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URODYNAMIC EVALUATION IN MALE PATIENTS WITH DIABETES MELLITUS

Hypothesis / aims of study
Diabetic cystopathy is characterized by a broad spectrum of urodynamic dysfunction such as bladder overactivity and impaired detrusor contractility. However, little is known about the natural history of the disease [1]. Therefore, we retrospectively analyzed urodynamic data in patients with diabetes mellitus (DM) to assess diabetic cystopathy based on the presence of diabetic complications, which tend to be dependent on DM duration.

Study design, materials and methods
Subjects included male DM patients who had a pressure flow study (PFS) in our institution from April 2005 to October 2016. Patients with prostate volume < 30 ml; no previous history of neurological disorder, prostate cancer, or pelvic surgery; no current urinary medication; and bladder outlet obstruction index < 40 on PFS were included. Bladder dysfunction was categorized into the following urodynamic patterns: (a) normal: bladder contractility index (BCI) > 100 without detrusor overactivity (DO); (b) DO: BCI > 100 with DO; (c) detrusor hyperreflexia/impaired contractility (DHIC): BCI ≤ 100 with DO; and (d) detrusor underactivity (DU): BCI ≤ 100 without DO. Urodynamic patterns were evaluated based on the presence of diabetic retinopathy (DR) and nephropathy (DN). Linear and multiple regression analyses were performed to investigate the relationship between clinical factors and urodynamic parameters.

Results
Fifty patients (mean age 66 ± 8 years, DM duration 7 ± 1 years) were enrolled. Twenty patients without DR and DN showed 5 normal (25%), 4 DO (20%), 4 DHIC (20%), and 7 DU (35%) patterns on PFS; 17 patients with DR but no DN showed 2 normal (11.7%), 9 DHIC (52.9%), and 6 DU (35.2%) patterns; 13 patients with DR and DN showed 3 normal (23.0%), 3 DHIC (23.0%), and 7 DU (53.8%) patterns (Figure 1). Univariate analysis indicated that DM duration, hemoglobin A1c (HbA1c) level, and DR were significantly negatively correlated with BCI ($r^2 = 0.13$, $p = 0.02$; $r^2 = 0.11$, $p = 0.03$; $r^2 = 0.28$, $p = 0.001$, respectively). Multivariate analysis also revealed that DM duration, HbA1c level, and DR were significantly negatively correlated with BCI ($r^2 = 0.44$, $p = 0.04$, $p = 0.02$, and $p = 0.02$, respectively)(Table 1). Moreover, univariate and multivariate analyses showed that first desire volume (FDV) was significantly positively correlated with post-void residual (PVR) urine ($r^2 = 0.49$, $p < 0.001$ and $r^2 = 0.63$, $p < 0.001$) and voiding efficiency ($r^2 = 0.14$, $p < 0.001$ and $r^2 = 0.63$, $p < 0.001$)(Table 2). In addition, maximum cystometric capacity (MCC) was significantly positively correlated with PVR ($r^2 = 0.28$, $p < 0.001$)(Table 3). However, FDV and MCC were not significantly associated with other urodynamic parameters, including BCI.

Interpretation of results
These results indicate that; (1) detrusor overactivity could occur in an early diabetic stage, replaced by impaired detrusor contractility in a later stage, shown by distribution of urodynamic patterns based on the presence of diabetic complications, (2) prolonged DM, poor glycemic control, and diabetic retinopathy are associated with a poorly contractile bladder, and (3) impaired bladder sensation decreases voiding efficiency and increases PVR independent of detrusor contractility, which implies that bladder afferent activity is an essential factor in physiological micturition reflex.

Concluding message
Our study indicated that DM patients had diverse progressive bladder dysfunction patterns. Moreover, impaired bladder sensation decreased voiding efficiency and increased PVR independent of detrusor contractility.
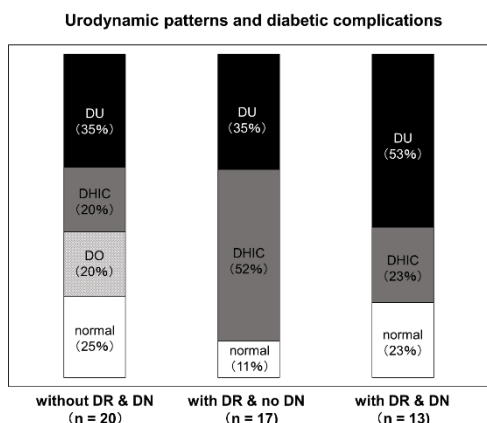
Figure 1

Table 1

Urodynamic patterns and diabetic complications

Urodynamic parameters and BCI

	univariate		multivariate	
	p-value	R²	p-value	R²
Age	0.21	0.03		
DM duration	0.02	0.13	0.04	
HbA1c	0.03	0.11	0.02	0.44
DR	0.001	0.28	0.02	
DN	0.29	0.02		

Table 2

Table 3

Urodynamic parameters and FDV

	univariate		multivariate	
	p-value	R^2	p-value	R^2
Age	0.96	<0.001		
DM duration	0.48	0.01		
HbA1c	0.11	0.06		
DR	0.51	0.01		
DN	0.60	0.006		
PdetQmax	0.24	0.03		
Qmax	0.80	0.001		
Compliance	0.14	0.05		
BOOI	0.43	0.01		
BCI	0.53	0.01		
PVR	<0.001	0.49	<0.001	0.63
Voiding efficiency	0.01	0.14	<0.001	

Urodynamic parameters and MCC

	univariate	
	p-value	R^2
Age	0.39	0.01
DM duration	0.76	0.002
HbA1c	0.21	0.03
DR	0.90	<0.001
DN	0.54	0.008
PdetQmax	0.79	0.001
Qmax	0.23	0.03
Compliance	0.08	0.07
BOOI	0.25	0.03
BCI	0.36	0.02
PVR	<0.001	0.28
Voiding efficiency	0.30	0.02

References

1. Bladder Dysfunction in Patients with Diabetes. Christopher S. Gomez, et al. Curr Urol Rep (2011) 12: 419-426

Disclosures