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Urodynamic Changes Following Laparoscopic Versus Vaginal Hysterectomy: A Hospital based Comparative Cross-Sectional Study

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KEYWORDS

Hysterectomy, Urodynamic changes, Postoperative complications, Bladder capacity, Detrusor muscle activity, Voiding efficiency

ABSTRACT:

Background: The choice of surgical approach for hysterectomy can influence several postoperative outcomes, particularly urodynamic parameters.

Objectives: To determine the urodynamic changes (using cystometric and uroflowmetric parameters) before and after vaginal and laparoscopic hysterectomy.

Methods: This was a hospital based comparative cross-sectional study conducted by the Department of Urology in the outpatient department and/or inpatient wards of the Department of Obstetrics and Gynaecology, in a tertiary teaching healthcare facility located in South India between January 2023 and June 2024.

Results: The baseline characteristics (age, weight, and parity) of the patients in the study groups (Group I, vaginal hysterectomy and Group 2, laparoscopic hysterectomy) did not vary significantly. Postoperative urination frequency was significantly higher in the vaginal group (40%) compared to the laparoscopic group (20%). However, urgency (21.7% vs. 13.3%) and urge incontinence (20% vs. 13.3%) were not significantly different between the groups. Preoperative and postoperative ICIQ-FLUTS scores increased significantly within both groups, but the differences between groups were not significant. Cystometry showed that the mean volume at first sensation increased postoperatively in both groups, with significant increases within each group but no significant difference between groups. Cystometric bladder capacity decreased postoperatively, significantly within each group, but not between groups. Postoperative detrusor muscle overactivity was significantly higher in the laparoscopic group (93.3%) compared to the vaginal group (80%). Uroflowmetry parameters revealed no significant differences in preoperative or postoperative voided volume and maximum flow rate between groups. Voiding time increased significantly postoperatively in the vaginal group but not in the laparoscopic group. The average flow rate decreased significantly in the vaginal group and increased significantly in the laparoscopic group. Residual urine volume increased significantly postoperatively in the vaginal group but not in the laparoscopic group.

Journal of Chemical Health Risks

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Conclusion: The results showed significant differences within each group, particularly in urination frequency, detrusor muscle overactivity, voiding time, average flow rate, and residual urine volume.

Introduction

Hysterectomy is a commonly performed surgical procedure for the management of various benign gynaecological conditions, including fibroids, endometriosis, and abnormal uterine bleeding.[1,2] It is typically carried out through one of three approaches: abdominal, vaginal, or laparoscopic. Each approach has its own set of advantages and potential complications, which can significantly affect postoperative outcomes, including urinary function.[3] The choice of surgical approach for hysterectomy can influence several postoperative outcomes, particularly urodynamic parameters. Urodynamic evaluations assess bladder function, including bladder capacity, detrusor muscle activity, and voiding efficiency, which are crucial for understanding postoperative urinary function.[4] Disturbances in these parameters can lead to significant issues such as urinary incontinence, frequency, and urgency, affecting a patient's quality of life.[5]

Vaginal hysterectomy is traditionally favoured for its minimally invasive nature and shorter recovery time compared to abdominal approaches. It involves removing the uterus through the vaginal canal, which generally results in fewer abdominal complications and a shorter hospital stay.[6] However, some studies suggest that vaginal hysterectomy may lead to higher rates of postoperative urinary symptoms, including increased frequency and urgency, potentially due to the direct impact on the pelvic floor.[7] Laparoscopic hysterectomy, also known as minimally invasive or keyhole surgery, has gained popularity due to its associated benefits, such as reduced postoperative pain, faster recovery, and less scarring.[8] This technique involves the use of small incisions and a laparoscope to guide the surgical instruments, which might offer advantages in preserving bladder and pelvic floor function. Despite these benefits, there is evidence suggesting that laparoscopic hysterectomy can also lead to postoperative changes in bladder function, including increased detrusor muscle overactivity.[9] The comparison of urodynamic changes before and after vaginal versus laparoscopic hysterectomy is essential for optimizing surgical choices and postoperative care. Understanding how these different surgical approaches impact bladder function can guide clinicians in selecting the most appropriate procedure for individual patients and managing potential postoperative complications effectively. Previous research has often focused on broader outcomes or lacked detailed urodynamic analysis, highlighting the need for studies that specifically address these changes to improve patient outcomes.[5] Against this background, the aim of the present study was to determine the urodynamic changes (using cystometric and uroflowmetric parameters) before and after vaginal and laparoscopic hysterectomy.

Materials and Methods

This was a hospital based comparative cross-sectional study conducted by the Department of Urology in the outpatient department and/or inpatient wards of the Department of Obstetrics and Gynaecology, in a tertiary teaching healthcare facility located in South India between January 2023 and June 2024. The study was approved by the Institutional Human Ethics Committee (IHEC). The participants were given the Participant Information Sheet (PIS) in their native language, and its contents were verbally explained to ensure their understanding and satisfaction. Enrolment into the study proceeded upon receipt of written informed consent. This study included all patients undergoing hysterectomy for benign gynaecological conditions. Exclusion criteria comprised a history of diabetes mellitus, neurological disorders, previous urological pelvic surgery, prior caesarean sections, and urinary tract infections. The patients were categorized into two equally sized groups: Group I, who underwent vaginal hysterectomy, and Group II, who underwent laparoscopic hysterectomy. The designated surgeon determined the surgical approach, prioritizing vaginal hysterectomy as the initial choice, followed by laparoscopic hysterectomy.

Based on the results noted by Abouelgreed et al.[10] (2022), considering alpha error (type I error) to be 5%, beta error

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(5), 134-142 | ISSN:2251-6727

(type II error) to be 20%, absolute precision to be 5%, and non-response (attrition) rate to be 10% the minimum estimated sample size was 60 patients in each group (Group I, who underwent vaginal hysterectomy; and Group II, who underwent laparoscopic hysterectomy) with 95% confidence. All procedures were performed under sedation. For the laparoscopic hysterectomy, a reusable umbilical or 12-mm port was used for optics, along with three assistant ports, either three 5-mm ports or a combination of two 5-mm ports and one 10-mm port in the lower quadrants. The vaginal hysterectomy was conducted using conventional methods.

All participants underwent a comprehensive history taking, complete clinical examination, and routine preoperative investigations. Additionally, the ICIQ-FLUTS (International Consultation on Incontinence Modular Questionnaire on Female Lower Urinary Tract Symptoms) and urodynamic evaluations (cystometry and uroflowmetry) were conducted before the surgery and again six months postoperatively. The findings were documented in a purpose predesigned, semi structured, pretested questionnaire.

Statistical analysis: The data obtained was manually entered into Microsoft Excel and analysed using Statistical Package for Social Sciences (SPSS) v23. All the categorical variables were summarised using frequencies and percentages. Continuous variables were summarized using mean (standard deviation) and/or median (interquartile range) (based on the results of data normality, tested using Kolmogorov–Smirnov test and the Shapiro–Wilk test). To test for statistical significance, Chi square test or Fisher exact test (for categorical variables) and independent "t" test or Mann Whitney U test (for continuous variables) was used. Statistical significance was considered at p value less than 0.05.

Results

The baseline characteristics of patients in the study groups are presented in terms of age, weight, and parity. The mean age of patients undergoing vaginal hysterectomy was 60.2 years (±2.9), while those undergoing laparoscopic hysterectomy had a mean age of 59.5 years (±4.1); this difference was not statistically significant ($p>0.05$). The mean weight of patients in the vaginal hysterectomy group was 72.7 kg (±8.2), compared to 72.0 kg (±7.6) in the laparoscopic group; again, this difference was not statistically significant ($p>0.05$). Regarding parity, the mean number of children for patients in the vaginal hysterectomy group was 2.6 (±0.7), and for those in the laparoscopic group, it was 2.8 (±0.7); this difference was also not statistically significant ($p>0.05$). None of the differences in these baseline characteristics were statistically significant at the $p<0.05$ level.

The postoperative frequency of urination was observed in 40.0% of patients who underwent vaginal hysterectomy compared to 20.0% in those who had laparoscopic hysterectomy, with a statistically significant difference ($p<0.05$). Regarding urgency, it was present in 21.7% of the vaginal hysterectomy group and 13.3% of the laparoscopic hysterectomy group, which was not statistically significant ($p>0.05$). Urge incontinence was reported in 20.0% of the vaginal hysterectomy group and 13.3% of the laparoscopic hysterectomy group, with no statistically significant difference ($p>0.05$). The mean ICIQ-FLUTS score preoperatively was 0.6 (SD 1.1) for vaginal hysterectomy and 0.4 (SD 1.1) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the scores increased to 1.2 (SD 1.3) for vaginal hysterectomy and 0.8 (SD 0.9) for laparoscopic hysterectomy ($p>0.05$). The change in scores from preoperative to postoperative was statistically significant within both groups ($p<0.05$ for vaginal hysterectomy and for laparoscopic hysterectomy).

Comparison of study groups by cystometry findings: The mean volume at first sensation preoperatively was 167.8 ml (SD 22.3) for vaginal hysterectomy and 169.4 ml (SD 23.5) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, these volumes increased to 178.0 ml (SD 15.1) and 180.1 ml (SD 16.5) respectively ($p>0.05$). Both groups showed a statistically significant increase from preoperative to postoperative measurements ($p<0.05$ for vaginal hysterectomy and for laparoscopic hysterectomy). Cystometric bladder capacity preoperatively was 517.1 ml (SD 23.5) for vaginal hysterectomy and 515.7 ml (SD 24.5) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the capacity decreased to 476.4 ml (SD 99.7) for vaginal hysterectomy and 485.3 ml (SD 55.3) for laparoscopic hysterectomy ($p>0.05$). The decrease was statistically significant within both groups ($p<0.05$ for vaginal hysterectomy and for laparoscopic hysterectomy).

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(5), 134-142 | ISSN:2251-6727

Postoperative detrusor muscle overactivity was present in 80.0% of the vaginal hysterectomy group and 93.3% of the laparoscopic hysterectomy group, with a statistically significant difference ($p<0.05$). It was absent in 20.0% of the vaginal hysterectomy group and 6.7% of the laparoscopic hysterectomy group.

Comparison of study groups by uroflowmetry parameters: Uroflowmetry parameters showed that the preoperative voided volume was 263.6 ml (SD 45.1) for vaginal hysterectomy and 274.4 ml (SD 49.8) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the voided volume increased to 275.5 ml (SD 54.8) and 285.3 ml (SD 47.2) respectively ($p>0.05$), with no statistically significant change within either group ($p>0.05$ for vaginal hysterectomy and for laparoscopic hysterectomy). The maximum flow rate preoperatively was 26.7 ml/second (SD 4.2) for vaginal hysterectomy and 25.1 ml/second (SD 5.4) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the rates were 25.1 ml/second (SD 4.8) and 26.8 ml/second (SD 4.7) respectively ($p>0.05$), with no statistically significant change within either group ($p>0.05$ for vaginal hysterectomy and for laparoscopic hysterectomy).

The voiding time preoperatively was 51.4 seconds (SD 12.7) for vaginal hysterectomy and 50.4 seconds (SD 12.5) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the times changed to 62.5 seconds (SD 13.7) and 47.4 seconds (SD 12.4) respectively, with a statistically significant increase in the vaginal hysterectomy group ($p<0.05$) but not in the laparoscopic group ($p>0.05$). The average flow rate preoperatively was 7.6 ml/second (SD 2.1) for vaginal hysterectomy and 6.4 ml/second (SD 1.6) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the rates were 6.8 ml/second (SD 1.2) and 8.7 ml/second (SD 3.1) respectively, with a statistically significant decrease in the vaginal hysterectomy group ($p<0.05$) and an increase in the laparoscopic group ($p<0.05$). The residual urine volume preoperatively was 54.1 ml (SD 8.2) for vaginal hysterectomy and 51.8 ml (SD 4.3) for laparoscopic hysterectomy ($p>0.05$). Postoperatively, the volumes were 58.1 ml (SD 6.1) and 52.9 ml (SD 4.4) respectively, with a statistically significant increase in the vaginal hysterectomy group ($p<0.05$) but not in the laparoscopic group ($p>0.05$).

Discussion

The findings from this study provide valuable insights into the urodynamic changes following vaginal and laparoscopic hysterectomy. Both surgical approaches are common treatments for benign gynaecological conditions, yet their impacts on urinary functions have been subjects of ongoing research. The baseline characteristics, including age, weight, and parity, did not show statistically significant differences between the two groups. This homogeneity is crucial as it suggests that the observed postoperative differences in urodynamic parameters are likely due to the surgical approach rather than demographic variables. The mean age and weight were comparable to those reported in similar studies, ensuring the generalizability of the findings (Abouelgreed et al., 2022; Dhobale et al., 2023; Harvey et al., 2022).[10-12]

A significant postoperative increase in urination frequency was observed in 40.0% of patients undergoing vaginal hysterectomy compared to 20.0% in those undergoing laparoscopic hysterectomy. This finding is consistent with previous literature suggesting that vaginal hysterectomy may be associated with a higher risk of postoperative urinary frequency (Chong et al., 2016; Link et al., 2010; Skorupska et al., 2021).[13-15] The underlying mechanisms could involve alterations in the pelvic floor support and nerve damage during surgery, which are more pronounced in vaginal hysterectomy (Bharucha et al., 2012; Chen et al., 2021; Forsgren et al., 2022).[16-18] The study found no significant differences in urgency and urge incontinence between the two groups. These results align with the findings of Firmeza et al. (2022),[19] who reported similar postoperative urinary urgency and incontinence rates between vaginal and laparoscopic hysterectomy (Longo et al., 2019; Skorupska et al., 2021).[14,20] It suggests that both surgical approaches have a comparable impact on these specific urinary symptoms, potentially due to the minimal difference in their effect on the bladder's detrusor muscle and surrounding structures.

The International Consultation on Incontinence Modular Questionnaire on Female Lower Urinary Tract Symptoms (ICIQ-FLUTS)[21,22] scores indicated a significant increase from preoperative to postoperative periods within both groups, although the between-group

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(5), 134-142 | ISSN:2251-6727

differences were not statistically significant. This result is critical as it highlights that both types of hysterectomy can lead to an increase in lower urinary tract symptoms (LUTS), a finding corroborated by Duru et al. (2012).[5] The increase in ICIQ-FLUTS scores postoperatively suggests that even minimally invasive surgeries like laparoscopic hysterectomy can have substantial impacts on urinary function, possibly due to factors such as postoperative inflammation and changes in pelvic anatomy.[23] The study's findings emphasize the need for thorough preoperative counselling for patients undergoing hysterectomy, regardless of the surgical approach. Patients should be informed about the potential for increased urinary frequency postoperatively, particularly with vaginal hysterectomy (El-Toukhy et al., 2004).[24] Furthermore, it underscores the importance of postoperative monitoring and management of LUTS to enhance patient outcomes and quality of life.

Preoperatively, the mean volume at first sensation was similar between the two groups, with 167.8 ml for vaginal hysterectomy and 169.4 ml for laparoscopic hysterectomy, showing no statistically significant difference. Postoperatively, these volumes increased to 178.0 ml and 180.1 ml, respectively, still without a significant difference between the groups. However, the increase within each group was statistically significant ($p<0.05$). This increase suggests an improvement in bladder sensory function post-surgery, possibly due to reduced pressure on the bladder from the removed uterus (Kruse et al., 2017; Sukgen & Türkay, 2020).[25,26] Preoperative bladder capacity was comparable between the groups, with 517.1 ml for vaginal hysterectomy and 515.7 ml for laparoscopic hysterectomy. Postoperatively, there was a significant decrease in bladder capacity within both groups, to 476.4 ml for vaginal hysterectomy and 485.3 ml for laparoscopic hysterectomy ($p<0.05$). This decrease might be attributed to postoperative inflammation, changes in pelvic anatomy, or detrusor muscle adaptation following the surgery (Lee et al., 2019; Polat et al., 2016).[27,28] The lack of a significant difference between the groups suggests that both surgical methods similarly impact bladder capacity. A notable finding was the high incidence of postoperative detrusor muscle overactivity (DO) in both groups, with 80.0% in the vaginal hysterectomy group and 93.3% in the laparoscopic hysterectomy group. The statistically significant difference between the groups ($p<0.05$) indicates a higher prevalence of DO in the laparoscopic hysterectomy group. This finding is crucial as DO is associated with symptoms of urgency and urge incontinence, impacting the patient's quality of life (Maher et al., 2013).[29] The higher prevalence of DO in the laparoscopic group could be due to more extensive dissection and manipulation of the pelvic organs during the procedure (Worley et al., 2009).[30] These cystometric findings have several clinical implications. First, the significant increase in volume at first sensation postoperatively suggests that patients may experience an initial improvement in bladder sensory function, likely due to decreased uterine pressure on the bladder. Clinicians should reassure patients about this potential positive change. The significant decrease in bladder capacity postoperatively, despite being a common finding, highlights the need for postoperative monitoring and management strategies to address potential symptoms such as frequent urination and urgency. Bladder training exercises and pharmacological interventions may be necessary to manage these symptoms effectively (Aue-Aungkul et al., 2021).[31]

Preoperatively, the voided volumes were similar between the two groups, with 263.6 ml for vaginal hysterectomy and 274.4 ml for laparoscopic hysterectomy. Postoperatively, both groups showed a slight increase in voided volume to 275.5 ml and 285.3 ml, respectively, although these changes were not statistically significant. This lack of significant change suggests that neither surgical approach substantially alters the overall volume of urine voided during a typical micturition cycle (Aarts et al., 2015).[32] The preoperative maximum flow rates were also comparable between the groups, with 26.7 ml/second for vaginal hysterectomy and 25.1 ml/second for laparoscopic hysterectomy. Postoperatively, the maximum flow rates showed minimal changes, with 25.1 ml/second for vaginal hysterectomy and 26.8 ml/second for laparoscopic hysterectomy, again without statistically significant differences. These results are consistent with previous studies indicating that hysterectomy, regardless of the approach, does not significantly impact the maximum urinary flow rate (Ekanayake et al., 2020).[33] Preoperative voiding times were similar between the groups, but a significant postoperative increase was observed in the vaginal hysterectomy group (from 51.4 seconds to 62.5 seconds, $p<0.05$), while the laparoscopic

Journal of Chemical Health Risks

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JCHR (2024) 14(5), 134-142 | ISSN:2251-6727

group showed no significant change (50.4 seconds to 47.4 seconds). This increase in voiding time in the vaginal hysterectomy group may be related to postoperative changes in pelvic floor dynamics or detrusor muscle activity (Aydoğan Kırmızı & Başer, 2020).[34] The lack of significant change in the laparoscopic group suggests that this approach might be less disruptive to voiding mechanics. Preoperatively, the average flow rates were 7.6 ml/second for vaginal hysterectomy and 6.4 ml/second for laparoscopic hysterectomy. Postoperatively, a significant decrease was observed in the vaginal hysterectomy group (to 6.8 ml/second, $p<0.05$), while the laparoscopic group showed a significant increase (to 8.7 ml/second, $p<0.05$). These findings indicate that vaginal hysterectomy might negatively affect urinary flow efficiency, possibly due to increased urethral resistance or altered bladder contractility (Hallock & Handa, 2016).[35] Conversely, the improvement in the laparoscopic group suggests that this approach might enhance urinary flow, potentially due to better preservation of the pelvic floor and neural structures. The preoperative residual urine volumes were 54.1 ml for vaginal hysterectomy and 51.8 ml for laparoscopic hysterectomy. Postoperatively, there was a significant increase in residual urine volume in the vaginal hysterectomy group (to 58.1 ml, $p<0.05$), whereas the laparoscopic group showed no significant change (to 52.9 ml). The increased residual volume in the vaginal hysterectomy group may indicate incomplete bladder emptying, potentially due to changes in bladder or urethral function post-surgery (O'Laughlin, 1986; K. Skorupska et al., 2021).[36,37] The uroflowmetry findings have several important clinical implications. First, the significant changes in voiding time, average flow rate, and residual urine volume in the vaginal hysterectomy group suggest that this approach might be associated with a higher risk of postoperative voiding dysfunction. Patients undergoing vaginal hysterectomy should be closely monitored for symptoms of incomplete bladder emptying and decreased urinary flow, and appropriate interventions should be implemented when necessary.

The present study is not without limitations. It includes single-centre study design limiting the external validity of the findings, short follow-up period, lack of randomization, and blinding. Addressing these limitations in future research would enhance the reliability and applicability of the findings and provide a more comprehensive understanding of the urodynamic changes associated with different hysterectomy approaches.

Conclusion

The findings indicate that both vaginal and laparoscopic hysterectomy resulted in significant changes in cystometric parameters, such as increases in the volume at first sensation and decreases in bladder capacity. These changes highlight the impact of surgery on bladder function and underscore the need for careful monitoring of bladder health in the postoperative period. In terms of uroflowmetry parameters, postoperative assessments revealed differences between the two groups. Vaginal hysterectomy was associated with significant increases in voiding time, decreases in average flow rate, and increases in residual urine volume. In contrast, laparoscopic hysterectomy showed improvements in average flow rate with minimal changes in voiding time and residual urine volume. These results suggest that laparoscopic hysterectomy may be linked to better urinary flow and less residual urine compared to vaginal hysterectomy. Additionally, a higher prevalence of postoperative detrusor muscle overactivity was observed in the laparoscopic hysterectomy group, indicating a potential for increased incidence of this condition, which could affect urinary symptoms and patient quality of life. These findings emphasize the importance of individualized surgical planning and patient counselling regarding potential postoperative urinary symptoms. The choice between vaginal and laparoscopic hysterectomy should be tailored to each patient's specific needs and preferences, considering the potential impacts on urinary function.

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Journal of Chemical Health Risks

www.jchr.org

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Journal of Chemical Health Risks

www.jchr.org

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Table 1: Baseline characteristics of patients in the study groups

	Hysterectomy			**P value**
	Vaginal N = 60	**Laparoscopic N = 60**	**Total N = 120**	
	n (%)	**n (%)**	**n (%)**	
Age (in years)	60.2 (2.9)	59.5 (4.1)	59.9 (3.5)	0.283
Weight (in kgs)	72.7 (8.2)	72.0 (7.6)	72.4 (7.9)	0.629
Parity	2.6 (0.7)	2.8 (0.7)	2.7 (0.7)	0.120
*Statistically significant at p<0.05				

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Table 2: Comparison of study groups, by outcomes of interest

		Hysterectomy		P value
		Vaginal N = 60	Laparoscopic N = 60	
		n (%)	n (%)	
Post operative frequency	Present	24 (40.0)	12 (20.0)	0.017*
	Absent	36 (60.0)	48 (80.0)	
Urgency	Present	13 (21.7)	8 (13.3)	0.229
	Absent	47 (78.3)	52 (86.7)	
Urge incontinence	Present	12 (20.0)	8 (13.3)	0.327
	Absent	48 (80.0)	52 (86.7)	
ICIQ-FLUTS score *Mean (SD)*	Preoperative	0.6 (1.1)	0.4 (1.1)	0.321
	Postoperative	1.2 (1.3)	0.8 (0.9)	0.062
	P value	0.007*	0.031*	
Volume at first sensation (in ml) *Mean (SD)*	Preoperative	167.8 (22.3)	169.4 (23.5)	0.703
	Postoperative	178.0 (15.1)	180.1 (16.5)	0.469
	P value	0.004*	0.005*	
Cystometric bladder capacity (in ml) *Mean (SD)*	Preoperative	517.1 (23.5)	515.7 (24.5)	0.750
	Postoperative	476.4 (99.7)	485.3 (55.3)	0.547
	P value	0.003*	<0.001*	
Postoperative Detrusor muscle overactivity	Present	48 (80.0)	56 (93.3)	0.032*
	Absent	12 (20.0)	4 (6.7)	
Uroflowmetry				
Voided volume (in ml) *Mean (SD)*	Preoperative	263.6 (45.1)	274.4 (49.8)	0.216
	Postoperative	275.5 (54.8)	285.3 (47.2)	0.296
	P value	0.197	0.221	
Maximum flow rate (in ml/second) *Mean (SD)*	Preoperative	26.7 (4.2)	25.1 (5.4)	0.073
	Postoperative	25.1 (4.8)	26.8 (4.7)	0.052
	P value	0.054	0.068	
Voiding time (in seconds) *Mean (SD)*	Preoperative	51.4 (12.7)	50.4 (12.5)	0.665
	Postoperative	62.5 (13.7)	47.4 (12.4)	<0.001*
	P value	<0.001*	0.189	
Average flow rate (in ml/sec) *Mean (SD)*	Preoperative	7.6 (2.1)	6.4 (1.6)	0.410
	Postoperative	6.8 (1.2)	8.7 (3.1)	0.527
	P value	0012*	<0.001*	
Residual urine volume (in ml) *Mean (SD)*	Preoperative	54.1 (8.2)	51.8 (4.3)	0.057
	Postoperative	58.1 (6.1)	52.9 (4.4)	<0.001*
	P value	0.003*	0.169	
*Statistically significant at p<0.05				