Long-term Results of Hysteroscopic Myomectomy for Abnormal Uterine Bleeding

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***Objective*: To analyze the efficacy of transcervical resection of submucous myomas and to identify prognostic factors for long-term results.**

***Methods*: Two-hundred eighty-five women were treated with transcervical resection of submucous myomas without endometrial ablation. In case of incomplete resection a repeat procedure was offered. Long-term follow-up was obtained. Recurrence was defined as the need for further surgery. The relation of several variables with the outcome was analyzed using Cox proportional hazard regression analysis.**

***Results*: Seventeen cases (6%) were lost to follow-up. The median follow-up was 46 months (range 1–104 months); for cases without recurrence median follow-up was 42 months (range 16–104 months). Forty-one (14.5%) patients had repeat surgery. An independent prognostic value of uterine size ($P < .001$) and number of submucous myomas ($P < .001$) for recurrence was noted. Twenty of 41 patients who had repeat surgery subsequently had a hysterectomy. None of the variables investigated predicted the need for hysterectomy. The surgery-free percentage of 165 patients with normal sized uteri and not more than two myomas was 94.3% (standard error ± 1.8%) at 2 years and 90.3% (± 3.0%) at 5 years.**

***Conclusion*: Transcervical resection of submucous myomas is a safe and effective treatment for patients with a normal sized uterus and not more than two myomas. It is an acceptable alternative for selected other patients. The need for a combined endometrial ablation is questionable. Transcervical resection of submucous myomas will give patients a high chance of averting further surgery and should modify the way patients are counseled. (Obstet Gynecol 1999;93: 743–8. © 1999 by The American College of Obstetricians and Gynecologists.)**

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Modern resectoscopic techniques have expanded treatment options for patients with submucous myomas.[1,2] However, less is known about the efficacy of transcervical resection of submucous myomas when applied on a larger scale. Classification of different types of submucous myomas was shown to be indispensible, because their intramural extension varies considerably and determines the chance of a complete resection.[3] Although many authors have published their results,[3–7] long-term outcomes of transcervical resection of submucous myomas are still to be elucidated. It is necessary to know which factors influence success, failure, and recurrence for appropriate treatment and counseling of patients. In the present study we analyzed the efficacy of transcervical resection of submucous myomas and the prognostic effect of several variables on the rate of recurrence after long-term follow-up.

Material and Methods

Between August 1987 and January 1995, 285 women with abnormal uterine bleeding (menorrhagia or metrorrhagia) and with one or more submucous myomas at diagnostic hysteroscopy were treated with transcervical resection using a continuous flow 8- or 9-mm Olympus resectoscope (Olympus, Hamburg, Germany). No patients refused to consent to transcervical resection. Sorbitol (4%) was used for distension and irrigation of the uterine cavity. Complete resection of all myomas without ablation of the endometrium was attempted. A meticulous fluid-balance control was maintained. If excessive deficit of the fluid used developed, the procedure was terminated even if resection was incomplete. Further details of this technique have been described previously.[3,8]

Pathologic examination confirmed the diagnosis in 283 patients and revealed a leiomyosarcoma in one

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Table 1. Variables Used in the Analysis

Variable	Type of variable	Mean	Median	SD	Range	Categories
Group 1: known before resection						
Patient age (y)	Interval	38.1	38	6.5	23–62	<35 (n = 79), 35–39 (n = 80), 40–44 (n = 60), ≥45 (n = 47)
Uterine size	Binomial					Normal (n = 181), enlarged (n = 85)
No. of myomas at hysteroscopy	Interval	1.63	1	1.73	1–15	1 (n = 194), 2 (n = 46), ≥3 (n = 26)
No. of myomas at laparoscopy	Interval	0.77	0	1.32	0–8	0 (n = 169), 1 (n = 43), ≥2 (n = 54)
Maximal intramural extension	Nominal					Type 0 (n = 67), type I (n = 93), type II (n = 106)
Group 2: known after resection						
Completeness of resection	Interval					0 rest (complete) (n = 256), ≥1 rest (incomplete) (n = 10)
No. of procedures	Interval					1 (n = 219), ≥2 (n = 47)

SD = standard deviation.

patient and a cellular leiomyoma of dubious malignancy grade in another.[9] Both patients were excluded from the study. All patients had a hysteroscopy after 2 to 3 months. A repeat procedure was offered in the case of incomplete resection. Some patients with incomplete resection had no complaints and declined further treatment.

A questionnaire was sent to all 283 patients in January 1996, inquiring about surgery for recurrence, procreational desires, and further pregnancies and their outcomes. In cases of nonresponse a second request was sent followed by a telephone call to the patient and her general practitioner. Adequate follow-up was obtained in 266 (94%) patients. The remaining 17 (6%) patients were lost to follow-up and withdrawn from the study population.

Recurrence was defined as abnormal uterine bleeding necessitating repeat surgical treatment. Time to recurrence was measured from the first resection until symptoms recurred.

The variables used in the analysis are listed in Table 1. The uterine size at internal examination was assessed preoperatively. The number of submucous myomas was noted during hysteroscopy. The number of other myomas was noted during preoperative laparoscopy or during a concomitant laparoscopy at the time of resection. The degree of intramural extension was assessed during hysteroscopy by observing the angle of the myoma with the endometrium at the attachment to the uterine wall. Careful inspection with varying degrees of uterine distension is necessary, as the endometrium may smooth away the actual angle. To categorize the degree of intramural extension, we used the classification system for submucous myomas adopted by the European Society of Gynaecological Endoscopy.[3] Pedunculated submucous myomas without intramural extension are classified as type 0 myomas. When the submucous myoma is sessile and the intramural part is less than 50%, the myoma is classified as type I; with an intramural extension of 50% or more, the myoma is classified as type II. When multiple myomas are present, classification is determined by the myoma with the deepest intramural extension.

Differences between the number of complete resections for the different types of myomas were tested using the Fisher exact test. The Kruskal-Wallis test was used to determine differences in the mean number of procedures to achieve complete resection.

The relationships of the variables given in Table 1 with surgery for recurrence, including a hysterectomy subgroup, were analyzed using Cox proportional hazard regression analysis[10] in a forward stepwise manner. The limit of P values to enter or remove the variables from the model was .05. Two types of variables as indicated in Table 1 were differentiated in one group of variables known before resection and a second group of variables known after resection. Variables from the second group were only considered for inclusion after completing the stepwise procedure for the first group. In that way the first part of the analysis is relevant in guiding the decision of whether to perform transcervical resection and the second part in determining a prognosis after resection.

The relationship between the natural logarithm (hazard) and the interval variables (Table 1) was assumed to be primarily linear. However, in each step linearity was tested for by comparing the models with and without dummy variables indicating category membership, as defined in Table 1, in addition to the linear term. Categories were so defined to get reasonably sized groups as well as sensible limits. Additionally, before each step, deviance residuals were plotted against the next variable to be included in the model to check linearity. No evidence of nonlinearity was found for any of the interval variables.

Adequacy of the proportional hazard model was checked visually from the curve, stratified according to the variable of interest with all other variables in the model as covariates. Additionally, weighted Schoenfeld residuals[11] for the variable of interest were plotted

against time. If these graphs suggested nonproportionality, we further tested the variable by introducing a time-dependent version of the variable in the model as suggested by the shape of the curves. No indications were found for nonproportionality for any of the variables. The Wald test was used to calculate *P* values. Survival-type curves were calculated using the product-limit method. PROC LIFETEST and PROC PHREG of the statistical package SAS 6.12 for Windows (SAS Institute Inc, Cary, NC) were used for all analyses.

Results

The mean age of the patients was 38.1 years (standard deviation [SD] ± 6.5, range 23–62 years) and the mean parity was 0.78 (± 1.06, range 0–5). Two serious complications occurred. The breakage of a loop electrode caused a small perforation of the uterus in one patient. She was observed for 1 day and antibiotic therapy was continued orally for 5 days. She recovered uneventfully. One patient developed pulmonary edema at the end of a repeat procedure after a fluid deficit of 4500 mL. She was treated with positive-end expiratory-pressure ventilation and recovered completely. No hemorrhages were observed and no patient required blood transfusion.

Figure 1 shows the patient data as a flow chart toward complete resection. The highest number of procedures in one patient until complete resection was achieved was five, in a 26-year-old woman with multiple myomas who wanted to preserve her uterus for childbearing. Four patients had three procedures, 42 patients two procedures, and 225 patients one procedure. All patients with complete resections were free of symptoms. Patients with incomplete resections, who declined further treatment, were free of symptoms as well.

Differences in the total number of procedures, the number of complete resections, and the total number of procedures to achieve complete resection for each type of myoma are given in Table 2. Using these data, we calculated the chance per procedure to achieve complete resection and the mean number of procedures to achieve complete resection. The chance of achieving a complete resection per procedure decreased and the mean number of procedures to achieve complete resection increased with more extensive intramural involvement.

After the loss of 17 patients to follow-up, the median follow-up for the remaining 266 patients was 46 months (range 1–104 months); for the 225 patients without recurrence median follow-up was 42 months (range 16–104 months). The surgery-free percentages are 90.5% (standard error [SE] ± 1.8%) at 2 years, 79.5%

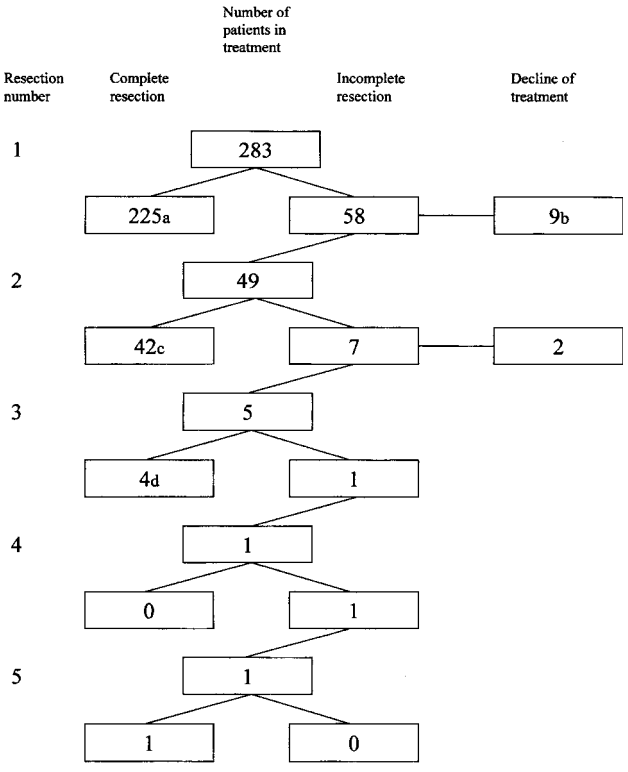

Figure 1. Flow chart of number of patients toward complete resection. a = 14 lost to follow-up; b = 1 lost to follow-up; c = 1 lost to follow-up; and d = 1 lost to follow-up.

(± 3.3%) at 5 years, and 73.3% (± 5.4%) at 8 years. Forty-one patients had repeat surgery for recurrence. The different procedures are listed in Table 3. Table 4 shows the *P* values from the Cox regression analysis. The variables uterine size and number of myomas found at hysteroscopy gave firm evidence for an independent prognostic value for recurrence. The prognostic information of these two variables combined is given in surgery-free percentages at 2 and 5 years in Table 5. On the basis of these results we grouped the curves, as indicated in Figure 2, in the following three groups: 165 patients with a normal uterine size and not more than two submucous myomas, ten patients with an enlarged uterus and three or more submucous myomas, and 91 other patients. Surgery-free percentages were calculated for the three groups. For the patients with a normal uterine size and not more than two submucous myomas this interval was 94.3% (SE ± 1.8%) at 2 years and 90.3% (± 3.0%) at 5 years. For the patients with an enlarged uterus and three or more myomas this interval was 64.8% (± 16.5%) at 2 years and less than or equal to 64.8% (± 16.5%), at 5 years and for all the other patients 86.2% (± 3.7%) and 62.5% (± 7.1%), respectively.

The percentages of patients free of hysterectomy are 94.9% (SE ± 1.4%) at 2 years, 89.2% (± 2.6%) at 5 years,

Table 2. Number of Procedures and Complete Resections Related to the Intramural Extension

	Type 0	Type I	Type II	Total
No. of patients	73	99	111	283
No. of procedures	73	104	162	339
Complete resections	73 (100%)*	96 (98%)*	103 (91%)*	272 (96%)
Chance per procedure to achieve complete resection	1.00 (73/73)	0.92 (96/104)	0.64 (103/162)	0.80 (272/339)
Total no. of procedures to achieve complete resection	73	100	153	326
Mean no. of procedures to achieve complete resection	1.00 (73/73)†	1.04 (100/96)†	1.49 (153/103)†	1.20 (326/272)

* Fisher exact test $P = .07$.
† Kruskal-Wallis test $P < .001$.

and 89.2% (± 2.6%) at 8 years. Twenty patients had hysterectomy for recurrence. This subgroup was analyzed separately. The Cox regression analysis did not provide any evidence for a prognostic value regarding hysterectomy of any variable.

Variables known after transcervical resection are grouped separately in Table 1 as these variables can be used only to give a prognosis after resection and not to guide counseling before resection. In Figure 3 the surgery-free curves are stratified by completeness of resection. Incomplete resection increased the chance of surgery for recurrence; however, the evidence for this from the regression analysis was not very firm.

Follow-up information further revealed that 57 (46%) of 124 patients with procreational desires conceived. Sixty-six viable children were born of 82 pregnancies (80.5%).

Discussion

When uterine myomas are diagnosed it does not necessarily mean that treatment is required. The presence of submucous myomas, however, is heralded by early symptoms such as abnormal uterine bleeding and dysmenorrhea. The development of transvaginal ultrasonography and continuous flow hysteroscopy has facilitated early diagnosis.[12]

The objectives of this study were to analyze efficacy of transcervical resection of submucous myomas and to determine the long-term results, particularly, to identify prognostic factors for recurrence. When our initial results on the efficacy of transcervical resection of submucous myomas[3] are compared with the results from this study population, the overall chance per procedure to achieve complete resection in all types of myomas increased from 0.70 initially to 0.80 in this study, and the mean number of procedures needed to achieve complete resection decreased from 1.28 to 1.20. The major improvement was achieved in the resection of type II myomas, which demonstrates that complete resection of the intramural part of a submucous myoma is technically the most difficult, with a slowly rising learning curve. The resection of the intramural portion is firmly related to increased loss of the irrigating and distending fluid.[8] Resection of type II myomas with extensive intramural involvement should therefore be performed only by experienced surgeons in selected cases. For type 0 and I myomas, rarely does any patient need more than one procedure to achieve complete resection, and the technique seems to be the method of choice.

Recurrences are the main reason to doubt any type of myomectomy compared with hysterectomy. If the patient has procreational desires, removal of the myomas is the only treatment option. If the desire to preserve the uterus is less definite, it is important to know the

Table 3. Surgical Procedures for Recurrence

Procedure	*n*
Abdominal hysterectomy	19
Vaginal hysterectomy	1
Transcervical resection of a submucous myoma	15
Abdominal myomectomy	3
Transcervical resection of a submucous myoma + abdominal myomectomy	1
Transcervical resection of the endometrium	1
Transcervical resection of an endometrial polyp	1
Total	41

Table 4. *P* Values for Surgery for Recurrent Symptoms, After Stepwise Proportional Hazard Analysis

Variable	Step 0	Step 1	Step 2
Age	.18	.075	.24
Uterine size	<.001	<.001*	<.001*
No. of myomas at hysteroscopy	<.001	<.001	<.001*
No. of myomas at laparoscopy	.11	.99	.99
Maximal intramural extension	.24	.73	.85
Completeness of resection	<.001	.001	.062
No. of procedures	.035	.44	.75

* Variables adjusted for in the model.

Table 5. Surgery-Free Percentages Stratified for Uterine Size and Number of Submucous Myomas

Patient subgroup	*n*	At 2 years	At 5 years
Normal uterine size			
1 myoma	138	94.1 ± 2.0%	89.5 ± 3.4%
2 myomas	27	95.7 ± 4.3%	95.7 ± 4.3%
3 or more myomas	16	87.1 ± 8.6%	48.4 ± 21.1%
Enlarged uterine size			
1 myoma	56	85.1 ± 4.9%	71.5 ± 7.8%
2 myomas	19	89.2 ± 7.2%	50.0 ± 15.9%
3 or more myomas	10	64.8 ± 16.5%	≤64.8 ± 16.5%*

Data are given as mean ± standard error of the mean.
* Follow-up was 4½ years.

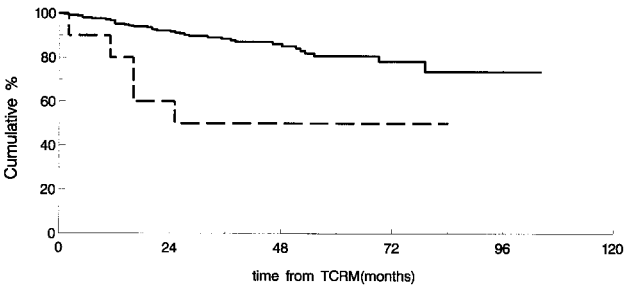

Figure 3. Survival-like analysis. Number of patients free from surgery for recurrence by completeness of resection. *Solid line* = complete resection (36 of 256); *dashed line* = incomplete resection (five of 10). TCRM = transcervical resection of submucous myomas.

chances of recurrence. Buttram and Reiter[13] published an overview of 18 studies reporting follow-up of 3206 abdominal myomectomies between 1926 and 1980. Overall, a 15% recurrence rate (range 4–29%) was found, and surgical treatment was offered in 10% (range 3–32%). The wide ranges might be explained by different criteria used and differences in periods of follow-up. More recently, Candiani et al[14] reported a series of abdominal myomectomies in 622 women. Although 19% of the patients were lost to follow-up, there was a steady increase in clinical recurrences, up to 27% at 10 years, with a protective effect provided by pregnancy. A cumulative probability of ultrasonographic recurrence, with 16% lost to follow-up, was reported to be 51% at 5 years.[15] Interestingly, 53% of the recurrences were at a different site than the primary myomas.

Although some authors presented follow-up information on transcervical resection of submucous myomas, prognostic factors have not been investigated. In these studies, with a maximum follow-up of 9 years and inadequate follow-up of 15% on an average, cumulative chances varied from 83.9% to avoid gynecologic surgery to 67.6% to have a good anatomic and functional result.[16,17] Comparison of these figures is difficult because failure and success were not well defined. The outcome that is probably the most explicit to define and therefore the most comparable is repeat surgery for recurrence. In a recent follow-up study concerning the long-term results of endometrial resection, outcome was defined in that way.[18]

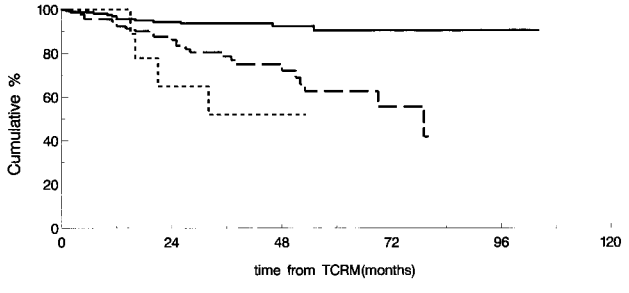

Figure 2. Survival-like analysis. Number of patients free from surgery for recurrence by uterine size and number of submucous myomas combined. *Solid line* (12 of 165) = normal uterine size and one or two myomas; *dashed line* (25 of 91) = other combinations; and *dotted line* (4 of 10) = enlarged uterus and three or more myomas. TCRM = transcervical resection of submucous myomas.

By identifying prognostic factors for surgery for recurrence, factors are recognized that guide counseling before resection and give a prognosis after the procedure. The proportional hazard regression analysis showed a very firm relationship between uterine size and number of submucous myomas at hysteroscopy compared with surgery for recurrence. Our findings could not be attributed to identifiable differences in other patient characteristics and support analysis of the following three subgroups: patients with normal uterine size and not more than two myomas at hysteroscopy, patients with an enlarged uterus and three or more myomas at hysteroscopy, and all other patients. For counseling the first group, it is clear that the chance to avoid surgery for recurrence is so high (90.3% at 5 years) that transcervical resection is the method of choice. For the second group this chance is much less (maximal 64.8% at 5 years), so hysterectomy should be the alternative unless preservation of the uterus is absolutely necessary. For all other patients no practical conclusions could be drawn from this analysis.

Although we expected a positive relationship between age and surgery-free outcome, as the time to develop a recurrence shortens with higher age, we did not find such a relationship. The difference between the effect of the number of myomas at hysteroscopy and laparoscopy on surgery for recurrence demonstrates the strong relationship between submucous myomas and abnormal bleeding. The depth of the intramural involvement of the submucous myoma was of minor importance, but the importance of completeness of resection was confirmed by the analysis, as half of the patients with an incomplete resection had surgery for a recurrence within 2 years (Figure 3).

Although transcervical resection of submucous myomas is effective treatment of abnormal uterine bleeding, many gynecologists combine the procedure with an endometrial ablation. As the overall surgery-free percentage in the present study was equal to that after endometrial resection,[18] the need to combine transcervical resection of submucous myomas routinely with endometrial resection is at the very least questionable.

Transcervical resection of submucous myomas is a safe and effective treatment for women, with or without procreational desire, with a normal uterine size and not more than two submucous myomas. The technique can be an acceptable alternative in selected other cases. It will give patients a high chance of averting further surgery. The findings of this study should modify the way patients are counseled before transcervical resection of submucous myomas and reassured after the procedure.

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