

Unrecognized Voiding Difficulty in Female Type 2 Diabetic Patients in the Diabetes Clinic

A prospective case-control study

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Patients with diabetes may develop diabetic cystopathy, which is characterized mainly by impaired detrusor sensation and contractility (1,2). Impaired detrusor contractility may lead to incomplete bladder emptying and subsequently result in voiding difficulty, urinary retention, chronic urinary tract infection (UTI), and upper urinary tract damage (1,3,4). Although diabetic cystopathy is common, with a reported prevalence ranging from 25 to 87% (1), it is frequently not recognized by patients and physicians due to its insidious development and inconspicuous symptoms. Usually, genitourinary dysfunction in diabetic patients has reached an advanced stage by the time urologists are consulted. The present study was designed to investigate the prevalence of voiding difficulty in female patients regularly treated in the diabetes outpatient clinic.

RESEARCH DESIGN AND METHODS

From July 2001 to June 2003, we conducted a prospective study to compare voiding function between 176 female type 2 diabetic patients and 162 age-matched nondiabetic women. Diabetic patients were regularly treated in the diabetes outpatient clinic for >1 year, and nondiabetic women were mostly hospital employees or family members of admitted patients in the urological ward, none of whom had ever sought treatment

for voiding dysfunction. Those with coexisting medical factors that could affect voiding function were excluded. Clinical parameters used to evaluate diabetic patients were collected in detail for data analysis. The study protocol was approved by the institutional review board of the National Taiwan University Hospital.

Each patient received a questionnaire interview regarding urinary symptoms, uroflow analysis, and postvoid residual urine (PVR) estimate. We used the American Urological Association Symptom Index questionnaire (5) to evaluate the prevalence of urinary symptoms (Table 1). Uroflow analysis was performed using a rotating disc flow meter (Dantec, Skovlunde, Denmark), and the PVR was measured by urethral catheterization immediately after voiding. Essential requirements included a minimum voided volume of 150 ml and the patient's confirmation of voiding taking place with the usual force. Voiding difficulty was defined as a maximal flow rate (Q_{max}) of <12 ml/s or a PVR of ≥ 100 ml on two or more determinations (3,4,6). The same protocol was used in the control subjects with one exception—the PVR was estimated by abdominal ultrasound (Just-Vision 200 System; Toshiba, Tochigi, Japan) with a 3.75-MHz PVG-366M transducer. The bladder height (H), width (W), and depth (D) were measured,

and PVR was calculated using the following formula: $PVR = 0.625 \times (H \times W \times D)$ (7). Due to ethical concerns, urethral catheterization was only performed in those with a PVR of ≥ 50 ml ($n = 8$) on ultrasound estimation.

For statistical analysis, mean values of continuous variables were compared using an independent sample *t* test. Univariate χ^2 analyses were performed to compare the differences between categorized clinical factors. Multivariate logistic regression analysis was then performed to determine whether the significant factors found in the univariate analysis were independently associated with voiding difficulty.

RESULTS— The average patient age was 62 years (range 40–85), the mean duration of diabetes was 11 years (range 1–36), and the mean HbA_{1c} value was 7.8% (range 5.3–12.4). Retinopathy was the most frequent complication (46.0%). Diabetes was mainly controlled by oral hypoglycemic agents (84.1%). Comparison of urinary symptoms and uroflow results between the control and diabetic groups is shown in Table 1. Diabetic women reported a significantly higher prevalence of nocturia. Voiding difficulty was detected in 22.2% of the diabetic patients versus 5.6% of the control subjects (odds ratio [OR] 4.8, 95% CI 2.3–10.4).

In the diabetic group, patients with voiding difficulty reported a higher prevalence of weak urinary stream, intermittency, and hesitancy than those without voiding difficulty (data not shown). Of the clinical parameters examined, χ^2 analysis showed that age, duration of diabetes of ≥ 20 years, the presence of peripheral neuropathy, and two or more episodes of UTI in the preceding year were significantly associated with higher odds for voiding difficulty. After controlling for age, only duration of diabetes ≥ 20 years (OR 3.2 versus duration <10 years, 95% CI 1.3–7.8) and two or more episodes of

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Abbreviations: PVR, postvoid residual urine; UTI, urinary tract infection.

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Table 1—Comparisons of urinary symptoms and uroflow analysis between the diabetic and control groups

	Control	Diabetes	P*
n	162	176	
Age (years)	60.9 ± 9.5	61.7 ± 9.1	0.43
Individual urinary symptoms (%)			
Frequency	13.8	14.8	0.31
Urgency	8.0	11.4	0.30
Nocturia	22.2	36.9	0.00
Incomplete emptying	9.3	12.5	0.22
Weak urinary stream	6.8	11.9	0.08
Intermittency	4.3	8.5	0.09
Hesitancy	5.6	10.8	0.06
Uroflow analysis			
Q _{max} (ml/s)	25.9 ± 8.5	19.4 ± 8.4	0.00
Q _{max} <12 ml/s	8 (4.9)	29 (16.5)	0.00
PVR ≥100 ml	3 (1.8)	24 (13.6)	0.00
Voiding difficulty	9 (5.6)	39 (22.2)	0.00

Data are n (%) or means ± SD, unless noted otherwise. *Comparison of variables between control and patient groups was made by an independent sample *t* test for continuous variables and univariate χ^2 analysis for categorized variables.

UTI in the preceding year (OR 4.7 versus less than two UTI episodes, 95% CI 1.8–12.6) remained as independent predictors in multivariate logistic regression analysis.

CONCLUSIONS— Our study showed that compared with nondiabetic control subjects, patients in the diabetic outpatient clinic were 4.8 times (95% CI 2.3–10.4) as likely to have unrecognized voiding difficulty. The presence of significant PVR is a fundamental factor differentiating the incipient stage from the advanced stage of diabetic cystopathy (8). Notably, 13.6% of the patients had high PVR levels (≥ 100 ml), indicating that advanced bladder dysfunction had already presented in a substantial portion of patients, a matter that deserves more attention and early intervention.

Clinical factors associated with voiding difficulty were explored. Duration of diabetes of ≥ 20 years appeared to be an independent predictor, suggesting the slowly progressive nature of diabetic cystopathy.

A significant association between voiding difficulty and recurrent UTI was also observed. Thus, physicians should be aware of the possibility of voiding difficulty when managing diabetic patients with recurrent UTIs. In concert with previous reports (2,9), our patients with peripheral neuropathy were associated with higher odds of voiding difficulty. However, multivariate logistic regression analysis failed to confirm peripheral neuropathy as a dependent predictor. This result may suggest possible interaction between peripheral neuropathy and other diabetes variables in causing voiding difficulty, or individual patients may have different pathogeneses of voiding difficulty. Also, another possibility is that the increased prevalence of voiding problems in diabetic patients could be due to glycosuria causing polyuria because the mean HbA_{1c} (7.8%) in these patients was high enough to be associated with glycosuria.

In conclusion, the current study indicates that unrecognized voiding difficulty

is common in female type 2 diabetic patients regularly treated in the outpatient clinic. Asking questions about urinary symptoms, paying attention to significantly associated clinical factors, and measuring PVR regularly in these patients may help to identify those at risk for voiding difficulty.

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