



Change in Lower Urinary Tract Symptoms after Hysterectomy in Uterine Adenomyosis and Uterine Myoma Patients- A Prospective and Comparative Study with 1-year Follow-up

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Abstract

Objective: 1) To compare the different effects of adenomyosis (study group) and uterine myoma (control group) on lower urinary tract symptoms (LUTS). 2) To compare the impact of hysterectomy on Lower Urinary Tract Symptoms (LUTS) between patients with uterine adenomyosis and uterine myoma. Who planned to undergo hysterectomy due to menorrhagia or acquired dysmenorrhea during Jan 2012 to Dec 2017 were recruited for this study Bristol Female Lower Urinary Tract Symptoms questionnaire and urinary distress inventory-6 (UDI-6) were conducted to assess the lower urinary tract symptoms of the patients before surgery, and one month and one year after the surgery.

Result: 1) The prevalence rate of LUTS before surgery was 51.0% overall, 55.5% in the study group and 47.4% in the control group; The prevalence rate of LUTS 1-year after surgery was 56.5% (59.8% in the study group and 51.8% in the control group) with no significant difference compared with the prevalence rate before surgery. The prevalence rate of urgency in study group (24.5%) is significantly higher than the rate in control group (12.4%). 2) For the study group, the prevalence rate of urinary symptoms such as frequency and urgency was significantly reduced at the 1-month follow up. At 1-year post operation, the prevalence rate of urinary frequency and urgency was still lower than baseline (frequency: 1-year 21.6% vs. baseline 31.4%; and urgency: 1-year 19.6% vs. baseline 24.5%). 3) The UDI-6 score showed a significant reduction in the total score as well as all breakdown items at the 1-month follow-up; The results of the 1-year-follow-up were comparable with the results before the surgery. 4) The prevalence rate of Stress Incontinence (SUI) was slightly increased in both groups (study group: 1-year 20.6% vs. baseline 16.7%; control group: 1-year 22.6% vs. baseline 19.0%), and the urinary incontinence symptom score in the UDI-6 of both group was increased at the 1-year followup (study group: 1-year 1.79 ± 1.30 vs. baseline 2.09 ± 1.15 ; control group: 1-year 2.17 ± 0.59 vs. baseline 1.62 ± 1.02).

Conclusion: Compared with patients with uterine myoma, patients with uterine adenomyosis are more likely to have LUTS, especially urgency. LUTS of uterine adenomyosis and myoma patients were significantly improved at 1 month after hysterectomy but were not significantly improved after 1 year; additionally, stress incontinence was worsened after 1 year.

Introduction

Uterine adenomyosis refers to heterotopy of endometrial cells above the position 2.5 mm below the endometrium-muscular layer junction, which may cause menorrhagia and acquired dysmenorrhea. Studies so far show that uterine adenomyosis may cause lower urinary tract symptoms and Overactive Bladder Symptoms (OAB). Some research has indicated that uterine adenomyosis may relate to the occurrence of lower urinary tract symptoms [1-2]. However, uterine adenomyosis very often occurs with uterine fibroids, which makes it difficult to do a comparative study of the two diseases. Our study was based on pathological diagnosis, and a characteristic of this study was that all the examined samples were from patients who underwent total hysterectomy; therefore, the pathologist was able to get data from the full sample to help with the diagnosis and to reduce the influence of uterine fibroids as much as possible. Hysterectomy is the principal operative treatment for uterine adenomyosis and has been proven to be safe and effective. However, so far there is no conclusion concerning the impact of hysterectomy on lower urinary tract symptoms.

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Our study used validated questionnaires to examine the occurrence and changes and characteristics of the lower urinary tract symptoms of uterine adenomyosis patients before and after surgery with uterine fibroid patients as the control group, and the possible causes were analyzed.

Data and Methodology

This study was examined and approved by the Ethics Committee of Peking University's People's Hospital. A total of 367 cases of patients who planned to undergo hysterectomy due to menorrhagia and/or dysmenorrhea during 2012-2017 were recruited for this study; patients with acute and chronic urinary tract infection, pelvic organ prolapse and malignant tumors were excluded. After surgery, all uterine samples were sent for pathological examination and 102 patients with uterine adenomyosis without uterine fibroids or had a maximal myoma volume less than 1 cm³ were confirmed and constituted the study group, 137 patients were confirmed to have uterine fibroids without uterine adenomyosis, and these patients formed the control group. Another 133 cases were excluded for various reasons (Figure 1). After an explanation of the objectives and methods of this study was given, patients completed two questionnaires, the Bristol Female Lower Urinary Tract Symptoms questionnaire and the Urogenital Distress Inventory-6 (UDI-6), regarding their personal information before surgery and underwent a follow-up interview 1 month and 1 year after surgery. Overactive Bladder Symptom Score (OABSS) ≥ 3 . Other clinical data were collected by the research team who were blinded to the results of the questionnaires. Data were analyzed with SPSS 16, and the analytical approaches include chi-square test, Fisher's exact test and the Mann-Whitney U test. Analytical results with $p < 0.05$ were considered significantly different.

Result

A total of 367 patients who were diagnosed as having uterine fibroids or uterine adenomyosis and planned to undergo hysterectomy met the recruitment criteria. Among them, 13 patients had difficulties in doing the follow-up survey and 17 patients refused to participate, and they were excluded from the study. The remaining 337 patients underwent total hysterectomy in our hospital, and all uterus samples were examined pathologically and classified into three groups: 102 patients with uterine adenomyosis without uterine fibroids or with maximal myoma volumes less than 1 cm³ constituted the study group; 137 patients with uterine fibroids without uterine adenomyosis or adenomyoma constituted the control group; and 97 patients with uterine fibroids of maximal volumes larger than 1 cm³ and with uterine adenomyosis or adenomyoma were excluded. In the study group, 24 cases used the levonorgestrel-releasing Intrauterine System [LNG-IUS] and took it out for reasons including (1) spotting and irregular bleeding, 10 cases (47.7%); (2) persistent and intolerable lower abdominal or back pain, 8 cases (33.3%); and (3) IUD falling out or moving down, 6 cases (25.0%). All patients underwent hysterectomy, including 197 cases of laparoscopic hysterectomy, 23 cases of total abdominal hysterectomy, and 12 cases of laparoscopic-assisted vaginal hysterectomy. No serious complications occurred during the perioperative period. There were no significant differences ($p > 0.05$) between the study group and the control group in demographic characteristics such as age, body mass index and number of parities (Table 1). There was no significant difference in uterine volume between the two groups (study group: 473.6 \pm 394.4 cm³, and control group: 411.7 \pm 487.8 cm³, $p > 0.05$). After surgery, urinary retention occurred in 1 patient who was capable of voluntary

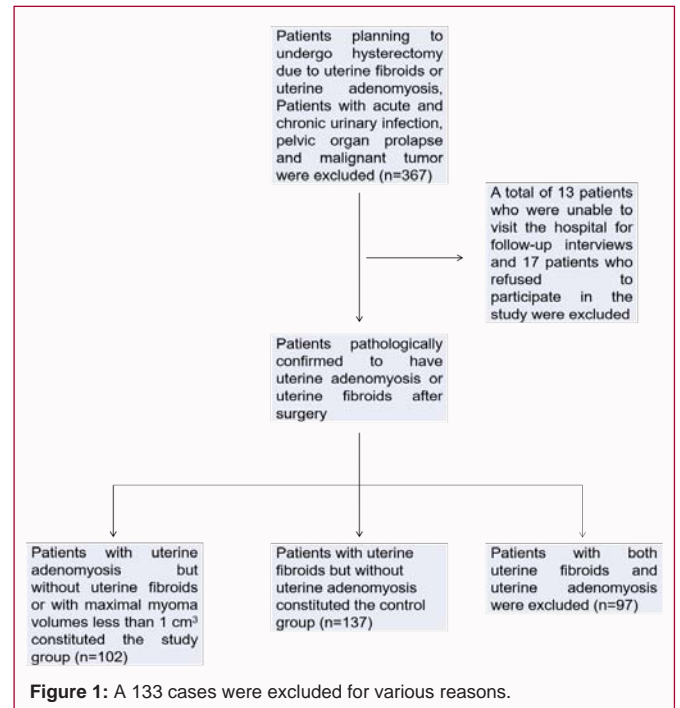


Figure 1: A 133 cases were excluded for various reasons.

micturition after 14 days with an indwelling catheter without severe complications. The prevalence rate of lower urinary tract symptoms for all patients at baseline was 51.0%; the prevalence rate of the study group was 55.9% and that of the control group was 47.4% with no significant difference. The prevalence rate of each symptom is listed in Table 2.

Lower urinary tract symptoms were evaluated in both the study group and the control group before surgery, and the results showed that the prevalence rate of urinary urgency in the study group was higher than that in the control group (study group: 24.5% and control group: 12.4%, $p = 0.02$). Based on the Overactive Bladder Symptom Score (OABSS), the OAB prevalence rate in the study group was higher than that in the control group (study group 12.7%, control group 6.6%, $p = 0.03$), and the prevalence rate of other lower urinary tract symptoms showed no obvious differences (Table 2). The severity of lower urinary symptoms was assessed through the UDI-6, which is a shorter version of the PFDI-20 about lower urinary tract symptoms, including irritation symptoms, urinary incontinence symptoms and obstruction symptoms. There were significant differences in the UDI-6 scores between the study group and the control group before the surgery (study group: 5.86 \pm 1.93 and control group: 5.22 \pm 1.69, $P = 0.017$), especially irritation symptoms (study group: 2.51 \pm 0.91 and

Table 1: General information of the study group and the control group.

	study Group n=102	control Group n=137	P Value
Age	46.7 \pm 8.3	47.1 \pm 9.7	0.738
Body Mass Index (BMI)	26.5 \pm 5.9	25.7 \pm 5.7	0.292
Parities (n)	1 (1-3)	1 (1-4)	0.782
cesarean deliveries (n, %)	37 (36.3%)	41 (29.9%)	0.301
Diabetes (n)	9 (8.8%)	15 (10.9%)	0.589
Uterine volume (cm ³)	473.6 \pm 394.4	411.7 \pm 487.8	0.294
Resistance index of the uterine artery	0.75-1.14	0.63-1.45	0.473
Indwelling catheter (days)	4 (3-5)	4 (3-14*)	0.618
Total	102	137	N/A

Table 2: Prevalence rates of lower urinary tract symptoms before and after surgery.

Symptoms	Baseline		1 month after surgery		1 year after surgery	
	Study group	Control group	Study group	Control group	Study group	Control group
Frequency	31.4% (32)	27.0% (37)	18.6% ^c (19)	19.0% (26)	21.6% (22)	24.1% (33)
Urgency	24.5% (25)	12.4% ^{**} (17)	12.7% ^c (13)	10.9% (15)	19.6% (20)	21.2% ^c (29)
Nocturia	36.3% (37)	39.4% (54)	32.4% (33)	33.6% (46)	29.4% (30)	32.8% (45)
Stress incontinence	16.7% (17)	19.0% (26)	11.8% (12)	13.1% (18)	20.6% (21)	22.6% (31)
Urge incontinence	10.8% (11)	5.8% (8)	6.9% (7)	6.6% (9)	8.8% (9)	6.6% (9)
OAB	12.7% (13)	6.6% (9)	8.8% (9)	7.3% (10)	16.7% (17)	13.1% ^c (18)

**represent statistical difference (p<0.05) between the study group and the control group at baseline.

c represent statistical difference (p<0.05) compared with baseline in the same group.

Table 3: Comparison of the UDI-6 in the study group before and after surgery.

UDI-6 Mean ± SD	Baseline		1 Month after Surgery		1 year after surgery	
	Study group	Control group	Study group	Control group	Study group	Control group
Irritation symptom	2.51 ± 0.91	1.83 ± 0.58 ^{**}	1.71 ± 0.36 ^c	1.75 ± 0.46	2.21 ± 1.35	2.11 ± 0.75 ^c
Urinary incontinence symptom	1.79 ± 1.30	1.62 ± 1.02	1.06 ± 1.09 ^c	1.21 ± 0.58 ^c	2.09 ± 1.15	2.17 ± 0.59 ^c
Obstruction symptom	1.55 ± 0.73	1.75 ± 0.95	1.16 ± 1.57 ^c	1.21 ± 1.36 ^c	1.53 ± 0.88	1.39 ± 0.53 ^c
Total score	5.86 ± 1.93	5.22 ± 1.69 ^{**}	3.10 ± 1.88 ^c	4.16 ± 1.28 ^{**c}	5.64 ± 2.10	5.66 ± 1.39 ^c

**represent statistical difference (p<0.05) between the study group and the control group at baseline.

a represent statistical difference (p<0.05) between the study group and the control group at 1 month post-op.

b represent statistical difference (p<0.05) between the study group and the control group at 1 year post-op.

c represent statistical difference (p<0.05) compared with baseline in the same group.

control group: 1.83 ± 0.58, P=0.009). Urinary incontinence symptom and Obstruction symptom showed no significant differences between study group and control group (Table 3). One month after the surgery, a second assessment of the LUTS of the study group and the control group indicated that the prevalence rate of frequency and urgency among study group was significantly lower than the baseline. The prevalence rate of nocturia, SUI, UUI and OAB was lower than baseline without significant difference (Table 3); the total score of UDI-6 and the scores of the entire breakdown items showed apparent improvements compared with baseline. As for the control group, the prevalence rate of LUTS was comparable to the baseline. One year after the surgery, we performed a third assessment of the LUTS. The prevalence rate of LUTS for all patients was 56.5% (study group: 59.8% and control group: 51.8%); the prevalence rate of frequency, urgency and nocturia was still lower than baseline but without significant differences. The SUI and OAB were even higher than baseline. The UDI-6 of the study group showed a significant reduction of the total score as well as all breakdown items at the 1-month follow up. The results of the 1-year follow up were comparable with the results before surgery. The urinary incontinence symptom score was increased at the 1-year follow up (Table 3).

Discussion

Lower urinary tract symptom is a general term for storage symptoms, urination symptoms and post-micturition symptoms, and the prevalence rate of LUTS throughout the world is rather high. According to the study of Irwin DE, lower urinary tract symptoms will affect over 150 million women in 2018 [2]. Recent studies have shown that the prevalence rate of lower urinary tract symptoms among uterine adenomyosis patients is higher than general population. However, But et al. [3] found that uterine adenomyosis patients experience higher OAB prevalence rates than controls (healthy women taking ultrasound examination). Total prevalence rate of lower urinary tract symptoms before surgery was

51.0% in this study, which is slightly higher than the data from the survey done by Irwin De [4]. In that dataset, the prevalence rate of the study group was 55.9% and that of the control group was 47.4%, with no significant difference between these two groups (p=0.197). Comparing the uterine fibroid and uterine adenomyosis patients, the uterine volumes of both groups in this study showed no significant difference; however, the prevalence rates of precipitant urination and OAB showed significant differences between the two groups. UDI-6 indicated that the irritation symptoms of uterine adenomyosis patients were worse, indicating that the cause of lower urinary tract symptoms among uterine adenomyosis patients may not only be due to the increased pressure by the enlarged uterus on the urinary bladder; there might be other reasons. One of the possible reasons is the "vascular steal theory" proposed by Arleo and Tal, suggesting that increased uterine blood perfusion and thus reduced blood perfusion in the urinary bladder causes lower urinary tract symptoms [8]. However, this study did not find any evidence proving that uterine adenomyosis patients experience more uterine blood perfusion compared with uterine fibroid patients. Another possible reason may be the excessive expression of pelvic local inflammatory factors and cell factors due to uterine adenomyosis (interleukin-1, interleukin-6, interleukin-8, monocyte chemotactic protein-1 and tumor necrosis factor tumor necrosis factor-alpha), which affect urinary bladder function. Total hysterectomy improves the local internal environment of the pelvic cavity and thus improves urinary bladder function.

The Levonorgestrel-Releasing Intrauterine System (LNG-IUS) has been proven to be effective in improving the LUTS among patients with adenomyosis [9], and indeed, the LNG-IUS showed good effects on adenomyosis and relieved the LUTS. However, the LNG-IUS is not suitable for all patients with adenomyosis, especially patients with a large uterus or heavy menstrual bleeding. Hysterectomy is still a common surgical treatment for uterine adenomyosis and has been proven to be safe and effective, particularly for patients without

fertility desire [4]. Some research found that the lower urinary tract symptoms change after total hysterectomy. Parys B found that patients undergoing hysterectomy experience higher prevalence rates of lower urinary tract symptoms after surgery than before surgery, but Griffith-Jones reached the opposite conclusion [5-7]. However, the above studies did not pertain specifically to uterine adenomyosis patients. The impact of hysterectomy on lower urinary tract symptoms in uterine adenomyosis patients is still open to question. Through the comparisons of hysterectomy and the levonorgestrel-releasing intrauterine system, S. Helliövara-Peippo found that total hysterectomy increased the risk of urinary incontinence [7]. In this study, we found that total hysterectomy can remarkably improve lower urinary tract symptoms in uterine adenomyosis patients in the short period but cannot improve the long-term outcome. The key indicator UDI-6 total score declined by 47%, and all items showed apparent improvement at 1 month after surgery

It is noteworthy that the UDI-6 scores of both the study group and the control group before surgery were low, which indicates that the patients' lower urinary tract symptoms were not severe. This had to do with the fact that lower urinary tract symptoms were not the patients' key reason for visiting our hospital; most patients came for abnormal uterine bleeding and acquired dysmenorrhea. Although lower urinary tract symptoms of patients were not severe before surgery, there was an apparent improvement after surgery, indicating that attention should be paid to lower urinary tract symptoms among uterine adenomyosis patients and that efforts should be made to improve such symptoms after surgery. The merit of this study lies in the prospective design that enabled the selection of reliable survey questionnaires to evaluate the patients' lower urinary tract symptoms and block the interference of uterine fibroids. One limitation of this study was the lack of objective indicators for evaluation of lower urinary tract symptoms such as a urinary diary and urodynamics. The other limitation was that our study used volume to describe the size of uterus, not weight, which is more accurate. Follow-up surveys will be conducted for these patients in future studies, and clinical tests will be expanded to verify the conclusion.

Conclusion

Compared with patients with uterine myoma, patients with uterine adenomyosis are more likely to have LUTS, especially

urgency. LUTS of uterine adenomyosis and myoma patients were significantly improved at 1 month after hysterectomy but were not significantly improved after 1 year; additionally, stress incontinence was worsened after 1 year.

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