Comparison of Long-Term Outcomes of Myomectomy and Uterine Artery Embolization

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OBJECTIVE: To compare long-term outcomes of uterine artery embolization and abdominal myomectomy in patients with symptomatic uterine myomas.

METHODS: At a single institution in an 18-month time, 59 patients had bilateral uterine artery embolization and 38 patients had abdominal myomectomy to treat symptomatic uterine myomas. We reviewed medical records and surveyed patients 3 or more years after their procedures to assess how many needed further surgical procedures in the intervening years, to what extent symptoms remained improved, and how satisfied the patients were with the long term results of the index procedure.

RESULTS: Follow-up was available on 51 embolization and 30 myomectomy patients and ranged from 37 to 59 months. Patients who had embolization were older (44 versus 38 years, $P < .001$) and more likely to have had previous surgical procedures ($P < .001$) than those who had myomectomy. Taking into account the variable follow-up period, embolization patients were more likely to have had further invasive treatment for myomas (29% versus 3%) ($P = .004$). Among women not needing further surgery, overall symptoms improved in 92% (33/36) of embolization and 90% (26/29) of myomectomy patients ($P = .78$). Ninety-four percent (34/36) of embolization patients and 79% (23/29) of myomectomy patients were at least somewhat satisfied with their choice of procedure ($P = .06$).

CONCLUSION: Women who had embolization were more likely than those who had myomectomy to need further invasive treatment (surgery or repeat embolization) in the 3–5 years after the index procedure. Among women who did not need such treatment, satisfaction and relief of symptoms were similar. Large, randomized trials are needed to more accurately compare these two procedures. (Obstet Gynecol 2002;100:864–8. © 2002 by The American College of Obstetricians and Gynecologists.)

Uterine leiomyomas occur in 20–40% of reproductive age women.[1] Symptoms are initially managed medically if possible, but intractable symptoms are often treated by hysterectomy. Myomas are the reason for 30–70% of hysterectomies in the United States.[2,3] Many women do not want to lose their uteri to a benign condition and turn to myomectomy, rather than hysterectomy, when myoma symptoms are no longer treatable with medications. Myomectomy and hysterectomy have similar blood loss, postoperative morbidity, and complication rates.[4,5] For women with symptomatic myomas who want to preserve their fertility or who do not want hysterectomy, myomectomy remains the treatment of choice. Reported recurrence rates after myomectomy vary widely, but a recent life-table analysis using data extracted from 41 separate studies determined that clinically identifiable (as opposed to those identified only by ultrasound) myomas occur in 10% of women by 5 years after myomectomy.[6–8]

Transcatheter bilateral uterine artery embolization for the treatment of symptomatic uterine myomas was first described in 1995.[9] Experience with uterine artery embolization as an alternative to myomectomy has grown steadily, with more than 8600 performed in the United States as of October 2000.[10] Embolization of both uterine arteries produces myoma necrosis, reducing uterine volume and improving menorrhagia and pelvic pain (at least in the short term) in approximately 85% of patients who have the procedure.[11–16] Small series of patients have been followed for up to 2 years with apparent persistence of symptom relief in 88–94% of patients but there are few reports on long-term effects of embolization, and fewer studies comparing it to more standard treatment.[12,17,18] In a MEDLINE search from 1995 through 2001 using keywords "embolization" and "my-

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oma" and without language restriction, we found one abstract comparing embolization and myomectomy. In a retrospective comparison of an unstated number of embolization and myomectomy patients, Hwang and colleagues found that those having embolization had fewer complications, more rapid recovery, and similar short-term symptom improvement when compared with patients having abdominal myomectomy.[19] Hand searching of references in published case series of embolization found no other comparative studies.

We designed this retrospective study to compare the need for further surgery and the adequacy of symptom reduction over the long term between women having embolization and those having myomectomy for uterine myomas.

Table 1. Demographic Data on Women Having Myomectomy or Embolization

	UAE (n = 51)	Myomectomy (n = 30)	P (2-sided)
Procedure to survey time, mo, mean (range)	46 (41–59)	49 (37–59)	.03
Age, y, mean (range)	43.5 (27–66)	37.6 (28–45)	< .001
Ethnicity, n (%)			.53*
White	23 (45)	14 (47)	
Black	17 (33)	7 (23)	
Hispanic	3 (6)	2 (7)	
Asian	1 (2)	3 (10)	
Other	7 (14)	4 (13)	

UAE = uterine artery embolization.
* For white vs nonwhite.

MATERIALS AND METHODS

From February 12, 1996 to August 7, 1997, 59 women had bilateral uterine artery embolization at one institution. During the same time, 38 women at the same institution had abdominal myomectomies. Embolization was performed as previously described and abdominal myomectomy was performed in the standard fashion.[12,20] In December 2000, we mailed surveys to all 59 patients who had embolization and all 38 patients who had myomectomies. Nonrespondents were contacted by phone. We surveyed those women who agreed to participate about symptoms, invasive procedures, and other treatments done both before and after the index procedure, and about their satisfaction with treatment. Patients rated menorrhagia, dysmenorrhea, bulk symptoms, and pelvic/abdominal pain on a scale of 1–5. We created an overall symptom score using the arithmetic total of individual symptom scores. Patients graded clinical improvement on a 7-point scale. Satisfaction with the procedure was graded on a 4-point scale from "very satisfied" to "very unsatisfied." We reviewed medical records to determine what treatments had been used before the index procedure.

Success or failure of the procedure at the time of the survey was the primary outcome of interest. We measured failure of the index procedure in several ways. We considered the procedure to have failed in women who required additional invasive treatment for myomas. Different individuals have different levels of tolerance for symptoms and different levels of aversion to surgery, so in those patients who did not have further invasive treatment we considered the index procedure to have failed if there was either no improvement or worsening of the overall symptoms score. Because some women will be dissatisfied despite an improvement in symptoms, we also considered the procedure to have failed if the patient rated herself as somewhat or very dissatisfied. To avoid double counting, we excluded women from calculations involving satisfaction or change in symptoms if, by the time of the survey, they had required further invasive treatment (ie, hysterectomy, myomectomy, or embolization). We used Fisher exact test to compare differences in proportions between the groups and the Wilcoxon rank-sum test to compare ordinal data. We performed logistic regression to examine the effect of clinical variables on the likelihood of failure. We also used the Cox proportional hazards model to compare the survival functions between women who had embolization and those who had myomectomy. Two-tailed P values of less than .05 were considered statistically significant. We used Stata statistical software (Stata, Release 5, College Station, TX) for all statistical calculations. The Institutional Review Board approved this project. We obtained informed consent from all patients before reviewing records or administering telephone surveys.

RESULTS

We reached 53 of 59 patients who had embolization and 51 (86%) completed the survey. We reached 32 of 38 patients who had myomectomy and 30 (79%) completed the survey. Surveys were completed at a mean of 49 months (range 37–59) after myomectomy and 46 months (range 41–59) after embolization (P = .03). The mean age at embolization was 44 years and at myomectomy 38 years (P < .001). The mean interval between the index procedure and survey differed by 3 months (P = .03). The proportion of white versus nonwhite women in each group did not differ significantly (Table 1). Patients in both the embolization and myomectomy groups presented with multiple symptoms. Forty of 51 (78%) women in the embolization group and 25 of 30

(83%) in the myomectomy group complained of menorrhagia preoperatively. Significantly more women who had myomectomy presented with abdominal/pelvic pain and urinary frequency than women who had embolization (Table 2).

Twenty-seven percent of embolization patients and 30% of myomectomy patients were treated with hormonal therapy before the index procedure. All 51 embolization patients had prior surgery for myomas. Forty of these 51 women had myoma biopsy and/or myomectomy shortly before embolization (Table 2). Performing hysteroscopy, laparoscopy, myoma biopsy, and myomectomy before embolization was common practice at this institution in our early experience with embolization, a practice that has since been discontinued.

Patients in the embolization group were more likely than those in the myomectomy group to have further invasive therapy, with 29% (15/51) of the embolization group and 3% (1/30) of the myomectomy group having such treatment ($P = .004$). These surgeries included one hysterectomy in the myomectomy group and six hysterectomies, eight myomectomies, and one repeat embolization in the embolization group (Table 3). Age at the time of the index procedure and follow-up interval differed significantly between groups. Using logistic regression, we modeled the effects of age, follow-up interval, and type of index procedure on the likelihood of needing further invasive therapy. Patients having embolization had an odds ratio of 12.5 ($P = .02$) for requiring such invasive treatment after the procedure, although the confidence limits were wide (95% confidence interval [CI] 1.4, 110.1). Neither age nor months elapsed between the index procedure and the survey significantly predicted failure in this model (95% CI for age 0.90, 1.01; for months of follow-up, 0.88, 1.10). A log-rank test for equality of survivor functions demonstrated a significant difference between groups ($P < .001$).

Table 2. Presenting Symptoms and Clinical History of Patients Having Embolization or Myomectomy

	UAE ($n = 51$)	Myomectomy ($n = 30$)	P (2-sided)
Symptoms			
Menorrhagia	40 (78%)	25 (83%)	.59
Dysmenorrhea	24 (47%)	19 (63%)	.16
Abdominal/pelvic pain	20 (39%)	19 (63%)	.04
Urinary frequency	12 (24%)	14 (47%)	.03
Constipation	19 (37%)	11 (37%)	.96
Abdominal distention	27 (53%)	19 (63%)	.36
Overall symptom score (range)	13 (6–28)	15 (9–29)	.21
Prior treatments			
Hormonal	13 (25%)	9 (30%)	.66
Myomectomy*	40 (78%)	1 (3%)	< .001

UAE = uterine artery embolization.
* Performed preoperatively by clinical protocol in many embolization patients.

Table 3. Long-Term Outcomes of UAE and Myomectomy

	UAE ($n = 51$)	Myomectomy ($n = 30$)	P (2-sided)
Further invasive therapy	15 (29%)	1 (3%)	.004
Hysterectomy	6 (12%)	1 (3%)	
Myomectomy	8 (16%)	0	
Uterine artery embolization	1 (2%)	0	
No improvement/worsening of symptoms*	3 (8%) $n = 36$	3 (10%) $n = 29$	.78
Somewhat/very dissatisfied with therapy*	2 (6%) $n = 36$	6 (21%) $n = 29$	.06
Clinical failure†	20 (39%) $n = 51$	9 (30%) $n = 30$	.40

UAE = uterine artery embolization.
* Excludes patients requiring further surgical intervention.
† Includes any patient with no improvement/worsening of symptoms, somewhat/very dissatisfied, or requiring further invasive therapy.

For those women who did not have further surgical intervention, we measured the change in overall symptom score and satisfaction with the index procedure. Embolization patients had a median improvement of six points (range −3 to 15) in overall symptom score, while myomectomy patients had a median improvement of five points (range −1 to 23) ($P = .44$). Three of 29 (10%) patients in the myomectomy group and three of 36 (8%) in the embolization group reported no improvement or worsening of symptoms at follow-up ($P = .78$). Embolization and myomectomy groups expressed similar levels of satisfaction with their outcomes. Among women not needing further invasive therapy, 94% (34/36) of the embolization group and 79% (23/29) of the myomectomy group were at least somewhat satisfied with their choice of procedure ($P = .06$).

Before beginning our analysis, we determined that a patient could be said to have "clinical failure" if any of the following three conditions was met: 1) the patient needed further invasive treatment, 2) the patient did not need further invasive therapy, but had no improvement (or worsening) in overall symptom score, 3) the patient did not need further invasive therapy but was moderately or very dissatisfied with the procedure. At the time of follow-up, nine of 30 (30%) women having myomectomy and 20 of 51 (39%) having embolization met this definition ($P = .40$). To achieve a power of .90 to detect an absolute difference in failure rate of 20% (with $\alpha = .05$) would have required approximately 130 subjects in each group. Our power to detect a statistically significant

difference between the observed clinical failure rates was .08.

DISCUSSION

Myomectomy is the standard of care surgical treatment for a woman who wishes to retain her uterus and who has symptomatic myomas not responsive to medical treatment. Uterine artery embolization is a less invasive therapeutic alternative to surgery for the treatment of symptomatic myomas. While short-term outcomes of embolization are promising, there is little information on long-term outcomes of this technique and little information comparing it with standard treatment. We gathered long-term data from patient surveys to compare the results of embolization and abdominal myomectomy. In our retrospective study, women who had embolization were substantially more likely to need further invasive treatment than those who had myomectomy, and this difference was not simply a function of the length of follow-up.

The rate of further invasive treatment after myomectomy in our patient population was lower than some reported rates, and our rate of invasive treatment after embolization higher than many reports.[7,21,22] In our study, only one woman in the myomectomy group required further surgery, a crude recurrence rate of 3% at 3 years. This compares with the 10% clinical recurrence rate at 5 years reported in a recent literature review.[8] Another recent study found 7% of women who had myomectomy needed further surgery within 1 year.[23] The wide variation in myoma recurrence in different studies may reflect differences in the underlying patient population, different definitions of recurrence, and possibly different surgical techniques. The higher crude rate of recurrence compared to other embolization studies likely reflects the longer period of follow-up in our study. Since the embolization patients we studied represent some of the earliest to have had this procedure in the United States, postembolization surgical intervention may have been undertaken with a lower threshold simply because of the lack of knowledge about the typical clinical picture after embolization, although we have no evidence to directly support this proposition.

Differences between groups in this retrospective study were profound, making direct comparisons problematic, but the higher recurrence rate after embolization than after myomectomy raises concerns that can only be addressed in a randomized trial. The higher recurrence rate after embolization is biologically plausible since, unlike myomectomy, this procedure does not remove myomas. Extensive collateral blood supply to the uterus allows the normal myometrium to survive embolization, but this collateral supply may also lead to regrowth of "treated" myomas. After myomectomy, myomas must grow from surgically undetectable size to a clinically significant size. After embolization, myomas may only need to return to their pretreatment size, or simply begin growing again, to cause resumption of symptoms.

There are two major limitations of this retrospective study. First, it was underpowered to detect a significant difference in one of our primary variables of interest, the overall clinical failure rate, which we defined as the need for further surgery, lack of improvement in symptoms, or dissatisfaction with the procedure. We found no statistically significant difference between groups with regard to this variable, but given our small sample size, the possibility of type 2 error is high. The second major limitation of the study is the possibility of bias as a result of differences (both measured and unmeasured) between groups. Without randomization, it is unlikely that patients presenting for embolization and myomectomy will be equivalent in all important respects. Embolization and myomectomy groups were similar in their ethnic distributions, but women in the embolization group were older and more likely to have had previous surgeries. Considering the difficulty in obtaining insurance approval for the procedure, the groups undoubtedly differ in other ways as well. A relatively new procedure, embolization may attract patients who have exhausted other treatment options, who are favorably disposed to less invasive treatments, or who have had more severe symptoms. It is not possible to estimate the overall direction of bias these differences could introduce and our study design did not allow us to adjust statistically for these differences.

Although imperfect, this study provides new data on the long-term outcomes of uterine artery embolization and provides some comparison with more conventional therapy. The rate of failure requiring further invasive treatment appears higher among women who have embolization, although patients who choose either myomectomy or embolization can expect good relief of symptoms. Among those who did not need further invasive treatment, women who had embolization were as likely as those who had myomectomy to remain satisfied with the results after 3 years. Whether the choice of procedure should be based on overall satisfaction, the need for further invasive procedures, or the amount of time spent recovering from the procedure, can only be answered by the patient in consultation with her physician. The quality of evidence on embolization is currently poor, and according to a recent review of the literature on treatment for myomas, evidence on standard treatments for myomas is similarly poor.[24] Patients and physicians may use the information in our study to

help make treatment choices, but only carefully conducted randomized trials can provide the data for a truly informed decision about treating this common condition.

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