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ORIGINAL ARTICLE

Sexual Function

Patient-reported ejaculatory function and satisfaction in men with lower urinary tract symptoms/benign prostatic hyperplasia

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This study aimed to investigate perceived ejaculatory function/satisfaction before treatment for lower urinary tract symptoms (LUTS)/benign prostatic hyperplasia (BPH) and to identify associations between specific categories of ejaculatory dysfunctions (EjDs) and LUTS. A total of 1574 treatment-naïve men with LUTS/BPH were included in this study. All patients underwent routine evaluation for LUTS/BPH including the International Index of Erectile Function and a 5-item questionnaire developed to assess ejaculatory volume/force/pain/satisfaction/latency time. Patients who had sexual intercourse over the past 4 weeks were classified as sexually active group. A total of 783 patients were categorized as sexually active group. Decreased ejaculatory volume and force were reported by 53.4% and 55.7% of 783 sexually active men, respectively. There was a strong correlation between ejaculatory volume and force. Ejaculatory pain/discomfort, premature ejaculation (PE), and delayed ejaculation (DE) were reported in 41.0%, 16.3%, and 41.4% of the patients, respectively. Over 40.0% of men without decreased ejaculation volume/force were satisfied with ejaculatory function, whereas approximately 6.0% of men with decreased volume/force were satisfied with ejaculatory function. About 30.0% of men with decreased volume/force had orgasmic dysfunction, while approximately 10.0% of men without decreased volume/force did. Decreased ejaculatory volume or force was associated with LUTS severity after adjusting for other influential factors including testosterone level, erectile function, and prostate size on ultrasonography, but PE or DE or ejaculatory pain/discomfort was not. In conclusion, a considerable portion of men with LUTS/BPH appear to have a variety of EjDs. Ejaculatory volume/force and satisfaction/orgasm do not always appear to be concordant. Ejaculatory volume or force is independently associated with LUTS severity, whereas PE or DE or ejaculatory pain/discomfort is not.

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INTRODUCTION

Ejaculatory dysfunction (EjD) is one of the most common male sexual disorders. It can negatively affect quality of life (QoL) in many men.¹ EjD includes premature ejaculation (PE), delayed ejaculation (DE), anejaculation, retrograde ejaculation, and painful ejaculation.² Although erectile dysfunction (ED) and, more recently, PE have been extensively studied, there are limited data on DE, anejaculation, and decreased ejaculatory volume (DEV) or force (DEF). Furthermore, although some epidemiologic studies have reported an association between EjD and lower urinary tract symptoms (LUTS),^{3–9} there are limited data on the degree of satisfaction with ejaculatory ability or on the association between LUTS and specific categories of EjDs in men with LUTS.

A recent meta-analysis suggests that α -blockers and 5 α -reductase inhibitors, which have been most commonly prescribed for medical treatment of LUTS/benign prostatic hyperplasia (BPH), are associated with 5.88- and 2.73-times higher risk of EjDs than placebo,

respectively.¹⁰ A previous study reported that 70% of sexually active men would not agree to continue medical treatments for BPH if they had to experience adverse effects including EjD.¹¹ Loss of ejaculation is a common complication of BPH surgery.¹² Previous studies of men with LUTS/BPH reported that 47.0%–94.0% considered DEV or painful ejaculation as a problem.^{7,8} Thus, effectively counseling patients regarding their ejaculatory function before treatment for LUTS may help improve treatment satisfaction and yield better QoL. In addition, given the era where particular attention is paid to patients' QoL and, thereby, effect of LUTS/BPH treatment on their ejaculatory function cannot be overlooked, the presence or absence of EjDs before treatment in men with LUTS/BPH may influence the selection of a therapeutic option.

The aim of this study was to investigate perceived ejaculatory function and satisfaction before the initiation of treatment in men with LUTS, and to identify significant associations between specific categories of EjDs and LUTS after adjusting for other confounding factors.

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MATERIALS AND METHODS

Between April 2005 and May 2011, a total of 1574 men, who visited the department of urology in our hospital because of LUTS/BPH, were treatment naïve for LUTS, and did not fall under the following exclusion criteria, were included in this study. The exclusion criteria were previous diagnosis of urethral stricture, prostate or bladder cancer, neurogenic bladder disease, previous history of urological surgery, previous or current medication with α -blockers or 5 α -reductase inhibitors or type-5 phosphodiesterase inhibitors or anti-cholinergic medications, and incomplete data. We retrospectively reviewed our prospectively collected database. This study was approved by our Institutional Review Board.

Evaluations for all patients included medical history, physical examination including digital rectal examination, urinalysis, serum creatinine, serum prostate-specific antigen (PSA), serum testosterone, transrectal ultrasonography (TRUS), the International Prostate Symptom Score (IPSS), the Overactive Bladder Symptom Score, and the International Index of Erectile Function (IIEF). Furthermore, patient-reported ejaculatory function and satisfaction were assessed by a 5-item questionnaire (EjQ) modified from the existing validated questionnaires about male sexual function (Brief Male Sexual Function Inventory, Ejaculation function domain of Male Sexual Health Questionnaire, and Premature Ejaculation Diagnostic Tool). The EjQ composed of five questions rated on a 6-point scale to assess ejaculation function and satisfaction concerning ejaculatory volume (EjQ1), ejaculatory force (EjQ2), pain/discomfort on ejaculation (EjQ3), degree of satisfaction with ejaculatory ability (EjQ4), and time from penile intromission to ejaculation (EjQ5) (**Supplementary Information**).

Patients who responded in the IIEF of a lack of sexual stimulation or intercourse over the past 4 weeks were classified as sexually inactive group. All the other responders were classified as sexually active group. LUTS severity was classified based on total IPSS as mild (score ≤ 7) and moderate to severe (score ≥ 8). According to the erectile function (EF) domain score of the IIEF, ED severity was classified into five categories as follows: no ED (score of 26–30), mild (score of 22–25), mild to moderate (score of 17–21), moderate (score of 11–16), and severe (score of 6–10).¹³ Patients with EjQ1 and EjQ2 score of 1 or 2 were considered as having DEV and DEF, respectively. Patients with EjQ3 score of 1–4 were considered as having pain/discomfort on ejaculation. Patients with EjQ5 score of 1 (short time) or 2 (very short time) and those with EjQ5 score of 4 (long time) or 5 (very long time) were considered as having PE and DE, respectively. Patients with EjQ4 score of 4 (moderately satisfied) or 5 (very satisfied) were considered as being satisfied with their ejaculation ability.

Statistical comparisons between groups were performed using χ^2 test or Fisher's exact test for categorical variables. In terms of continuous variables, the independent *t*-test and Mann-Whitney *U*-test were used for normally distributed data and skewed data, respectively. Spearman's correlation coefficient was calculated to estimate the association between each ejaculatory function. Multivariate logistic regression analyses were performed to examine the association between ejaculatory problems and LUTS severity with adjustment for confounding variables of age, body mass index, presence of comorbidities, serum PSA, testosterone level, total prostate volume on TRUS, IIEF-EF score, and sexual desire domain score of the IIEF. $P < 0.05$ was considered to indicate statistical significance and all tests were two sided. SPSS version 20.0 for Windows software (SPSS Inc., Chicago, IL, USA) was used for analyses.

RESULTS

Comparison in patient characteristics between sexually active and sexually inactive groups

A total of 783 patients (49.7%) had sexual intercourse over the 4 weeks prior to this study (sexually active group), whereas 791 patients (50.3%) had not (sexually inactive group). **Table 1** summarizes the baseline characteristics of the two groups. Most of the patients in the sexually inactive group (93.8%) almost never/never felt sexual desire, according to their response to IIEF question 11. On the other hand, 71% of the patients in the sexually active group had considerable sexual desire (score ≥ 3). In the sexually active group, the percentages of men with severe, moderate, mild-to-moderate, and mild ED were 13.2%, 17.0%, 18.0%, and 16.7%, respectively. The remaining 275 men (35.1%) did not complain of ED according to the IIEF-EF score.

Ejaculatory function in sexually active men with LUTS/BPH

Figure 1 summarizes the patients' responses to the EjQ questionnaire. In the sexually active group, 53.4% and 55.7% of the patients reported DEV and DEF, respectively. There was a strong correlation between DEV and DEF (Spearman's correlation coefficient of 0.823; $P < 0.001$).

According to their responses to IIEF question 10, the percentage of men with orgasmic dysfunction (score of 1 or 2) was 21.6% in the overall sexually active group, 30.4% of men with DEV, and 30.2% of men with DEF. The percentage of men with orgasmic dysfunction in the subset of patients without DEV was 11.5%. The rate of orgasmic dysfunction in the subset of men without DEF was 10.6%.

In the sexually active group, pain/discomfort during ejaculation was reported by 41.0% of the patients. The ejaculatory latency time was reported to be very long in 5.8%, long in 10.5%, short in 26.6%, and very short in 14.8% of patients.

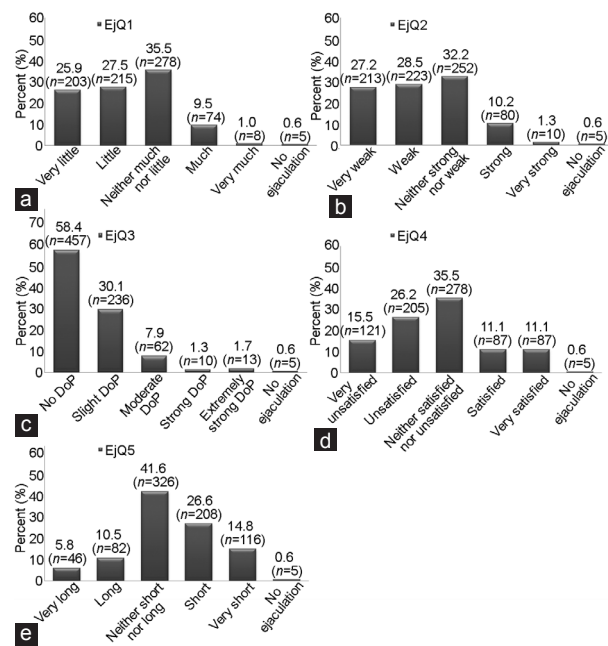


Figure 1: Distribution of (a) perceived ejaculatory volume, (b) ejaculatory force, (c) DoP during ejaculation, (d) degree of ejaculatory satisfaction and (e) ejaculatory latency time, according to the EjQ questionnaire. EjQ: ejaculation questionnaire; DoP: pain or discomfort.

Table 1: Comparison of baseline characteristics between sexually active and inactive groups

	Sexually active group (n=783)	Sexually inactive group (n=791)	Total (n=1574)
Age* (year)	64.01±8.87	69.76±8.62	66.90±9.20
BMI (kg m ⁻²)	24.34±3.08	24.10±4.13	24.22±3.65
Waist circumference (cm)	87.78±9.87	88.30±9.42	88.03±9.65
Hypertension, n (%)	242 (30.9)	296 (37.4)	538 (34.2)
Diabetes mellitus, n (%)	82 (10.5)	118 (14.9)	200 (12.7)
PSA (ng ml ⁻¹)	2.33±2.76	2.58±3.60	2.45±3.22
Testosterone (ng ml ⁻¹)	4.08±1.55	4.20±1.90	4.14±1.73
Total prostate volume (ml)	42.03±18.83	44.02±17.17	43.03±18.03
Transition zone volume (ml)	19.56±16.57	21.17±12.64	20.37±14.72
Maximum urine flow rate* (ml s ⁻¹)	13.93±10.27	12.29±9.70	13.10±10.01
Postvoid residual urine volume* (ml)	32.46±51.66	41.99±73.38	37.30±63.79
Bladder voiding efficiency* (%)	87.21±17.37	83.11±21.00	85.13±19.40
Daytime frequency on voiding diary	7.76±2.87	7.69±2.71	7.72±2.79
Nocturnal frequency on voiding diary*	1.53±1.25	1.85±1.38	1.70±1.33
Nocturnal polyuria index*	0.35±0.13	0.38±0.14	0.36±0.13
Subtotal voiding symptom score	8.76±5.38	9.01±5.63	8.89±5.51
Subtotal storage symptom score*	5.87±3.27	6.35±3.74	6.12±3.52
Total IPSS	14.64±7.72	15.36±8.40	15.00±8.08
QoL index*	3.40±1.40	3.54±1.41	3.47±1.39
Total OABSS*	4.69±3.45	5.29±3.46	5.01±3.46
IIEF Q11 (How often have you felt sexual desire?)*, n (%)			
Almost never/never	58 (7.4)	742 (93.8)	800 (50.8)
A few times	169 (21.6)	28 (3.5)	197 (12.5)
Sometimes	221 (28.2)	8 (1.0)	229 (14.5)
Most times	240 (30.7)	1 (0.1)	241 (15.3)
Almost always/always	95 (12.1)	12 (1.5)	107 (6.8)
IIEF-EF domain score*	20.51±7.70	1.39±1.71	10.92±11.06
IIEF-OF domain score*	7.39±2.80	0.08±0.57	3.71±4.17
IIEF-SD domain score*	6.10±1.79	2.21±0.95	4.14±2.42
IIEF-IS domain score*	7.93±2.96	0.06±0.51	3.98±4.47
IIEF-OS domain score*	6.17±2.00	2.15±0.89	4.16±2.54
Total IIEF score*	48.04±15.73	5.85±3.53	26.84±23.97

* $P < 0.05$: comparison between the sexually active and sexually inactive groups. BMI: body mass index; PSA: prostate-specific antigen; IPSS: International Prostate Symptom Score; QoL: quality of life; OABSS: Overactive Bladder Symptom Score; IIEF: International Index of Erectile Function; EF: erectile function; OF: orgasmic function; SD: sexual desire; IS: intercourse satisfaction; OS: overall satisfaction

Perceived ejaculatory satisfaction in sexually active men with LUTS/BPH

In the sexually active group, 22.2% of the patients were satisfied with their ejaculatory function (Figure 1). According to their response to the EjQ4, only 6.0% of the 418 men with DEV and only 5.5% of the 436 men with DEF were satisfied with their ejaculatory function (Figure 2). On the other hand, 41.4% of the 360 men without DEV and 43.9% of the 342 men without DEF were satisfied with their ejaculatory ability.

Correlation between ejaculatory problems and LUTS severity in sexually active men with LUTS/BPH

On multivariate analysis, volume or force of ejaculation was associated with LUTS severity after adjustment for other variables ($P = 0.007$ and $P = 0.017$, respectively; Table 2). Patients with moderate-to-severe LUTS had 3.007-times or 2.803-times higher risk of DEV or DEF, respectively, than those with mild LUTS. However, the LUTS severity was not associated with PE or DE or pain/discomfort during ejaculation (Table 3 and 4). Lower IIEF-EF domain score and smaller prostate volume were associated with DE ($P = 0.015$ and $P = 0.041$, respectively; Table 3). Older age was associated with PE ($P = 0.029$) and younger age with pain/discomfort during ejaculation ($P < 0.001$; Table 3 and 4).

DISCUSSION

There have been limited data on patient-reported ejaculatory function and satisfaction in men with LUTS/BPH. This study extends the current state of knowledge regarding them. There were four main findings in our study. First, nearly half of the sexually active men with LUTS/BPH had DEV or DEF. There was a strong correlation between ejaculatory volume and force. Second, patient-reported pain/discomfort during ejaculation, PE, and DE were observed in 41.0%, 16.3%, and 41.4% of the sexually active men with LUTS/BPH, respectively. Third, although the degree of ejaculatory satisfaction or orgasm in men without DEV or DEF was higher than that in those with DEV or DEF, about half of the men without DEV or DEF as well as most of the patients with DEV or DEF were not satisfied with their ejaculatory ability. Furthermore, about 70% of men with DEV or DEF did not have orgasmic dysfunction. Fourth, the ejaculatory volume or force was associated with LUTS severity after adjustment for other influencing factors. However, the LUTS severity was not associated with PE or DE or pain/discomfort during ejaculation.

In our study, 53.4% of the sexually active men with LUTS/BPH had DEV. Previous studies similarly reported DEV in 47.0%–63.0% of men with LUTS/BPH.^{7,8} These findings carry significant implications in men with LUTS/BPH, because BPH surgeries and selective α -1A-adrenergic

Table 2: Odds ratios of potential risk factors for decreased volume or force of ejaculation, according to the logistic regression analysis

	Decreased volume of ejaculation (EjQ1 score of 1 or 2)		Decreased force of ejaculation (EjQ2 score of 1 or 2)	
	OR (95% CI)	Adjusted OR (95% CI)	OR (95% CI)	Adjusted OR (95% CI)
Age	1.025 (1.000–1.050)	1.009 (0.964–1.056)	1.038 (1.014–1.063)*	1.034 (0.985–1.084)
BMI	0.999 (0.926–1.078)	0.992 (0.870–1.131)	0.996 (0.923–1.075)	0.965 (0.840–1.109)
Diabetes mellitus				
Absence	1.000	1.000	1.000	1.000
Presence	0.637 (0.334–1.214)*	0.314 (0.115–0.856)*	0.638 (0.335–1.217)*	0.280 (0.097–0.804)*
Hypertension				
Absence	1.000	1.000	1.000	1.000
Presence	1.169 (0.707–1.931)	2.033 (0.816–5.065)	1.252 (0.754–2.079)	1.343 (0.544–3.317)
Serum PSA	1.021 (0.933–1.117)	1.086 (0.875–1.349)	1.062 (0.958–1.178)	1.267 (0.941–1.706)
Serum testosterone	0.980 (0.796–1.207)	0.947 (0.745–1.204)	0.896 (0.732–1.098)	0.940 (0.733–1.205)
Total prostate volume	1.000 (0.990–1.010)	0.997 (0.972–1.022)	1.003 (0.992–1.013)	0.988 (0.962–1.015)
IIEF-EF score	0.906 (0.872–0.943)*	0.886 (0.813–0.965)*	0.882 (0.845–0.921)*	0.888 (0.809–0.974)*
IIEF-sexual desire score	0.626 (0.534–0.734)*	0.939 (0.694–1.271)	0.512 (0.428–0.612)*	0.720 (0.518–1.001)
LUTS severity				
Mild	1.000	1.000	1.000	1.000
Moderate to severe	1.912 (1.143–3.200)*	3.007 (1.353–6.682)*	1.588 (0.940–2.682)	2.803 (1.208–6.504)*

* $P < 0.05$. BMI: body mass index; PSA: prostate-specific antigen; IIEF: International Index of Erectile Function; EF: erectile function; LUTS: lower urinary tract symptoms; OR: odds ratio; CI: confidence interval; EjQ: ejaculation questionnaire

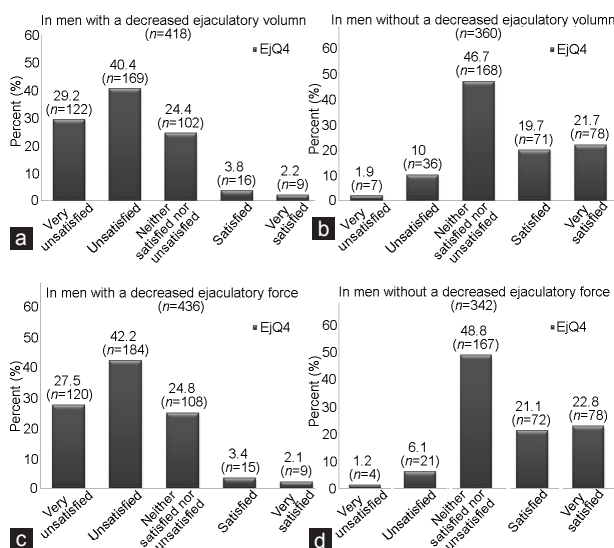


Figure 2: Perceived ejaculatory satisfaction (a) in men whose ejaculatory volume was decreased (EjQ1 of 1 or 2), (b) in those whose ejaculatory volume was not decreased (EjQ1 of ≥ 3), (c) in those whose ejaculatory force was decreased (EjQ2 of 1 or 2), and (d) in those whose ejaculatory force was not decreased (EjQ2 of ≥ 3), according to the EjQ4 scores.

receptor blockers may aggravate EjD including loss of ejaculation.^{10,12} In our study, men with moderate-to-severe LUTS were 3 times more likely to have DEV than those with mild LUTS. Given that men with moderate-to-severe LUTS seek medical advice from clinicians more frequently than those with mild LUTS, the BPH treatments used to alleviate relatively severe symptoms may exact a toll of aggravated EjDs such as further decrease in an ejaculatory volume. In addition, an ejaculatory force might be affected by BPH treatments in the same manner as an ejaculatory volume. In our study, 55.7% of the sexually active men with LUTS/BPH had DEF. The percentage of patients with DEF was very similar with the prevalence of DEV; this correlation is further supported by our finding of the strong correlation between ejaculatory volume and force. In our study, 77.8% of the sexually active men with LUTS/BPH were not satisfied with their ejaculatory

function. Furthermore, 58.6% of the 360 men without DEV and 56.1% of the 342 men without DEF were not satisfied with their ejaculatory function. Taken together, a considerable portion of sexually active men with LUTS/BPH appear to have ejaculatory problems including DEV or DEF and dissatisfaction with their ejaculatory ability before BPH treatment.

Our findings indicate that a considerable portion of clinicians might change their indifference in ejaculatory function of men with LUTS/BPH because they may be bothered by their ejaculatory function. In these patients, EjDs should not be overlooked, particularly in men with moderate-to-severe LUTS. Therefore, we think that evaluation of ejaculatory function and satisfaction before the initiation of treatment in men with LUTS/BPH may be a reasonable step. Furthermore, we recommend that, together with baseline ejaculatory function of patients, the impact of LUTS/BPH treatments on ejaculatory function or satisfaction should be explained to those with LUTS who are bothered enough to consider therapy because it may have an adverse impact on ejaculatory function or satisfaction to varying degrees.

Our study noted that 16.3% of the sexually active men with LUTS/BPH had PE, which was relatively lower compared to results (26.7%–29.1%) of a recent study involving a small cohort.¹⁴ However, the prior study was limited by the small sample size and the absence of assessment of sexual activity over the most recent period. Our study with a relatively larger cohort may provide more useful baseline data regarding PE in the sexually active men with LUTS/BPH. Meanwhile, our data showed that 41.4% of the sexually active men with LUTS/BPH had DE.

As expected, men without DEV or DEF had higher degree of ejaculatory satisfaction or orgasm compared to those with DEV or DEF. Interestingly, our study noted that 58.6% of men without DEV or 56.1% of those without DEF were not satisfied with their ejaculatory ability. In addition, 69.6% of men with DEV and 69.8% of men with DEF did not have orgasmic dysfunction. These findings indicate that ejaculatory volume/force and satisfaction about ejaculatory function or orgasm are not always concordant.

Most of the prior community-based studies have suggested that LUTS are strongly associated with DEV.^{3,4,6} In addition, previous

Table 3: Odds ratios of potential risk factors for premature or delayed ejaculation, according to the logistic regression analysis

	Premature ejaculation (EjQ5 score of 1 or 2)		Delayed ejaculation (EjQ5 score of 4 or 5)	
	OR (95% CI)	Adjusted OR (95% CI)	OR (95% CI)	Adjusted OR (95% CI)
Age	1.002 (0.985–1.018)	1.042 (1.001–1.084)*	1.036 (1.012–1.061)*	0.991 (0.964–1.019)
BMI	0.964 (0.915–1.015)	1.053 (0.971–1.142)	1.021 (0.959–1.088)	0.940 (0.869–1.016)
Diabetes mellitus				
Absence	1.000	1.000	1.000	1.000
Presence	0.750 (0.462–1.215)	1.256 (0.520–3.037)	1.221 (0.679–2.196)	0.616 (0.290–1.310)
Hypertension				
Absence	1.000	1.000	1.000	1.000
Presence	0.837 (0.609–1.151)	1.291 (0.703–2.369)	1.694 (1.135–2.526)*	0.919 (0.563–1.498)
Serum PSA	0.956 (0.900–1.015)	1.017 (0.916–1.129)	1.083 (1.015–1.155)*	0.954 (0.841–1.082)
Serum testosterone	0.975 (0.860–1.105)	1.027 (0.845–1.249)	1.035 (0.879–1.219)	0.975 (0.840–1.133)
Total prostate volume	0.991 (0.984–0.999)*	1.011 (0.994–1.028)	1.013 (1.006–1.021)*	0.987 (0.975–0.999)*
IIEF-EF score	0.936 (0.917–0.955)*	1.045 (0.988–1.106)	1.008 (0.982–1.035)	0.942 (0.904–0.982)*
IIEF-sexual desire score	0.793 (0.728–0.865)*	0.950 (0.756–1.194)	1.006 (0.902–1.123)	0.926 (0.783–1.096)
LUTS severity				
Mild	1.000	1.000	1.000	1.000
Moderate to severe	0.971 (0.670–1.407)	1.197 (0.559–2.563)	0.936 (0.573–1.529)	0.887 (0.510–1.544)

* $P < 0.05$. BMI: body mass index; PSA: prostate-specific antigen; IIEF: International Index of Erectile Function; EF: erectile function; LUTS: lower urinary tract symptoms; OR: odds ratio; CI: confidence interval; EjQ: ejaculation questionnaire

Table 4: Odds ratios of potential risk factors for pain or discomfort on ejaculation, according to the logistic regression analysis

	Pain or discomfort on ejaculation (EjQ3 score of 1 or 2 or 3 or 4)	
	OR (95% CI)	Adjusted OR (95% CI)
Age	0.959 (0.943–0.975)*	0.938 (0.911–0.966)*
BMI	0.999 (0.950–1.051)	1.022 (0.953–1.096)
Diabetes mellitus		
Absence	1.000	1.000
Presence	0.974 (0.605–1.566)	1.908 (0.947–3.843)
Hypertension		
Absence	1.000	1.000
Presence	0.875 (0.634–1.208)	0.895 (0.549–1.458)
Serum PSA	0.999 (0.948–1.052)	0.979 (0.879–1.091)
Serum testosterone	1.009 (0.890–1.144)	1.024 (0.883–1.189)
Total prostate volume	1.000 (0.994–1.006)	1.004 (0.989–1.019)
IIEF-EF score	0.971 (0.953–0.990)*	0.978 (0.938–1.019)
IIEF-sexual desire score	0.958 (0.884–1.039)	1.026 (0.868–1.213)
LUTS severity		
Mild	1.000	1.000
Moderate to severe	1.184 (0.813–1.724)	0.887 (0.509–1.546)

* $P < 0.05$. BMI: body mass index; PSA: prostate-specific antigen; IIEF: International Index of Erectile Function; EF: erectile function; LUTS: lower urinary tract symptoms; OR: odds ratio; CI: confidence interval; EjQ: ejaculation questionnaire

studies of men with LUTS noted that DEV or DEF was related to LUTS severity or individual LUTS.^{7,8,15} In accordance with the studies, our study found associations between the ejaculation volume or force and the LUTS severity even after adjustment for other influential factors. However, the LUTS severity was not associated with PE or DE or pain/discomfort during ejaculation after adjusting for the confounders. Contrarily, previous studies reported a relationship of pain/discomfort during ejaculation with LUTS.^{3,6–8} It is not easy to provide possible explanations for the differences in the results between the present and previous studies, although the characteristics of study populations, definitions of EjD and evaluation tools, such as questionnaires, vary according to the studies. However, unlike other

previous studies, we performed multivariate regression analyses to identify the associations between EjDs and LUTS severity controlled for confounding variables including testosterone level or erectile function (IIEF-EF) or prostate size on TRUS, which could influence the association in men with LUTS/BPH. In this regard, our data might provide another meaningful clue to the association between EjDs and LUTS in men with BPH, although additional studies are needed to draw a solid conclusion and to confirm the pathophysiologic background of EjDs in men with LUTS/BPH.

This study has several limitations. The study was retrospective and was not community based. Moreover, a nonvalidated questionnaire modified from a few validated questionnaires was used to evaluate ejaculatory function. However, given the significant association between EjDs and LUTS suggested in several previous studies, the evaluation of various ejaculatory functions can carry significant implications in men with LUTS/BPH. Thus, we thought that the questionnaire assessing varying ejaculatory functions and satisfaction would be an appropriate tool to evaluate the association between EjDs and LUTS/BPH.

Despite these limitations, the present study may provide meaningful data. There remains a significant association between a reduced volume or force and LUTS severity in men with LUTS/BPH even after adjusting for confounding variables including testosterone level, erectile function, and prostate. The finding of no association between LUTS severity and PE or DE or pain/discomfort during ejaculation after adjusting for the confounders might also be meaningful.

CONCLUSION

A considerable portion of men visiting urologic clinic for LUTS/BPH appear to have a variety of EjDs. Thus, evaluation of various ejaculatory functions including ejaculatory volume, force, discomfort/pain, and satisfaction deserves consideration before the initiation of BPH treatment. This seems reasonable, given that the EjDs may be newly developed or further aggravated by the treatment. Furthermore, although it seems to be apparent that DEV or DEF significantly correlates with decreased ejaculatory satisfaction or orgasm, an

ejaculatory volume/force and ejaculatory satisfaction/orgasm do not always appear to be concordant. Therefore, evaluation tools including ejaculatory satisfaction can be appropriate for assessing the ejaculatory function. Our study indicates that an ejaculation volume or force is independently associated with LUTS severity even after adjusting for confounding variables including erectile function, testosterone level, and prostate size, whereas PE or DE or pain/discomfort during ejaculation does not. Further studies are necessary to validate our findings.

AUTHOR CONTRIBUTIONS

MCC carried out substantial contributions to conception/design, data acquisition, data analysis, interpretation, drafting the manuscript, and statistical analysis. JKK, SHS, and SYC carried out substantial contributions to conception/design and data interpretation. SWL and SWK carried out data interpretation, critical revision of the manuscript for scientific and factual content, and helped to draft the manuscript. JSP carried out substantial contributions to conception/design, data analysis, interpretation, drafting the manuscript, supervision, and approved the final manuscript. All authors read and approved the final manuscript.

COMPETING INTERESTS

All authors declare no competing interests.

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Supplementary information is linked to the online version of the paper on the *Asian Journal of Andrology* website.

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