

OUTCOMES AFTER TOTAL VERSUS SUBTOTAL ABDOMINAL HYSTERECTOMY

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ABSTRACT

Background It is uncertain whether subtotal abdominal hysterectomy results in better bladder, bowel, or sexual function than total abdominal hysterectomy.

Methods We conducted a randomized, double-blind trial comparing total and subtotal abdominal hysterectomy in 279 women referred for hysterectomy because of benign disease; most of the women were premenopausal. The main outcomes were measures of bladder, bowel, and sexual function at 12 months. We also evaluated postoperative complications.

Results The rates of urinary frequency (urination more than seven times during the day) were 33 percent in the subtotal-hysterectomy group and 31 percent in the total-hysterectomy group before surgery, and they fell to 24 percent and 20 percent, respectively, at 12 months ($P=0.03$ for the change over time within each group; $P=0.84$ for the interaction between the treatment assignment and time). The reduction in nocturia and stress incontinence and the improvement in bladder capacity were similar in the two groups. The frequency of bowel symptoms (as indicated by reported constipation and use of laxatives) and measures of sexual function (including the frequency of intercourse and orgasm and the rating of the sexual relationship with a partner) did not change significantly in either group after surgery. The women in the subtotal-hysterectomy group had a shorter hospital stay (5.2 days, vs. 6.0 in the total-hysterectomy group; $P=0.04$) and a lower rate of fever (6 percent vs. 19 percent, $P<0.001$). After subtotal abdominal hysterectomy, 7 percent of women had cyclical bleeding and 2 percent had cervical prolapse.

Conclusions Neither subtotal nor total abdominal hysterectomy adversely affects pelvic organ function at 12 months. Subtotal abdominal hysterectomy results in more rapid recovery and fewer short-term complications but infrequently causes cyclical bleeding or cervical prolapse. (N Engl J Med 2002;347:1318-25.)

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HYSTERECTOMY is the most common major gynecologic operation in the United Kingdom and the United States.^{1,2} It is associated with higher rates of patient satisfaction than are other treatments for dysfunctional uterine bleeding.³ However, since hysterectomy disrupts the local nerve supply and anatomical relationships, it has been thought that overall pelvic organ function might be adversely affected. Total abdominal

hysterectomy involves the removal of both the body of the uterus and the cervix, whereas subtotal abdominal hysterectomy conserves the cervix. Because the subtotal procedure minimizes anatomical disruption, it may be less likely to have adverse effects than total hysterectomy. The concern that cancer might develop in the cervical stump is no longer considered a justification for routine use of total abdominal hysterectomy; screening reduces the incidence of invasive cancer,⁴ and the risk of cervical cancer after subtotal abdominal hysterectomy is less than 0.1 percent.⁵ Injury to the urinary tract, which occurs in 0.5 to 3.0 percent of cases,⁶ is the most frequent cause of litigation after total abdominal hysterectomy.⁷ Subtotal abdominal hysterectomy requires less mobilization of the bladder and minimizes the risk of injury to the ureters. The subtotal procedure is also associated with lower rates of wound infection, hematoma,⁸ and symptomatic vault granulation.⁹

A recent systematic review¹⁰ of studies comparing the effects of subtotal abdominal hysterectomy and total abdominal hysterectomy on urinary function identified only three studies¹¹⁻¹³ of sufficiently high methodologic quality to be included in the analysis. Two were observational studies that showed an increased risk of incontinence among women who had undergone total abdominal hysterectomy.^{11,12} The third¹³ was a small randomized, controlled trial showing no advantages of one operation over the other. Most studies of the effect of hysterectomy on bowel function¹⁴⁻¹⁷ have been retrospective, with small numbers of women and a lack of adequate controls; some have not defined the type or route of the hysterectomy. Although a series of nonrandomized studies^{12,18-20} showed that subtotal abdominal hysterectomy had advantages over total abdominal hysterectomy with respect to urinary and sexual function, a subsequent study from the same institution²¹ failed to confirm these findings.

We conducted a prospective, randomized, double-blind, multicenter study to test the hypothesis that, as compared with total abdominal hysterectomy, subtotal abdominal hysterectomy results in better urinary,

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bowel, and sexual function, more rapid recovery, and a reduced rate of complications.

METHODS

Subjects

We recruited women who had been offered abdominal hysterectomy for a benign indication at two London hospitals between January 1996 and April 2000. Exclusion criteria were an age over 60 years, suspected cancer, a body weight that exceeded 100 kg, previous pelvic surgery, known endometriosis, abnormal cervical smears, symptomatic uterine prolapse, and symptomatic urinary incontinence for which the patient might seek expert medical advice. All women provided written informed consent. The research ethics committee at each participating hospital approved the study.

Study Design

The women were randomly assigned to the treatment groups with the use of computer-generated numbers. The sealed opaque envelope containing the assignment was opened only after the surgical incision had been made. The women and the investigator who evaluated the outcomes were unaware of treatment assignments throughout the 12-month study period. Each operation was carried out or supervised by an experienced surgeon, with the use of the clamp-cut-ligate method,²² polyglycolic sutures, and antibiotic prophylaxis. The endocervical canal was electrocoagulated during subtotal abdominal hysterectomy. Bilateral salpingo-oophorectomy, the only concomitant procedure, was performed at the surgeon's discretion or at the patient's request.

Data were collected on the duration of the operation (from incision of the skin to closure), estimated blood loss, the length of the hospital stay, postoperative hemoglobin values, pain scores on days 2 and 4, blood transfusion, and intraoperative, early, and late complications.

Assessment of Urinary, Bowel, and Sexual Function

Urinary, bowel, and sexual function was evaluated before surgery and 6 and 12 months afterward. Urinary function was determined with the use of twin-channel subtracted cystometrography and uroflowmetry, as well as the women's responses to a subjective standardized questionnaire used by the Urogynecology Unit at St. George's Hospital. Definitions of urinary incontinence conformed to those of the International Continence Society.²³ Bowel function was evaluated on the basis of responses to a previously validated questionnaire.¹⁷

Sexual function was evaluated with a questionnaire that had been used in a pilot study. Internal reliability in the sample of sexually active women was reasonable (Cronbach's alpha, 0.68). We restricted the analyses of sexual function to women who were sexually active at all three time points. There were no significant differences in the proportions of women in each group who were sexually active at each time point.

Statistical Analysis

On the basis of a previous randomized, controlled study in which 55 percent of women had stress incontinence after abdominal hysterectomy,²⁴ we determined that we would need to enroll 138 women in each treatment group in order to detect an 18 percent difference between the groups with 90 percent power at an alpha level of 0.05.

Data were analyzed with the use of SPSS software (version 9). Repeated-measures analysis of variance was performed to determine the main effect of the type of operation, regardless of the time point, and the main effect of time, regardless of the type of operation, and to determine whether there was an interaction between the type of operation and time. Extremely skewed variables that could not be

corrected by transformations were made dichotomous and analyzed with the use of linear models for categorical data.²⁵ Student's paired t-tests were used for normally distributed data, and the chi-square test was used for categorical data. The effects of covariates (age, presence or absence of fibroids, use or nonuse of hormone-replacement therapy, and performance or nonperformance of bilateral salpingo-oophorectomy) on urinary, bowel, and sexual function were examined with the tests indicated above.

RESULTS

The two treatment groups were similar in age, weight, parity, menopausal status, race or ethnic group, and indication for hysterectomy, with the exception that menorrhagia alone as an indication was more frequent in the subtotal-hysterectomy group than in the total-hysterectomy group (Table 1). Of the 146 women randomly assigned to the total-hysterectomy group, 3 did not undergo the procedure, because of a frozen pelvis (i.e., dense pelvic adhesions, completely distorting the normal anatomy) in 1, an adherent bladder in another, and an adherent bladder and bowel in the third. Of the 133 women randomly assigned to the subtotal-hysterectomy group, 5 did not undergo the procedure. For three of the five women, the reasons were a bleeding cervical stump, bilateral ovarian cysts, and inadvertent entry into the vagina; no reason was given for the other two. Bilateral salpingo-oophorec-

TABLE 1. BASE-LINE CHARACTERISTICS OF THE STUDY PARTICIPANTS.

CHARACTERISTIC	SUBTOTAL HYSTERECTOMY (N=133)	TOTAL HYSTERECTOMY (N=146)
Age — yr		
Mean ±SD	43±6	44±6
Range	29–50	30–59
Weight — kg		
Mean ±SD	70±15	72±15
Range	41–100	40–100
Parity		
Median	2	2
Range	0–6	0–6
Premenopausal — no. (%)	117 (88)	132 (90)
Race or ethnic group — no. (%)		
White	87 (65)	99 (68)
African or Caribbean	36 (27)	35 (24)
Asian	7 (5)	8 (5)
Chinese	0	1 (1)
Other	3 (2)	3 (2)
Indications for hysterectomy — no. (%)		
Menorrhagia only	89 (67)	79 (54)*
Menorrhagia and dysmenorrhea	19 (14)	34 (23)
Dysmenorrhea only	10 (8)	13 (9)
Pelvic pain	5 (4)	13 (9)
Irregular bleeding	4 (3)	3 (2)
Abdominal mass	4 (3)	1 (1)
Premenstrual syndrome	1 (1)	0
Ovarian cyst	1 (1)	3 (2)
Retention of urine	0	1 (1)

*P=0.03.

tomy was performed in 81 of the women who underwent total abdominal hysterectomy and in 61 of those who underwent subtotal abdominal hysterectomy. Follow-up data were unavailable for 14 women at 6 months and for 21 women at 12 months in the total-hysterectomy group and for 12 and 11 women, respectively, in the subtotal-hysterectomy group. Analyses were based only on data that were available at both 6 and 12 months. There were no significant differences in base-line characteristics between the group of women for whom follow-up data were available at 6 and 12 months and the group of women for whom complete follow-up data were not available.

Complications

Total abdominal hysterectomy was associated with a significantly longer duration of surgery, greater

blood loss, and a longer hospital stay than was subtotal abdominal hysterectomy (Table 2). No visceral damage was sustained in either group. Pyrexia was more frequent after total abdominal hysterectomy, as was antibiotic use. Some minor complications, such as retention of urine and vault hematoma, occurred only in the total-hysterectomy group (in two women and in one woman, respectively). The rates of wound infection and wound hematoma were similar in the two groups.

At 12 months, nine women in the subtotal-hysterectomy group (6.8 percent) had cyclical vaginal bleeding, two (1.5 percent) had cervical prolapse (i.e., the cervix protruded outside the introitus), and three (2.3 percent) had persistent pelvic pain (Table 2). Seven women in the total-hysterectomy group had persistent pelvic pain (4.8 percent), and two had bowel ob-

TABLE 2. INTRAOPERATIVE AND POSTOPERATIVE EVENTS AND COMPLICATIONS AMONG WOMEN WHO UNDERWENT SUBTOTAL OR TOTAL ABDOMINAL HYSTERECTOMY.*

VARIABLE	SUBTOTAL HYSTERECTOMY (N=133)	TOTAL HYSTERECTOMY (N=146)	DIFFERENCE (RANGE)	P VALUE
Duration of operation — min†	59.5±20.6	71.1±23.4	-11.6 (-16.9 to -0.6)	<0.001
Blood loss — ml‡	320.1±271	422.6±301.8	-102.4 (-172.0 to -32.8)	0.004
Blood loss requiring transfusion — no. (%)	7 (5.3)	8 (5.6)		0.91
Hospital stay — days	5.2±1.1	6.0±4.7	-0.8 (-1.6 to -0.04)	0.04
Hemoglobin on day 2 — g/dl	11.7±6.9	10.8±1.3	0.86 (-0.30 to 2.02)	0.15
Pain score§				
Day 2	3.6±1.7	3.7±1.8	-0.02 (-0.46 to 0.40)	0.81
Day 4	2.7±8.2	2.4±2.1	-0.37 (-1.11 to 1.78)	0.63
Readmission — no. (%)¶	1 (0.8)	4 (2.8)		0.42
Intraoperative complications — no. (%)	11 (8.3)	21 (14.4)		0.11
Postoperative complications — no. (%)				
Before discharge	13 (9.8)	40 (27.4)		<0.001
Pyrexia	8	28		
Retention of urine	0	2		
Vault hematoma	0	1		
Wound hematoma	3	4		
Wound infection	2	3		
Ileus	0	1		
Vaginal bleeding	0	1		
After discharge (within 1 yr)	14 (10.5)	9 (6.2)		<0.001
Bowel obstruction	0	2		
Cyclical vaginal bleeding	9	—		
Cervical prolapse	2	—		
Persistent pain	3	7		

*Plus-minus values are means ±SD. Data on blood loss were missing for seven women in each group, data on the length of the hospital stay were missing for one woman in the total-hysterectomy group, the hemoglobin value on day 2 was missing for one woman in the subtotal-hysterectomy group and two women in the total-hysterectomy group, and data on blood transfusion and readmission were missing for two women in the total-hysterectomy group.

†The duration of the operation was defined as the time from incision of the skin to closure.

‡Blood loss was assessed by weighing swabs and measuring the volume of blood collected by suction.

§The pain score was determined with the use of a visual-analogue scale ranging from 0 (no pain) to 7 (maximal pain).

¶Readmission refers to hospitalization up to one year after surgery for a reason directly related to the operation.

||Pyrexia was defined as a core body temperature of more than 38.0°C on one occasion or 37.5°C on two or more occasions 24 hours after surgery.

struction (1.4 percent), one at four weeks and the other at four months. None of the women with pelvic pain had endometriosis.

Bladder and Bowel Function

The preoperative and postoperative rates of urinary frequency (defined as urination more than seven times during the day), stress incontinence, urgency, urge incontinence, poor stream, interrupted stream, and incomplete bladder emptying did not differ significantly between the two groups (Table 3). Smaller proportions of women in the subtotal-hysterectomy group had dysuria, straining to void, and nocturia postoperatively, but these differences predated surgery. In both groups significantly fewer women had stress incontinence, urgency, urinary frequency, nocturia, interrupted stream, and incomplete emptying over time. Follow-up rates for urodynamic studies were lower than anticipated because some women declined the tests at 6 and 12 months, although they agreed to participate in the other assessments. After surgery, the volume of urine voided when the urge to micturate was first experienced, the volume of urine voided when a strong urge to micturate was experienced, and the maximal capacity (the largest volume of urine held) increased in both groups, whereas the peak flow rate did not change significantly. Urodynamic studies showed a reduction in stress incontinence after surgery in both groups.

We also looked at changes in urinary function after surgery according to the presence or absence of fibroids preoperatively, since fibroids are often associated with urinary symptoms. Approximately 10 percent of women without fibroids, as compared with 17 percent of those with fibroids, reported micturition more than seven times a day preoperatively. The rate remained similar after surgery among the women without fibroids but fell to 9 percent six months after surgery among those with fibroids ($P=0.003$ for the interaction between the presence or absence of fibroids and time). Among the women with fibroids, the reduction in urinary frequency was similar in the two treatment groups (data not shown). Improvements in other measures of urinary function were not associated with the presence or absence of fibroids (data not shown).

The rates of constipation, hard stools, urgency, straining, use of laxatives, and incontinence of flatus were similar in the two treatment groups after surgery (Table 4).

Sexual Function

Before surgery, 112 women in the subtotal-hysterectomy group (84 percent) and 122 in the total-hysterectomy group (84 percent) were sexually active; the corresponding figures were 95 (71 percent) and 106

(73 percent) at 6 months and 100 (75 percent) and 96 (66 percent) at 12 months. Reasons for celibacy included lack of a partner, divorce or separation, and concurrent illness. In the total-hysterectomy group, no previously celibate woman became sexually active after surgery, whereas in the subtotal-hysterectomy group, one woman became sexually active at 6 months and another at 12 months. Because the multivariate analyses we used required data at all time points, the analyses were limited to the 91 women in the subtotal-hysterectomy group and the 86 women in the total-hysterectomy group who were sexually active at all three points in time.

The frequency of intercourse, desire for intercourse, and initiation of intercourse did not differ significantly between the two groups before surgery or 6 or 12 months afterward (data not shown). However, there was a significant increase in the frequency of intercourse in both groups combined after surgery ($P=0.01$), with no significant effect of the type of surgery on this outcome. The two groups were similar postoperatively with respect to the frequency of orgasm, frequency of multiple orgasm, extent of vaginal lubrication, and rating of the sexual relationship with a partner (Table 5). Deep dyspareunia was reduced significantly in both groups at 6 and 12 months, whereas superficial dyspareunia decreased at 6 months but increased at 12 months.

DISCUSSION

In this prospective, randomized, double-blind, multicenter trial, urinary, bowel, and sexual function at one year was similar in the group of women who had undergone total abdominal hysterectomy and in those who had undergone subtotal abdominal hysterectomy. Neither procedure had apparent adverse effects on these functions; indeed, some measures of urinary function improved, and the rate of deep dyspareunia decreased. We used outcome measures that have been validated for accuracy and reproducibility. A variety of surgeons performed the operations, suggesting that the results are widely applicable. The investigator who evaluated outcomes and the patients were unaware of the treatment assignments. Recognizing that the effect of surgery on pelvic organ function may evolve over time, we followed patients for at least 12 months.

With total abdominal hysterectomy, much of the operative time, cost, and morbidity are associated with the removal of the cervix.²⁶ We found that subtotal abdominal hysterectomy required less operative time and was associated with less blood loss. Other investigators have reported a higher incidence of abscesses and wound infection after total abdominal hysterectomy,⁸ which is often attributed to contamination of the abdominal cavity by vaginal flora during the procedure. In our study, there was a significantly high-

TABLE 3. URINARY FUNCTION ACCORDING TO TREATMENT GROUP.*

VARIABLE†	SUBTOTAL HYSTERECTOMY (N=133)			TOTAL HYSTERECTOMY (N=146)			P VALUE‡	INTERACTION BETWEEN TREATMENT AND TIME
	BEFORE SURGERY	AT 6 MO	AT 12 MO	BEFORE SURGERY	AT 6 MO	AT 12 MO		
Urinary frequency — no./total no. (%)	39/119 (32.8)	27/119 (22.7)	28/119 (23.5)	38/121 (31.4)	21/121 (17.4)	24/121 (19.8)	0.26	0.03
Nocturia — no./total no. (%)	11/119 (9.2)	5/119 (4.2)	4/119 (3.4)	22/121 (18.2)	15/121 (12.4)	9/121 (7.4)	0.01	0.01
Dysuria — no./total no. (%)	13/119 (10.9)	9/119 (7.6)	8/119 (6.7)	23/121 (19.0)	20/121 (16.5)	16/121 (13.2)	0.02	0.49
Straining to void — no./total no. (%)	11/119 (9.2)	4/119 (3.4)	6/119 (5.0)	18/121 (14.9)	12/121 (9.9)	12/121 (9.9)	0.02	0.21
Poor stream — no./total no. (%)	6/117 (5.1)	2/117 (1.7)	3/117 (2.6)	4/121 (3.3)	5/121 (4.1)	4/121 (3.3)	0.65	0.71
Interrupted stream — no./total no. (%)	41/119 (34.5)	27/119 (22.7)	29/119 (24.4)	38/121 (31.4)	33/121 (27.3)	25/121 (20.7)	0.48	0.03
Incomplete emptying — no./total no. (%)	35/117 (29.9)	21/117 (17.9)	16/117 (13.7)	44/121 (36.4)	32/121 (26.4)	25/121 (20.7)	0.07	<0.001
Urge incontinence — no./total no. (%)	22/117 (18.8)	15/117 (12.8)	13/117 (11.1)	19/120 (15.8)	11/120 (9.2)	14/120 (11.7)	1.00	1.00
Stress incontinence	1.8±0.9	1.5±0.8	1.5±0.9	1.8±1.0	1.5±0.8	1.5±0.9	0.74	<0.001
Urgency	2.2±1.4	2.0±1.3	2.0±1.4	2.4±1.4	2.1±1.3	2.0±1.3	0.66	0.004
Peak flow rate — ml/sec	19.4±1.3	20.5±17.9	21.2±14.1	20.6±11.4	18.8±14.2	21.6±19.9	0.98	0.63
First desire to void — ml	195.3±102.4	222.2±124.7	229.7±114.3	195.1±98.3	231.4±114.8	237.3±106.6	0.45	<0.001
Strong desire to void — ml	274.8±118.7	300.0±129.9	303.4±141.9	281.5±124.9	318.5±135.3	318.1±129.3	0.21	<0.001
Maximal capacity — ml	377.5±143.9	388.8±146.8	391.5±124.7	364.3±143.8	389.4±135.5	394±130.4	0.90	0.04

*Plus-minus values are means ±SD. Data were not available for the following numbers of women in the subtotal-hysterectomy and total-hysterectomy group, respectively: stress incontinence, 15 and 26; urgency, 14 and 25; peak flow rate, 71 and 88; first desire to void, 26 and 41; strong desire to void, 22 and 40; and maximal capacity, 27 and 40.

†Urinary frequency was defined as urination more than seven times during the day. Nocturia was defined as waking twice or more at night to micturate. Dysuria, straining to void, poor stream, interrupted stream, incomplete emptying, urge incontinence, stress incontinence, and urgency were defined as a score of 2 or higher on a 4-point scale (1, never; 2, occasionally; 3, weekly; and 4, always).

‡The treatment effect denotes the difference between the treatment groups, with values at all time points averaged; the effect of time denotes differences among the three time points, with the two groups combined; and the interaction between group and time denotes the difference between the two groups over time.

TABLE 4. BOWEL FUNCTION ACCORDING TO TREATMENT GROUP.*

VARIABLE†	SUBTOTAL HYSTERECTOMY (N=133)				TOTAL HYSTERECTOMY (N=146)				P VALUE		
	BEFORE SURGERY	AT 6 MO	AT 12 MO	ABSOLUTE CHANGE FROM 0-12 MO	BEFORE SURGERY	AT 6 MO	AT 12 MO	ABSOLUTE CHANGE FROM 0-12 MO	TREATMENT EFFECT	EFFECT OF TIME	INTERACTION BETWEEN TREATMENT AND TIME
	no. (%)				no. (%)						
Constipation	10 (8.4)	9 (7.6)	7 (5.9)	-2	20 (16.4)	14 (11.5)	18 (14.8)	2	1.00	1.00	1.00
Hard stools	81 (68.1)	67 (56.3)	72 (60.5)	-8	92 (75.4)	75 (61.5)	76 (62.3)	-13	0.84	0.50	0.96
Straining to move bowels	51 (42.9)	41 (34.5)	44 (37.0)	-6	60 (49.6)	53 (43.8)	51 (42.1)	8	0.29	0.92	0.68
Use of laxatives	16 (13.4)	17 (14.3)	19 (16.0)	+3	14 (11.5)	23 (18.9)	18 (14.8)	+3	0.93	0.12	0.41
Urgency	36 (30.3)	45 (37.8)	36 (30.3)	0	39 (32.0)	37 (30.3)	43 (35.2)	+3	0.20	0.07	0.12
Incontinence of flatus	3 (2.5)	2 (1.7)	0	-1	3 (2.5)	2 (1.6)	0	-1	0.98	0.84	0.19

*Data on constipation, hard stools, use of laxatives, urgency, and incontinence of flatus were not available for 14 women in the subtotal-hysterectomy group and 24 in the total-hysterectomy group; data on straining to move bowels were not available for 14 and 25 women, respectively.

†Constipation was defined as fewer than three bowel movements per week. All other variables were scored on a 6-point scale (0, never; 1, occasionally; 2, often; 3, one to three times a week; 4, most days; and 5, every day). For straining, use of laxatives, urgency, and incontinence of flatus, the symptom was considered to be present if the score was 3 or higher; a score of 2 or higher indicated the presence of hard stools.

er incidence of pyrexia and use of antibiotics in the total-hysterectomy group, which may have contributed to the longer hospital stay in this group. Despite endocervical cautery, 6.8 percent of women reported cyclical bleeding after subtotal abdominal hysterectomy. This finding is potentially important, since most women would expect to stop menstruating after a hysterectomy. We speculate that formal reverse conization, whereby the cervical epithelium, including the transformation zone, along with any residual endometrium, is excised through the abdominal wound, might minimize this complication. Even small amounts of endometrial tissue could result in abnormal bleeding if hormone-replacement therapy was prescribed. Cervical prolapse occurred in two women in the subtotal-hysterectomy group but in none of those in the total-hysterectomy group. However, it might be too early to draw firm conclusions on the basis of this finding, since the frequency of prolapse may increase over time.

Our finding that some measures of urinary function improved with either type of surgery corroborates a previous report by Virtanen et al.²¹ Langer et al.²⁷ attributed similar findings to the removal of fibroids, but with the exception of urinary frequency, we found improvements whether or not fibroids had been removed. Urodynamic measures of bladder capacity did not differ significantly between our two groups, but in both groups there was a significant increase over time in these measures. This effect could not be attributed to elimination of the pressure effects of fibroids, since the findings were similar in the women with fibroids and in those without fibroids. There was also a reduction in the number of asymptomatic

women who had stress incontinence on the basis of urodynamic studies. Similar findings have been reported,²⁸ although postoperative deterioration in symptoms and urodynamic measures has also been described.²⁹ The mechanism for the improvement we observed is not clear.

Women often date the onset of bowel symptoms to previous gynecologic surgery. However, bowel dysfunction is common among women with gynecologic symptoms,^{15,30-32} even in the absence of surgery. We found no difference in any of the measures of bowel function between the two groups before or after surgery or over time. Our findings are consistent with the results of a nonrandomized study in which 42 women were evaluated before and 18 months after they underwent subtotal or total abdominal hysterectomy.³³

A few studies have suggested that hysterectomy adversely affects sexuality.^{34,35} Our findings corroborate the results of the majority of studies, which have found no adverse effects.³⁶⁻³⁸ We found no differences between the two operations with regard to subsequent frequency of intercourse, sexual desire, frequency of initiating intercourse, or orgasm; there was a reduction in deep dyspareunia in both treatment groups. We cannot explain the reduction in superficial dyspareunia at six months and the increase at one year, especially since there was no change in vaginal lubrication. We cannot exclude the possibility that hysterectomy has an effect on subtle, qualitative aspects of sexual function that we did not measure.

Although it seems biologically plausible that the disruption of local innervation and anatomical relationships caused by hysterectomy might lead to organ dys-

TABLE 5. SEXUAL FUNCTION ACCORDING TO TREATMENT GROUP.*

VARIABLE†	SUBTOTAL HYSTERECTOMY (N=91)			TOTAL HYSTERECTOMY (N=86)			P VALUE			
	BEFORE SURGERY	AT 6 MO	AT 12 MO	ABSOLUTE CHANGE FROM 0-12 MO	BEFORE SURGERY	AT 6 MO	AT 12 MO	ABSOLUTE CHANGE FROM 0-12 MO	TREATMENT EFFECT OF TIME	INTERACTION BETWEEN TREATMENT AND TIME
Orgasm‡	3.2±0.8	3.2±0.8	3.3±0.9	+0.1	3.1±0.9	3.1±1.0	3.2±0.9	+0.1	0.31	0.51
Multiple orgasm§	1.8±1.0	1.8±1.0	1.7±1.0	-0.1	1.7±0.9	1.6±0.9	1.7±1.0	0	0.41	0.69
Poor vaginal lubrication — no./total no. (%)	30/90 (33.3)	33/90 (36.7)	25/90 (27.8)	-6	22/84 (26.2)	23/84 (27.4)	22/84 (26.2)	0	0.22	0.37
Superficial dyspareunia — no./total no. (%)	9/91 (9.9)	6/91 (6.6)	15/91 (16.5)	+7	11/85 (12.9)	4/85 (4.7)	9/85 (10.6)	-2	0.61	0.01
Deep dyspareunia — no./total no. (%)	42/91 (46.2)	12/91 (13.2)	6/91 (6.6)	-40	33/84 (39.3)	14/84 (16.7)	12/84 (14.3)	-25	0.32	<0.001
Good sexual relationship with partner — no./total no. (%)	73/91 (80.2)	78/91 (85.7)	82/91 (90.1)	+10	68/86 (79.1)	69/86 (80.2)	69/86 (80.2)	+1	0.46	0.28

*Plus-minus values are means ±SD. Analyses were limited to the 91 women in the subtotal-hysterectomy group and the 86 in the total-hysterectomy group who were sexually active at all three time points.
 †Orgasm and multiple orgasm were scored on a 4-point scale: 1, never; 2, rarely; 3, mostly; and 4, always. Vaginal lubrication, deep or superficial dyspareunia, and a good sexual relationship with a partner were scored as present or absent.
 ‡Data were missing for one woman in the subtotal-hysterectomy group and two in the total-hysterectomy group.
 §Data were missing for two women in the total-hysterectomy group.

function, our findings, as well as the consistently high satisfaction rates reported in other studies in association with simple hysterectomy,^{3,39-42} suggest that substantial pelvic organ dysfunction is uncommon after total or subtotal abdominal hysterectomy. A recent study by Butler-Manuel et al.⁴³ suggests a possible explanation. These investigators showed that the uterosacral and cardinal ligaments had a significantly greater autonomic-nerve content in the middle-to-lateral third of the ligaments than in the medial third (where these ligaments enter the uterine body and cervix). During simple hysterectomy, only the ligaments with nerves innervating the uterus and cervix are interrupted, sparing those innervating the surrounding structures. In contrast, radical hysterectomy, in which the ligaments are divided more laterally, has been associated with greater disturbance of pelvic organ function.⁴⁴

In conclusion, our data provide reassurance that neither total nor subtotal abdominal hysterectomy adversely affects pelvic organ function. Subtotal abdominal hysterectomy is easier to perform than total abdominal hysterectomy, with less risk of ureteric damage, but requires that women have regular Pap smears and results in cyclical bleeding in a minority of women. Consideration of patients' preferences based on expected outcomes might further improve satisfaction rates after hysterectomy performed because of a benign condition.⁴⁵

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