVTA were predictive of near- and long-term clinical outcomes [9]. Brucker et al. recently reported mean times to discharge from the hospital following RFVTA and LM (ClinicalTrials.gov Identifier: NCT01750008) [11]. Their study confirmed significantly shorter mean hospitalization for subjects undergoing RFVTA compared to those undergoing LM.

The purpose of this follow-up to Brucker et al.'s earlier report [11] is to analyze, compare and describe that study's 3-, 6-, and 12-month outcomes in terms of pain medication use, recovery from surgery, and subjects' subjective responses to validated questionnaires.

Materials and Methods



Study design

This 1 : 1 parallel randomized, prospective, single-center, longitudinal, comparative study of clinical and safety outcomes after laparoscopic ultrasound-guided RFVTA and ultrasound-guided laparoscopic myomectomy was designed for women ≥ 18 years of age with uterine sizes of < 16 gestational weeks, who had symptomatic fibroids (< 10 cm in any diameter) detected by transvaginal ultrasound, and who desired uterine conservation and preservation of fertility [11]. Exclusion criteria applied to those women who: were contraindicated for laparoscopic surgery and/or general surgery, were known to have significant intra-abdominal adhesions, had an implanted intrauterine or fallopian tube contraceptive device, had chronic pelvic pain not due to fibroids, had known or suspected endometriosis or adenomyosis, had active (or a history of) pelvic inflammatory disease, had a history of

(or evidence of) gynecologic malignancy or premalignancy within the past 5 years, had a cervical myoma, or had one or more completely intracavitary submucous fibroids or only type 0/1 submucous fibroids that are better treated via hysteroscopic methods [11].

Subjects were recruited from referral gynecologists beginning in mid-2012 in Germany, and study subjects were enrolled at the Women's Hospital at the University of Tübingen between November 1, 2012 and June 30, 2013. The University of Tübingen Local Ethics Committee approved the protocol. An independent third party (CenTrial GmbH, Tübingen, Germany) monitored the data and an independent biostatistics company (Innovative Analytics, Kalamazoo, Michigan USA) analyzed all monitored data. The 50 enrolled women were informed of the purpose of the study, study testing, expected duration of 60 months of follow-up, and potential risks and benefits of participation. They were treated at Tübingen University Women's Hospital in Tübingen, Germany.

Intraoperative treatment randomization and operative technique

Randomization occurred as an intraoperative step following contact laparoscopic ultrasound mapping of the uterus; the latter provided classification, size, and location of all fibroids within the uterus. Once each subject's fibroids were mapped and recorded on the treatment case report form, the surgeon, who up to this point was blinded as to which treatment method would be assigned – RFVTA or LM – drew an envelope containing the subject's treatment assignment (● Fig. 1). The assignments were computer-generated in blocks of 6 or 4 by an independent biostatistics company (Innovative Analytics, Kalamazoo, Michigan USA).

Brucker et al. have described the treatment approaches in detail [11]. Briefly, subjects randomized to LM received the standard surgical procedure in the lithotomy position. Two-layer suturing was used, as a standard of care, only for deep intramural fibroids or for those without endometrial or serosal distortion (● Fig. 2a). Though not a protocol exclusion, surgeons performing LM chose not to excise small (1.0–1.5-cm diameter) deep intramural fibroids.

Subjects undergoing RFVTA first had 3–5 core tissue needle biopsies from their largest fibroid and the samples were sent to pathology for routine analysis. The tip of the Acessa handpiece (3.4 mm in diameter) was then inserted and advanced into the fibroid via the same tract as the biopsy needle. The needle electrodes were deployed depending on the size of the fibroid, the ablation was carried out, and the tract was coagulated upon handpiece tip removal, therein providing hemostasis (● Fig. 2b). For both LM and RFVTA, the port sites were closed per standard procedure. Subjects were followed via phone, mail, and/or an in-person interview at 3, 6, and 12 months post procedure.

Outcome measures

The primary outcome measure of the study (hospitalization time) has been reported in the literature [11]. In this longer term follow-up of the same study, we report on qualitative outcomes through one year post treatment: subjects' subjective responses to validated questionnaires (Uterine Fibroid Symptom and Quality-of-Life (UFS-QOL), EQ-5D, Overall Treatment Effect Survey (OTE), and menstrual impact (MIQ) questionnaires [12–15]), their use of pain medication, procedure-related complications, re-interventions for fibroid symptoms, and pregnancy outcomes.

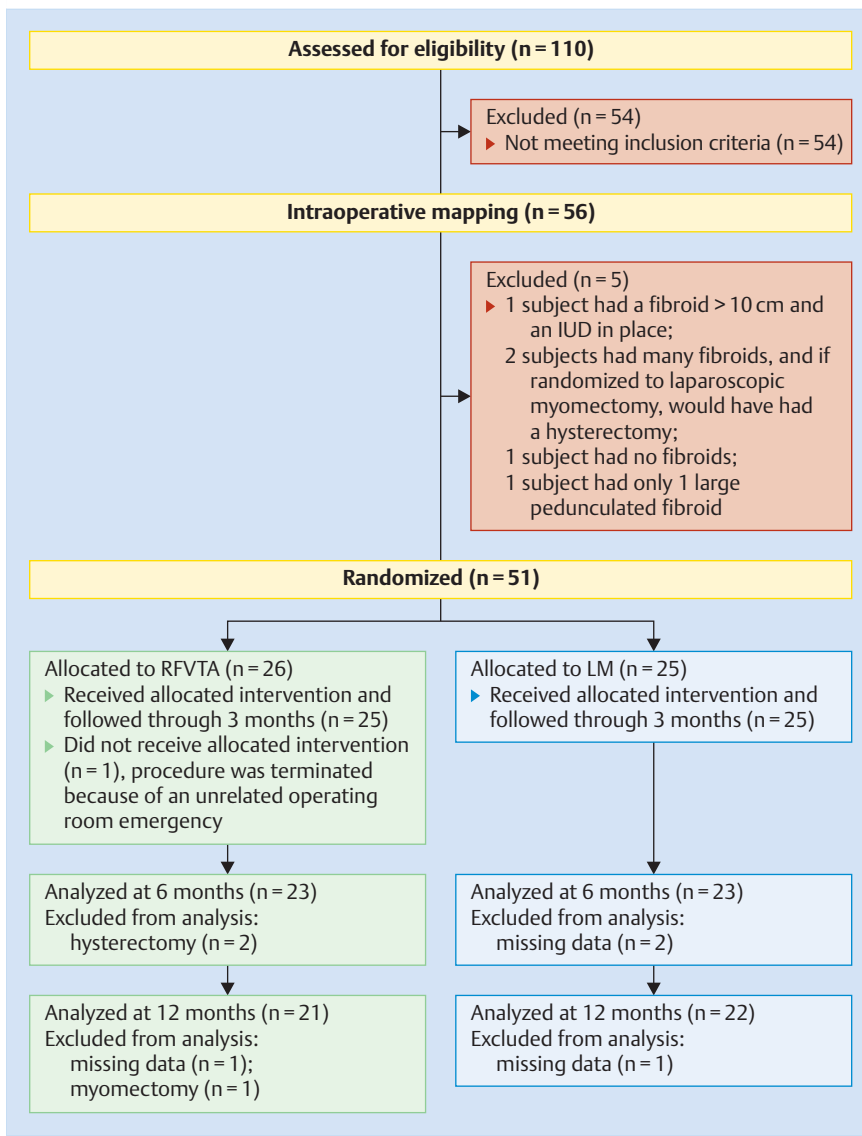


Fig. 1 Disposition of subjects throughout study. Flow of subjects through 12 months of follow-up (modified from Figure 1, reference [11]).

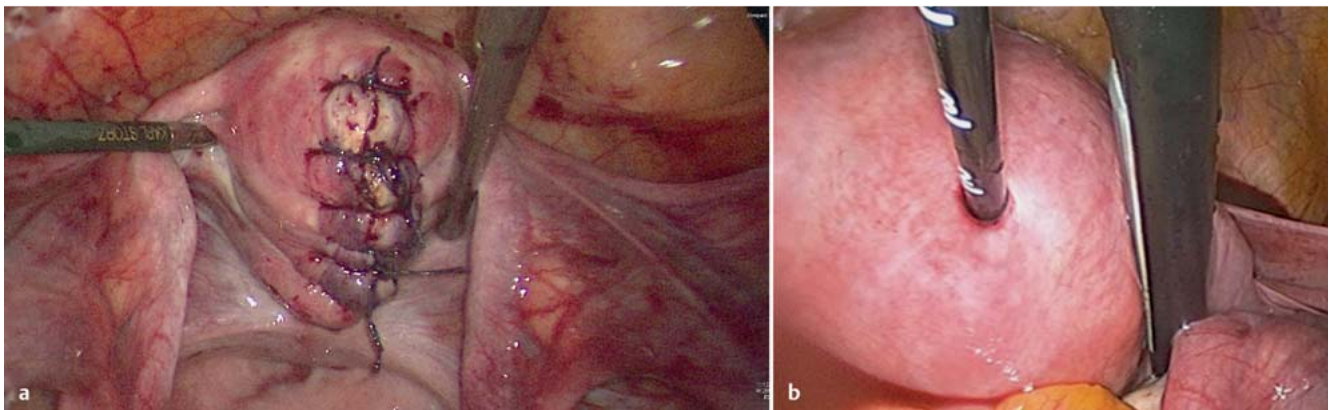


Table 1 Demographics of study participants and intraoperative myoma characteristics at baseline (modified from Table 2, reference [11])^{a,b}.

Variable	Baseline		p-value ^c
	RFVTA (n = 25)	LM (n = 25)	
Mean age, years (SD)	40.0 (7.8)	34.4 (6.1)	0.006
Mean height, cm (SD)	166.0 (5.8)	164.4 (5.9)	0.33
Mean weight, kg (SD)	62.4 (8.9)	64.9 (13.5)	0.43
Race, n (%)			
▶ White/Caucasian	25 (100)	25 (100)	
Intraoperative myoma characteristics			
▶ Total fibroids, n	72	61	
▶ Mean number of fibroids per subject (SD; median: range)	2.9 (2.6; 2: 1–9)	2.4 (1.6; 2: 1–6)	0.99
▶ Submucosal, N (%)	0 (0.0)	2 (3.3)	0.17
▶ Transmural, N (%)	0 (0.0)	3 (4.9)	0.17
▶ Intramural, N (%)	33 (45.8)	26 (42.6)	0.45
▶ IMAE, N (%)	2 (2.8)	0 (0.0)	0.17
▶ Subserosal, N (%)	37 (51.4)	34 (55.7)	0.21
▶ Pedunculated subserosal, N (%)	0 (0.0)	2 (3.3)	0.17

^a RFVTA = radiofrequency volumetric thermal ablation; LM = laparoscopic myomectomy; SD = standard deviation; IMAE = intramural abutting the endometrium

^b Intraoperative myoma characteristics were evaluated by laparoscopic ultrasound mapping of the uterus prior to treatment/excision.

^c P-values based on t-test for age, height, and weight; p-values were based on Wilcoxon test for fibroids.

Table 2 Number and percentage of subjects reporting symptoms at baseline and at 12 months.

Symptom	Baseline			12 months		
	RFVTA (n = 25) n (%)	LM (n = 25) n (%)	p-value	RFVTA (n = 21) n (%)	LM (n = 22) n (%)	p-value
Heavy menstrual bleeding	21 (84.0)	18 (72.0)	0.31 ^a	7 (33.3)	2 (9.1)	0.069 ^b
Increased abdominal girth	7 (28.0)	5 (20.0)	0.51 ^a	3 (14.3)	1 (4.5)	0.34
Dyspareunia	3 (12.0)	6 (24.0)	0.46	0 (0.0)	0 (0.0)	
Pelvic discomfort/pain	10 (40.0)	11 (44.0)	0.77 ^a	1 (4.8)	2 (9.1)	1.00
Dysmenorrhea	7 (28.0)	8 (32.0)	0.78 ^a	2 (9.5)	2 (9.1)	1.00
Urinary frequency	13 (52.0)	9 (36.0)	0.25 ^a	3 (14.3)	1 (4.5)	0.34
Urinary retention	4 (16.0)	8 (32.0)	0.19 ^a	0 (0.0)	0 (0.0)	
Sleep disturbance	0 (0.0)	1 (4.0)	1.00	0 (0.0)	0 (0.0)	
Uterine pain	3 (12.0)	1 (4.0)	0.61	0 (0.0)	0 (0.0)	
Backache	7 (28.0)	6 (24.0)	0.75 ^a	1 (4.8)	2 (9.1)	1.00
Localized pain	5 (20.0)	5 (20.0)	1.00 ^a	0 (0.0)	1 (4.5)	1.00
Other	0 (0.0)	1 (4.0)	1.00	2 (9.5)	0 (0.0)	0.23

^a P-value based on χ^2 test, otherwise based on Fisher's exact test.

^b P-value is 0.088 based on logistic regression controlling for baseline heavy menstrual bleeding.

Sample size and statistical analyses

The determination of the sample size has been reported in detail [8]. In brief, the sample size required for comparison of RFVTA and LM was based on assumptions with regard to hospitalization time. The null hypothesis was that RFVTA is more than 10% worse than LM concerning hospital stay and the alternative hypothesis was that this is not the case. The sample size required to reject the null hypothesis with a power of 0.80 was 50 (25 in each surgical group).

Analyses were performed using SAS version 9.3 (SAS Institute, Cary, North Carolina, USA). Continuous variables for the analyses performed for this study were summarized using descriptive statistics, whereas categorical variables were summarized in terms of frequencies and percentages. The precision of selected questionnaire outcomes for each treatment group is presented using 95% confidence intervals. Statistical tests comparing the two treatment groups were performed using the t-test, unless otherwise noted.

Results

Demographics, fibroid dimensions, and symptomatology

Demographic and baseline symptomatology summaries for subjects in each of the two treatment groups are presented in **Tables 1 and 2**, respectively. Subjects in the RFVTA and LM groups were similar with regard to height and weight, although the RFVTA subjects were several years older ($p = 0.006$). At baseline, symptomatology was similar between the two groups ($p = 0.19$ to 1.00, χ^2 or Fisher's exact test).

The surgeons incorporated intraoperative laparoscopic ultrasound not only to detect the uterine fibroids, but to measure the sum of their major diameters. For those women in the ablation group, the mean sum at baseline was 7.7 ± 4.2 cm; for those women randomized to myomectomy, the mean sum was 6.6 ± 3.2 cm. For those fibroids that were present and measurable at 12 months in the 19 subjects in each group, the mean sum of

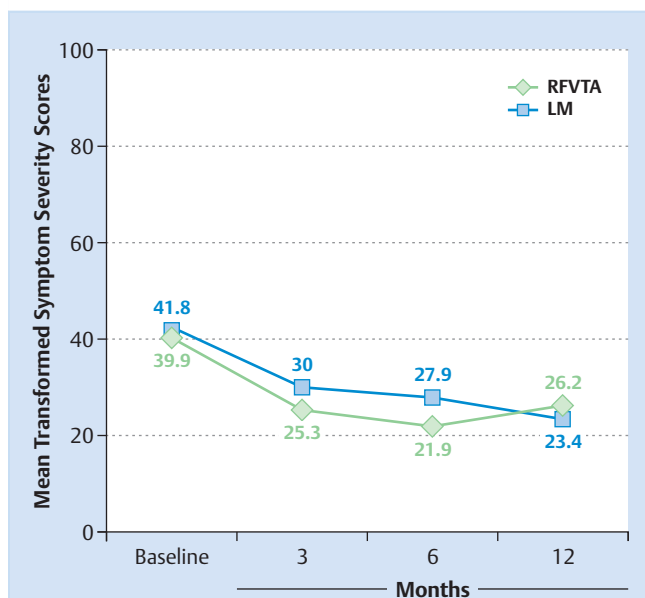


Fig. 3 Mean transformed uterine fibroid symptom severity scores. Symptom Severity scores for both radiofrequency volumetric thermal ablation (RFVTA) and laparoscopic myomectomy (LM) subjects. Note: The sample sizes at baseline, 3 months, 6 months, and 12 months are 25, 24, 23, and 18 for the RFVTA group; 25, 25, 22, and 20 for the LM group.

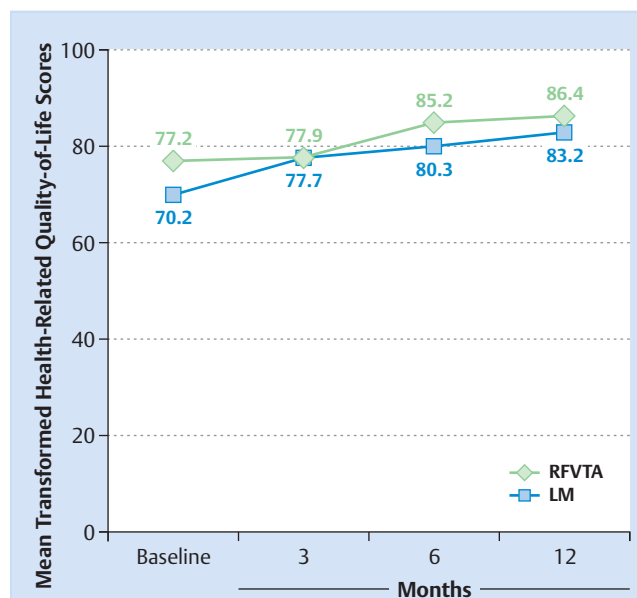


Fig. 4 Mean transformed uterine fibroid health-related quality-of-life scores. Health-Related Quality of Life scores for both RFVTA and LM subjects. Note: The sample sizes at baseline, 3 month, and 6 months are 25, 24, 23, and 20 for the RFVTA group; 25, 24, 23, and 21 for the LM group.

the major diameters was 4.8 ± 2.8 cm for the 15 fibroids detected in those women in the ablation group and 4.2 ± 2.6 cm for the 3 residual fibroids detected in those women in the myomectomy group.

At 12 months, heavy menstrual bleeding was the symptom with the greatest numerical difference between the two groups and the smallest associated p-value: 7 of 21 subjects (33.3%) in the RFVTA group and 2 of 22 subjects (9.1%) in the LM group ($p=0.088$, logistic regression, controlling for baseline heavy menstrual bleeding) (Table 2). All patients provided binary (yes/no) responses regarding the presence of heavy menstrual bleeding. Twelve (12/18; 66.7%) of the ablation subjects who had reported heavy menstrual bleeding at baseline did not have heavy menstrual bleeding at 12 months. This compares with 13 (13/15; 86.7%) of the myomectomy subjects who had heavy menstrual bleeding at baseline but not at 12 months. One of the 3 ablation subjects who reported no heavy menstrual bleeding at baseline reported heavy menstrual bleeding at 12 months; all of the 7 LM subjects reporting no heavy menstrual bleeding at baseline continued to report absence of this symptom at 12 months.

Postoperative use of pain medication and recovery

Subjects were followed postoperatively for 3 months with regard to their medication use and their return to day-to-day and work activities. During this period, ablation subjects ($n=25$) took pain relievers for a median of 4.0 days (range: 1–46 days), whereas myomectomy subjects ($n=25$) took pain medications for a median of 7.0 days (range: 1–83 days) ($p=0.60$). Twenty-four ablation subjects reported that they returned to normal activities in a median of 20.5 days (range: 5–103 days); 24 myomectomy subjects reported that they returned to normal activities in a median of 28.0 days (range: 10–42 days) ($p=0.86$). Of the 24 ablation subjects who reported that they worked outside the home, 23 returned to work having missed a median of 10.0 workdays (range,

2–86 days) including the procedure day. Of the 18 myomectomy subjects who worked outside the home, 17 returned to work and missed a median of 17.0 workdays (range, 7–30 days) ($p=0.28$).

Uterine Fibroid Symptom Severity and Quality-of-Life (UFS-QOL) outcomes

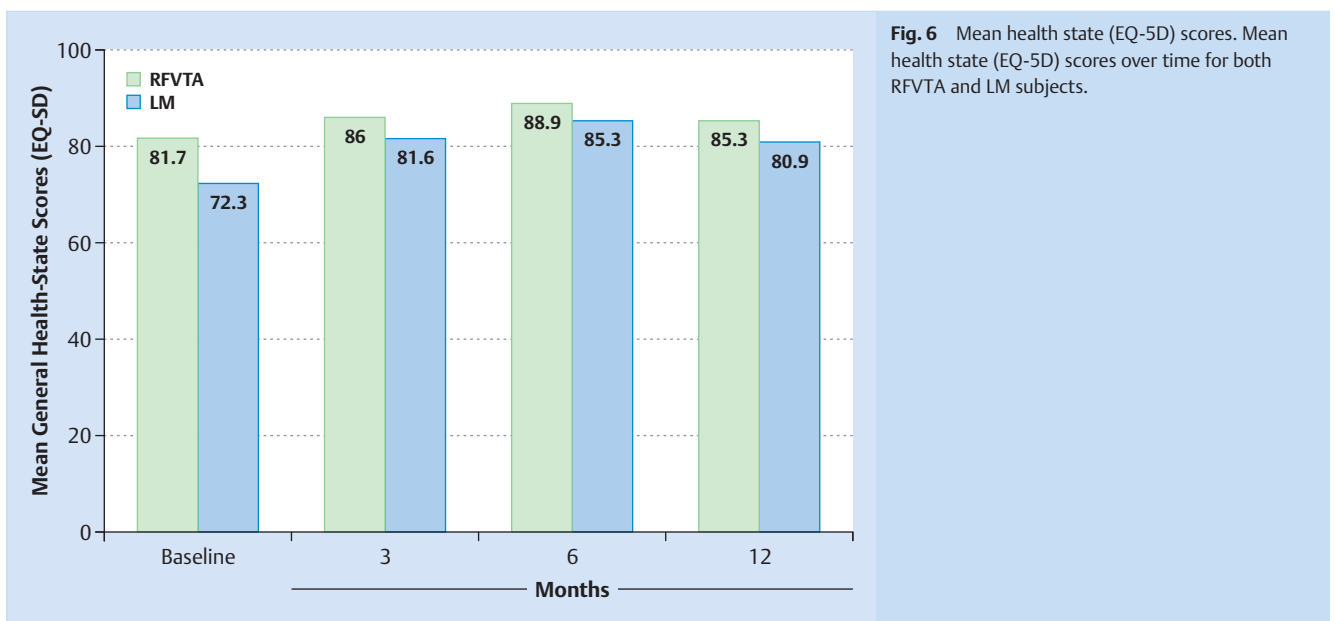
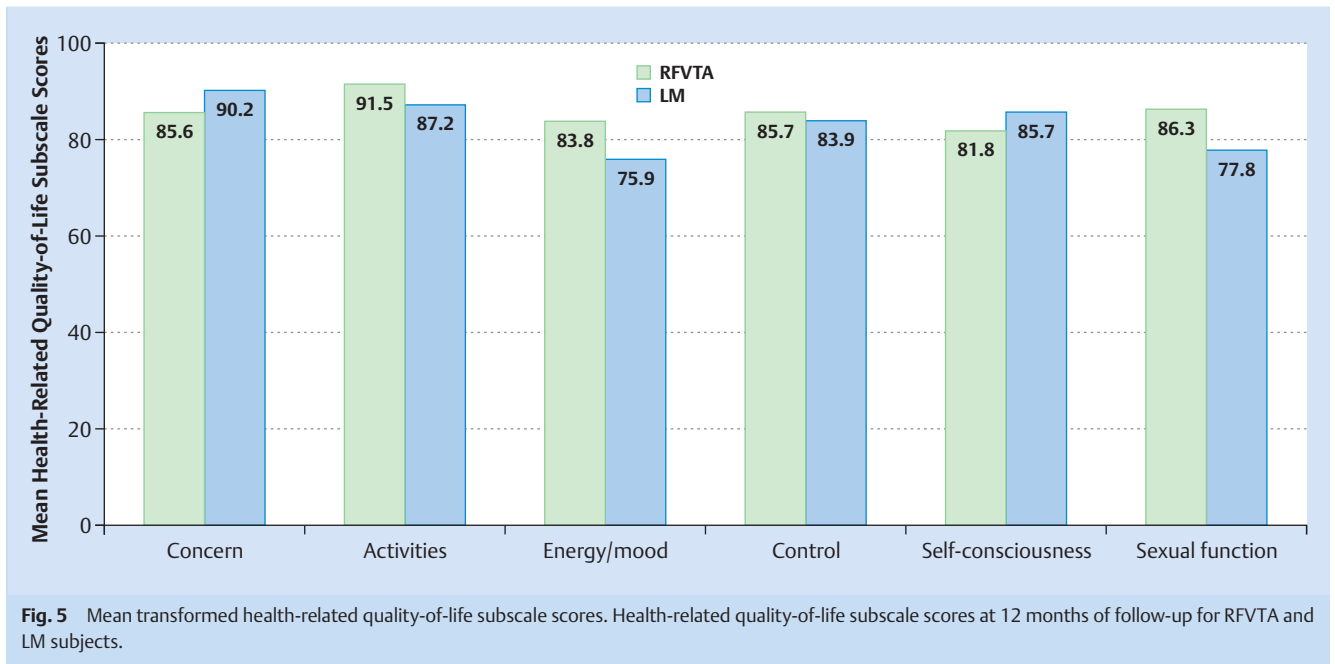
Uterine Fibroid Symptom Severity and Health Related Quality-of-Life (HRQL) scores over time are presented in Figs. 3 and 4. The mean symptom severity score (the higher the score, the worse the severity) at baseline was 41.8 for the LM group and 39.9 for the RFVTA group, while the mean HRQL score (the lower the score, the worse the quality of life) was 70.2 for the myomectomy group and 77.2 for the ablation group.

For the 18 ablation subjects with both baseline and 12-month symptom severity data, mean transformed symptom severity scores decreased (improved) from baseline to 12 months by -7.8 to 26.2, whereas the corresponding 20 myomectomy subjects achieved a reduction of -17.9 to 23.4 over the same period (mean difference of 10.1 ± 21.6 ; 95% CI: $-4.1, 24.3$; $p=0.16$).

HRQL increased (improved) for both groups over 12 months of follow-up, with mean increases of 7.5 to 86.4 and 13.1 to 83.2 for the ablation and myomectomy subjects, respectively, with both baseline and 12 month HRQL data (mean difference of -5.6 ± 24.1 ; 95% CI: $-20.8, 9.7$, $p=0.46$). The mean 12-month HRQL subscale scores (describing patient-reported concern, activities, energy/mood, control, self-consciousness, and sexual function) were similar between both treatment groups (Fig. 5).

Health state (EQ-5D) outcomes

The mean health state (EQ-5D) scores (the lower the score, the worse the health state) at baseline through 12 months are presented in Fig. 6. The mean EQ-5D score at baseline was 72.3 for the myomectomy subjects and 81.7 for the ablation subjects. Both groups reached their highest score at 6 months. Ablation



subjects with both baseline and 12-month data achieved a mean change from baseline to 12 months of 2.0, compared with a mean change of 8.9 for the myomectomy subjects. The mean difference in the increase in scores between the ablation and myomectomy treatment groups was -6.8 ± 18.8 (95% CI: $-18.4, 4.7$; $p = 0.24$).

Menstrual Impact Questionnaire

The Menstrual Impact Questionnaire (MIQ) was used to gauge subjects' perceptions of blood loss from the previous period. At 12 months follow-up, 94.4% of ablation respondents reported "better" or "about the same" compared to their previous period. At the same follow-up period, 84.3% of the LM subjects reported that their bleeding was "better" or "about the same" ($p = 0.12$, Wilcoxon test).

Overall Treatment Effect (OTE)

In terms of subject responses regarding overall treatment satisfaction at 12 months based on the Overall Treatment Effect (OTE) Survey, 42.9% (9/21) of the ablation respondents reported being very satisfied with the treatment, 42.9% ($n = 9$) were moderately satisfied, 9.5% ($n = 2$) were somewhat satisfied, and 4.8% ($n = 1$) were moderately dissatisfied with the treatment due to the presence of hypermenorrhea at 4 weeks follow-up. Also at 12 months, 86.5% ($n = 19$) myomectomy subjects reported being very satisfied with the treatment, whereas 13.6% ($n = 3$) reported being moderately satisfied ($p = 0.004$, Wilcoxon test). No subject in either group reported being very dissatisfied with her treatment.

In terms of responses to the question, “Would you recommend this treatment to a friend with the same health problem?” 33.3% of the ablation respondents reported that they would definitely recommend RFVTA, 61.9% would probably recommend RFVTA, and 4.8% would probably not. In the myomectomy group, 54.5% would definitely recommend LM, whereas 45.5% would probably recommend LM ($p = 0.14$, Wilcoxon test).

In response to the question “How effective was the treatment in eliminating symptoms?” 23.8% of the ablation group found that the treatment was very effective, 57.1% found it moderately effective, 9.5% found it somewhat effective, 4.8% regarded it as somewhat ineffective, and 4.8% found it very ineffective. Of the myomectomy respondents, 45.5% found the treatment very effective, 31.8% found it to be moderately effective, and 22.7% found it to be somewhat effective ($p = 0.32$, Wilcoxon test).

Procedure-related complications and re-interventions

There was one serious complication that occurred during the early postoperative follow-up period in a subject who had undergone RFVTA and was experiencing hypermenorrhea. Dilation and curettage resulted in uterine perforation and subsequent hysterectomy. Another ablation subject underwent a preemptive hysterectomy after a biopsy revealed a fibroid of smooth muscle tumor of uncertain malignant potential (STUMP) [11]. Histopathologic analysis of the uterus and fibroids confirmed no malignancy. One myomectomy subject had a hematoma at the trocar site, which resolved without sequelae.

There was one elective surgical re-intervention in the ablation group. A 30-year-old subject presented with a single 6.3-cm intramural fibroid at baseline, and the fibroid had decreased to 2.5 cm by 6 months. Though she reported to be asymptomatic at the 6-month visit, she desired pregnancy in the near future. Transvaginal ultrasound at 9 months showed an increase in the fibroid's diameter to 4 cm; therefore, she sought myomectomy prior to attempting pregnancy.

Pregnancy outcomes

There were 5 pregnancies in 4 subjects within the first 9 months of follow-up: a myomectomy subject (G0P0) conceived; however, the fetus was anencephalic and was aborted. The same woman conceived again after excision of 5 fibroids measuring 0.7 to 2.0 cm; she had a full-term pregnancy with Cesarean delivery (adhesions were noted) of a healthy male infant weighing 3310 g (Apgars 1 minute/5 minutes, 10/10). Another myomectomy patient (G1P0), who had a spontaneous abortion in 2012 before the trial began, conceived after excision of a 1.5-cm intramural fibroid and a 0.9 subserosal fibroid. This pregnancy concluded with a spontaneous vaginal delivery at 39 weeks of a healthy female (Apgars 1 minute/5 minutes, 5/8) weighing 3280 g. A third patient (G3P1), who was 31 years old, underwent RFVTA of a 5.7-cm intramural fibroid, conceived at 8.5 months post ablation, and vaginally delivered a healthy male infant at 40 weeks (Apgars 1 minute/5 minutes, 8/8; weight, 3880 g). Last, a 31 year-old G0P0 woman underwent RFVTA of a 3.3-cm intramural fibroid abutting the endometrium for heavy menstrual bleeding symptoms. There were no complications intra- or post-operatively, and the subject was free of fibroid symptoms by 3 months post ablation. She conceived 7 months post surgery and spontaneously delivered a healthy female baby (Apgars 1 minute/5 minutes, 10/10; weight, 3260 g) at 39 weeks gestation. All 4 subjects will remain in the study.

Discussion

Management of fibroid symptoms ranges from medical therapy to the most definitive approach, hysterectomy. Along this range of care, fibroid ablation and laparoscopic myomectomy offer uterine-conserving therapies that can be considered when medical treatment fails, is inappropriate, or is not well tolerated. This study provides the first description of 12-month outcomes in women with symptomatic fibroids who were randomized to laparoscopic myomectomy and to radiofrequency volumetric thermal ablation for treatment of their fibroid symptoms. Both treatment groups improved in terms of their reported symptom severity, health-related quality of life, and EQ-5D health state at 12 months. However, the differences in improvements between both groups were not statistically significant. The only significant difference detected between the two groups was in the degree of treatment satisfaction (very vs. moderately satisfied) favoring the myomectomy group.

The perception of blood loss from the previous period as measured by the MIQ indicated that RFVTA subjects had a more favorable perception, in contrast to the higher proportion of subjects in the RFVTA group who reported having heavy menstrual bleeding at 12 months. These somewhat contradictory results could have to do with the magnitude of the blood loss both at 12 months and at the preceding period for subjects in each group. The relationships between perception of blood loss and treatment, as well as between heavy menstrual bleeding and treatment, were not very strong. It is interesting to note that the location of the fibroids in both groups were almost entirely intramural and subserosal. Galen et al. reported on the decrease in menstrual bleeding associated with ablation of intramural fibroids and the importance of intramural fibroids in the evaluation of heavy menstrual bleeding [16].

We previously reported that subjects who underwent the ablative therapy experienced significantly improved perioperative outcomes in terms of shorter hospital stays and less blood loss [11]. We found that these women also needed pain medication for fewer days than did the myomectomy patients, and the ablation subjects missed fewer days from work and returned earlier to normal activities.

RFVTA of fibroids causes intracellular friction or heat, which results in necrosis of the target fibroid tissue with resultant shrinking and absorption by the surrounding myometrium. In Chudnoff et al., contrast-enhanced magnetic resonance imaging revealed that the total mean fibroid volume decreased by 45.1% at 12 months post ablation [8]. Because RFVTA does not require serosal and myometrial suturing, it can be used safely to treat fibroids smaller than 1 cm in diameter and has been used to ablate up to 29 fibroids in a single patient [8]. The ablation of small fibroids may preclude their growth with consequent symptoms. Day Baird et al. reported a prospective observational study of 36 women with fibroids, whose volumes were tracked every 3 months over one year [17]. They found that “much of the observed growth in fibroids < 5 cm in diameter appears to be associated with growth spurts. Treatments that could prevent spurts could limit the number of tumors that become large enough to cause symptoms.” This finding supports treatment or ablation of fibroids as small as 0.5 to 1.0 cm that might cause future symptoms.

All subjects in both groups saw their ultrasound scans at 3 and 6 months. The increased expression of satisfaction with treatment by the LM subjects compared to the RFVTA subjects may have

been due to a lack of understanding of the clinical significance of fibroid ablation by the ablation group. These women may have expected a great decrease in size or disappearance of their fibroids by 12 months as evidenced by ultrasound and may have correlated their perceptions at ultrasound with expected symptom improvement. The one elective surgical re-intervention in the RFVTA group was a myomectomy of a single intramural fibroid that measured 6.3 cm at baseline, decreased to 2.5 cm by 6 months, and – on transvaginal ultrasound at 9 months – appeared to increase to 4 cm. The subject sought myomectomy prior to attempting pregnancy. Two hysterectomies were performed for reasons unrelated to fibroid symptoms. One was a preemptive treatment related to a STUMP fibroid, which was later confirmed to be nonmalignant [11]. The other was caused by the unknowingly aggressive treatment of hypermenorrhea via curettage (within a few weeks after the subject's RFVTA procedure) with corresponding perforation of the uterus.

All of the outcomes must be taken in the aggregate: most of the evaluations point toward similar benefits of improved efficacy and safety of RFVTA and LM. However, because of the local practice of tissue sampling of large fibroids and the relative unfamiliarity with RFVTA by local gynecologists, two women underwent hysterectomy – perhaps both of them unnecessarily.

The principal strength of the study was the computer-generated randomization of the subjects to either RFVTA or LM; randomized controlled trials are, by definition, rigorous. Despite randomization, there were study limitations and weaknesses, which included an unexpected age discrepancy between the groups. This discrepancy might potentially have biased the results in terms of subjects' perceptions of symptoms and their expectations of symptom relief. Differences in reported symptomatology (Table 2) may also correlate with the age of the study participants, but the small sizes of the study groups make it difficult to evaluate such a relationship; regardless, symptom differences were not statistically significant. Also, despite being randomized to one of the two laparoscopic treatments intraoperatively, patients were told postoperatively their assigned treatment. This knowledge may have impacted their responses to questionnaires. Last, data were missing for 2 RFVTA subjects and 3 LM subjects at 12 months. Given the small size of the groups, inclusion of additional responses from 2 and 3 more subjects could have made substantial differences in the reported outcomes.

Conclusions

Twelve-month qualitative results from this study, in which subjects will be followed for 5 years, indicate similar efficacy, quality of life, and safety for both treatment groups.

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Conflict of Interest

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