RESEARCH ARTICLE

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Urodynamic Findings of the Patients with Parkinson's Disease: A Single Tertiary Center Results

ABSTRACT

Objective: In Parkinson's disease (PD), lower urinary tract symptoms (LUTS) are common with a prevalence ranging from 25% to 57%. Patients who are resistant to medical treatment for LUTS may require urodynamic examination and pressure flow study (UD-PFS) to better comprehend the bladder's dynamics. To be able to understand the pathophysiology of LUTS, UD-PFS examinations should be performed. In this study, the demographics and clinical properties of PD patients were presented along with their UD-PFS examinations.

Materials and Methods: The data of 155 patients with PD followed up between 2010-2020 were retrospectively analyzed. UD-PFS was applied to 42 PD patients resistant to medical treatment of LUTS. Patients' demographic and clinical data with their UD-PFS findings were investigated separately.

Results: Twenty-eight of the patients underwent UD-PFS were male, and 14 were female. In UD, the first urinary sensation was 86.00±68.77cc, and the maximum cystometric capacity was 322.07±194.25cc. Sixteen patients had a hypo-compliant bladder, 25 (59.5%) had a normo-compliant bladder. In PFS, Q max and peak detrusor pressure during voiding were 12.72±10.08 mL/sec and 43.93±15.56 cm-H2O, respectively. Stress-type urinary incontinence was detected in 6 (15%) of the patients. When evaluating the detrusor activity, neurogenic detrusor overactivity was observed in 18 (44%) patients, detrusor areflexia in 8 (19%) and normal UD-PFS in 16 (22%) patients.

Conclusions: The majority of the PD patients presented with neurogenic detrusor overactivity accompanied by diminished bladder capacity and hypersensitivity. In the selected PD patients who are resistant to medical treatment with LUTS clinics, UD-PFS provides useful scientific information about the LUTS clinics of patients and may be helpful in treatment management.

Keywords: Urodynamic Examination, Pressure Flow Study, Parkinson's Disease.

Parkinson Hastalarında Ürodinamik İnceleme Bulguları: Tek Tersiyer Merkez Sonuçları

ÖZET

Amaç: Parkinson hastalığında (PH), alt üriner sistem semptomları (AÜSS) yaygın olarak, %25 ila %57 arasında değişen bir prevalansla görülür. AÜSS için medikal tedaviye yanıt vermeyen hastalarda mesane dinamiklerini daha iyi anlamak için ürodinamik inceleme ve basınç akış çalışması (ÜD-BAÇ) gerekebilir. ÜD-BAÇ incelemeleri AÜSS patofizyolojisinin anlaşılmasına katkı sağlayabilir. Bu çalışmada Parkinson hastalarının demografik ve klinik bulgularının ÜD-BAÇ tetkiklerinin sonuçları ile birlikte değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: 2010-2020 yılları arasında takip edilen 155 Parkinson hastasının verileri retrospektif olarak incelendi. AÜSS'ları medikal tedaviden fayda görmeyen 42 Parkinson hastasına ÜD-BAÇ uygulandı. Hastaların klinik ve demografik verileri ile ÜD-BAÇ bulguları ayrı ayrı değerlendirildi.

Bulgular: ÜD-BAÇ uygulanan hastaların 28'i erkek, 14'ü kadındı. ÜD'de ilk idrar hissi 86.00±68.77cc, maksimum sistometrik kapasite 322.07±194.25cc idi. 16 hastada hipo-kompliyan mesane, 25'inde (%59,5) normo-kompliyan bir mesane vardı. BAÇ'ta işeme fazındaki Qmax ve maksimum detrüsör basıncı sırasıyla 12,72±10,08 mL/sn ve 43,93±15,56 cm-H2O idi. 6 (%15) hastada stres tip üriner inkontinans saptandı. Detrusor foksiyonu değerlendirildiğinde ise 18 (%44,0) hastada nörojenik detrusor aşırı aktivitesi, 8 (%19) hastada detrusor arefleksi ve 16 (%22) hastada normal ÜD-BAÇ saptandı.

Sonuç: PD hastalarının çoğunda azalmış mesane kapasitesi ve hipersensitivite ile nörojenik detrüsör aşırı aktivitesi vardı. AÜSS klinikleri ile medikal tedaviye dirençli PH grubundaki seçilmiş hastalarda ÜD-BAÇ, hastaların AÜSS klinikleri hakkında değerli bilimsel veriler sağlar ve tedavi yönetiminde faydalı olabilir.

Anahtar Kelimeler: Ürodinamik İnceleme, Basınç Akım Çalışması, Parkinson Hastalığı.

INTRODUCTION

Parkinson disease (PD) is a neurodegenerative condition characterized by the aberrant accumulation of alpha-synuclein protein in the central and peripheral nervous systems (1). Parkinson's disease is one of the most prevalent neurodegenerative conditions, affecting 100 to 180 people per 100,000 (2). Motor symptoms (tremors, rigidity, and bradykinesia) are frequently predominate, while commonly observed non-motor symptoms include neuro-psychiatric disorders, lower urinary tract symptoms (LUTS) and sleep disorders (3). The reported incidence of voiding dysfunction in Parkinson's disease patients ranges between 37 and 70% (4).

In PD patients, LUTS can be variable and of varying degrees. The presence of LUTS in PD is linked to decreased quality of life, falls, and hospitalization (5). Overactive bladder (OAB) symptoms, which are urine urgency, frequency, and nocturia, with or without incontinence, are the most common LUTS in PD patients (6). According to studies, 57–83% of patients exhibit storage symptoms, but only 17–27% of patients exhibit voiding symptoms (7). Patients who do not respond to medical treatment for LUTS may require a urodynamic examination and pressure flow study (UD-PFS) to better comprehend the bladder's dynamics. UD-PFS examinations may aid in the comprehension of the pathogenesis of LUTS in PD patients.

In this study, we aimed to evaluate the demographic and clinical characteristics of PD patients along with their UD-PFS examinations.

MATERIAL AND METHODS

With the approval of a local ethical committee (Protocol Number: 2021.17.01.17), the data of 155 patients diagnosed with PD who were followed up in Urology Clinic of Tekirdağ Namık Kemal University between 2010 and 2020 were retrospectively analyzed. Patients who were excluded from the study included those who were incompatible with the diagnosis of PD or had external diseases that could explain the symptoms. UD-PFS was applied to 42 PD patients who did not benefit from the medical treatment of LUTS. International Continence Society (ICS) standards were applied in all urodynamic studies (8). Before the examination, patients were instructed to void their bladders, and the initial procedure was to quantify the postvoid residual (PVR) volume using a urethral catheter. Filling cystometry was then conducted at a rate of 10 mL/min with saline solution or at lower rates in cases of severe detrusor overactivity (DO) or known small functional capacity. Thereafter, a PFS was conducted after the urodynamic evaluation. The PVR was reevaluated following the pressure-flow research with a urethral catheter again. A specialist in urodynamics conducted the evaluation of all the urodynamic traces. Demographic (age, gender, follow-up period) and clinical data (incontinence, urgency) and following urodynamic findings according to ICS guidelines of the patients were investigated (8); first urinary sensation of the filling bladder (mL), maximum cystometric capacity (mL), maximum detrusor pressures at filling and voiding phases (cm H2O), post-voiding residual volumes (mL), and pressure flow study parameters (Qmax, mL/sec, and PdetQmax, cm H2O) were evaluated separately.

RESULTS

A total of 42 patients, 28 males and 14 females, underwent UD-PFS. The mean ages were 65.85 years, and the mean follow-ups were 69.34 months. Most of the patients had urgency (52.4%) and urge type-incontinence (66.7%). The patient demographic variables are given in Table 1.

Table 1. Patient demographics of the PD patients with UD examinations

Variable	Value
Age (mean ± SD)	65.85 ± 8.70
Gender (n, %)	
Male	28 (66.7%)
Female	14 (33.3%)
Follow up period (months) (mean ± SD)	69.34 ± 30.1
Body-Mass Index (BMI) (mean ± SD)	25.4 ± 4.6
Urgency (n, %)	
Yes	22 (52.4%)
No	20 (47.6%)
Urge-Incontinence (n, %)	
Yes	28 (66.7%)
No	14 (33.3%)
Stress-Incontinence (n, %)	
Yes	6 (14.3%)
No	36 (85.7%)

SD: standard deviation

The mean first urinary sensations of the patients were 86.0 mL. Among the patients with PD, most of them had normo-compliant bladders and only 1 patient had hypercompliant bladder. The mean maximum cystometric capacities were 322.07mL. Maximum detrusor pressures at the filling phase were 23.74 and at the voiding phase were 43.93 cm H_2O. The mean post voiding residual volumes were 92.29 mL and Qmax were 12.72 mL/sec. A total of 8 patients (19.0%) had obstruction during the urination phase. The UD-PFS findings of the patients can be seen in Table 2.

About 15% of the patients had stress-type urinary incontinence. Four of them were female (28.6%), and two (7.1%) of them were male. In patients with stress urinary incontinence, 2 of them had neurogenic detrusor overactivity, 3 of them had normal detrusor activity, and 1 of them had detrusor areflexia. In the total patient group, about 38.1% of

the patients had neurogenic detrusor overactivity, 19.0% had detrusor areflexia, and 42.9% of them had normal detrusor functioning.

Table 2. Urodynamic findings of the PD patients

Variable	Value
First urinary sensation (mL) (mean ± SD)	86.00 ± 68.77
Maximum Cystometric Capacity (mL) (mean ± SD)	322.07 ± 194.25
Maximum Detrusor Pressure at filling (cm H_2O) (mean ± SD)	23.74 ± 20.55
Maximum Detrusor Pressure at voiding (cm H_2O) (mean ± SD)	43.93 ± 15.56
Compliance (n, %)	
Hypo-compliant	16 (38.0%)
Normo-compliant	25 (59.5%)
Hyper-compliant	1 (2.5%)
Post-voiding Residual Volumes (mL) (mean ± SD)	92.29 ± 98.82
Qmax (mL/sec) (mean ± SD)	12.72 ± 10.08
Detrusor pressure at maximum flow (cm H_2O) (mean ± SD)	43.93 ± 15.56

SD: standard deviation

DISCUSSION

Parkinson's disease patients exhibited multiple forms of bladder dysfunction, as determined by urodynamic testing. The disease severity and duration increase the prevalence of pathological urodynamic findings (9). Nevertheless, only postvoid residual urine volume was correlated with disease severity. Thus, lower urinary tract symptoms may be more sensitive for detecting minor differences in bladder dysfunction than urodynamic parameters, despite the fact that urodynamic evaluation is essential for distinguishing voiding disorder etiologies (10). As indicated in all neurological diseases, in PD treatment, treatment protocols can be arranged by providing information about bladder functions with a urodynamic examination accompanied by PFS.

The overactive bladder is the most prevalent urinary symptom in Parkinson's patients with LUTS. (11). Our study population's results are also in correlation with that. Ransmayr et al. found that neurogenic detrusor overactivity (NDO) was present in 46% of patients with PD, which is very similar to our study population's results (12). About 27–63.9% of patients with PD have lower urinary tract dysfunction, which is substantially higher than in healthy controls (13). In early publications, this ratio was detected as 38-71% (14). Before initiating treatment, individuals with PD and complicated LUTS should undergo a comprehensive urodynamic evaluation, including cystometry, sphincter EMG, uroflowmetry, electromyelography, and ultrasonography (15). To what extent PD contributes to LUTS, however, has been difficult to determine. Because of benign prostatic hyperplasia (BPH), not only PD patients but also men over the age of 60 may experience urinary obstruction symptoms as a result of their condition. Stress urinary incontinence can occur in females of elderly age (13). It is difficult to distinguish whether these conditions are due to Parkinson's or the result of a natural aging process.

Urgency is another common complaint among patients with PD. In the literature, it occurs in 33-54% of the patients (16). It is believed that overactive bladder (detrusor) is the primary cause of urinary urgency, frequency, and incontinence. Pressure-flow analysis of the voiding phase in PD has revealed reduced detrusor activity and low Qmax values. (40% of men vs. 66% of women) (17). There is a relationship between a weak detrusor and the disease's stage. But again, BPH might be a co-existing factor that also causes voiding difficulty. Also, obstruction itself can cause detrusor overactivity and urgency.

We were only able to evaluate the urodynamic findings of PD patients referred to the urology clinic for LUTS or routine urological examination in this study. Therefore, the sample population could not include all PD patients. Due to the invasive character of urodynamic studies, it is unethical to conduct them on all PD patients. When patients with these conditions are evaluated, the relationship between bladder compliance and PD is a subject that has not been studied much in the literature. Otherwise, there are some studies with some links that lightened to other neurological disorders (18). In our study, while normo-compliant bladder was detected in more than half of the patients, hypo-compliant bladder was also found in a substantial number of cases. Studies with larger numbers of patients are needed to determine whether this cause-and-effect relationship is due to the disease itself or the natural process of aging.

The prevalence of stress urinary incontinence ranges from 4% to 35% in women (19). The rate of stress urinary incontinence in women in our patient population was similar to that in the general population. Rates of stress urinary incontinence appear to be similar in the general population of women with PD (20). In males, this ratio is found to be less than 10% (21) which is again in correlation with our study's findings.

Our research has some limitations. It is retrospective and has a nonrandomized design. Our findings may have been influenced by the fact that this was a single-center study from a tertiary referral center. We were unable to conduct multivariate analysis to examine success and complication predictability with greater precision due to the relatively small sample size and inherent lack of statistical power. Even urology clinics with a high patient volume were able to publish their results with a small sample size, according to the literature. We believe that future multi-centric studies documenting national data similar to our study will allow enriching the national library. In

light of this, we believe that the number of study participants adds significant scientific data to the national data library. The absence of validated questionnaires related to PD to assess LUTS is another significant limitation. We think that such studies will serve as a pioneer for the creation of questionnaires. Lastly, the lack of evaluation of how urodynamic findings may influence treatment decisions and outcomes may be regarded as a significant limitation. The prospective randomized studies are necessary to understand the treatment outcomes.

CONCLUSION

As a result of UD-PFS results of individuals with PD, it was found that the majority of patients had neurogenic detrusor hyperactivity with hypersensitivity and decreased bladder capacity. In the selected group of PD patients who are resistant to medical treatment in accordance with their LUTS clinics, to be able to provide valuable scientific information about the patients' LUTS clinics and to have beneficial treatment management, a UD-PFS should be performed.

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