Association between Diabetes Mellitus and Hypertension in Benign Prostatic Hyperplasia Patients

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To the Editor: Hypertension is a global problem characterized by high morbidity; the prevalence rate of hypertension reaches 29.6% in China.[1] Diabetes mellitus (DM) is known to be associated with an increased risk of hypertension[2] and greater severity of benign prostatic hyperplasia (BPH).[3] In addition, some researches also suggest that hypertension is implicated in BPH etiology.[4] With the existed evidences, it is hypothesized that BPH may influence the relationship between DM and hypertension. Hence, this study was carried out to investigate the association between DM and hypertension in BPH patients using a case-control design.

This study was reviewed and approved by the Committee for Ethical Affairs of the Zhongnan Hospital of Wuhan University. All participants signed informed consent before enrollment. The study participants were selected from the Bladder Cancer and Benign Prostatic Hyperplasia Study in Chinese Population, which was a prospective study estimating the clinical effect of interventional therapy and the risk factors for bladder cancer and BPH.[5] From September 2016 to October 2017, patients diagnosed with BPH, undergoing surgery for this disorder, and possessing all required data were embraced in this research. Patients experiencing prostate cancer, bacteriuria or pyuria, as well as undergoing previous prostate and urethral surgery were excluded from the study. All eligible patients were finally divided into two groups according to the presence of hypertension. Detailed medical history and physical examination results were obtained from all included patients, including age, weight, height, systolic blood pressure (SBP; mmHg), diastolic blood pressure (DBP; mmHg), international prostate symptom score (IPSS), maximum urine flow rate (Q_{max}), prostate ultrasonography for prostate volume (PV; ml), fasting blood sugar (FBS, ng/ml), and total prostate-specific antigen (t-PSA; ng/ml). The incident DM of this study was defined as FBS ≥7.0 mmol/L (1260 mg/L); hypertension was confirmed according to SBP and DBP. The incident hypertension of this study was defined as office BP with sitting SBP of ≥140 mmHg or sitting DBP of ≥90 mmHg; the hypertensive patients were then classified as mild, moderate, and severe hypertensive groups.

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All analyses were carried out using the SPSS 19.0 software (SPSS Inc., USA). The percentage or mean with its standard deviation was calculated to summarize the frequency distributions of age, height, weight, PV, SBP, DBP, body mass index (BMI; kg/m^2), FBS, t-PSA, IPSS, Q_{max}, hypertension, and DM using the one-way analysis of variance and Chi-squared test or Fisher's exact test according to the properties of these variables. To investigate the association between DM and hypertension, the unadjusted odds ratios (*OR*s) with corresponding 95% confidence intervals (*CI*s) were computed using univariate analysis; then, we performed a logistic regression analysis to obtain adjusted *OR*s and their 95% *CI*s for age, BMI, t-PSA, IPSS, and Q_{max}. The statistical significance of differences among the three hypertensive groups was also measured using above analyses. A two-sided $P \leq 0.05$ was considered statistically significant.

Ultimately, 327 patients were included in this study. Of them, there were 108 patients with hypertension and 219 patients without hypertension; the former contained 74 patients with mild hypertension, 27 with moderate hypertension, and 7 with severe hypertension. Besides, there were 32 DM patients and 295 non-DM patients. The mean age of all participants was 70.8 ± 7.4 years. The mean ages for the two groups were 70.6 ± 7.4 years and 71.3 ± 7.5 years, and there was no statistically significant difference ($P = 0.390$). The weight, BMI, DBP, and SBP in the nonhypertensive group were significantly lower than those in hypertensive group ($P < 0.05$), whereas the Q_{max} was significantly higher ($P = 0.034$). Table 1 provides the results of univariate and multivariate logistic regression analyses. In the unadjusted analysis, DM could increase risk of hypertension by 1.244 times in all BPH patients (*OR* = 1.244, 95% *CI* = 0.584–2.649), and similar results were observed in patients with moderate and

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Table 1: Logistic analysis for diabetes mellitus with hypertension of participants (*N* = 327)

HP status	DM patients (*n*)	Crude*		Adjustment†	
		OR (95% *CI*)	*P*	*OR* (95% *CI*)	*P*
Without HP (*n*=219)	20	1.0 (reference)	N/A	1.0 (reference)	N/A
With HP (*n*=108)	12	1.244 (0.584–2.649)	0.572	1.853 (0.51–6.737)	0.349
Mild HP (*n*=74)	6	0.878 (0.339–2.277)	0.789	1.634 (0.366–7.298)	0.520
Moderate HP (*n*=27)	5	2.262 (0.772–6.622)	0.137	1.442 (0.141–14.706)	0.757
Severe HP (*n*=7)	1	1.658 (0.19–14.472)	0.647	142.269 (N/A)	0.082

*Crude: Unadjusted model; †Adjustment: Adjusted for age, BMI, PV, t-PSA, IPSS, and Q_{max}. HP: Hypertension; DM: Diabetes mellitus; *OR*: Odds ratio; *CI*: Confidence interval; N/A: Not applicable; BMI: Body mass index; PV: Prostate volume; t-PSA: Total prostate-specific antigen; IPSS: International prostate symptom score; Q_{max}: Maximum urine flow rate.

severe hypertension; however, the associations showed no significant difference (all $P > 0.05$). After adjusted analysis, the *OR*s were elevated to 1.853 times (95% *CI* = 0.51–6.737) in total hypertensive patients, 1.634 times (95% *CI* = 0.366–7.298) in mild hypertensive patients, 1.442 times (95% *CI* = 0.141–14.706) in moderate hypertensive patients, and 142.269 times in severe hypertensive patients. None of these relationships were statistically significant (all $P > 0.05$).

This case-control study assessed the association between DM and hypertension in BPH patients, which provided new information about this issue. Consistent with previous evidences, this case-control study indicated that BPH patients with DM had an increased risk of hypertension; however, unlike previous researches, our study showed a nonsignificant association. There might be two major reasons for this difference. First, the significant and positively relationship of DM with hypertension was really influenced by BPH, simplying that the development of BPH might exert a regulating effect on these two diseases. Second, the significant and positive correlation of DM with hypertension was not actually influenced by BPH, and the presented results were just due to insufficient sample sizes. In conclusion, the present case-control study suggested a positive but nonsignificant correlation between DM and hypertension in BPH patients. These results raise the question for further investigations of why the positive and significant association between DM and hypertension is still unidentified.

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Conflicts of interest

There are no conflicts of interest.

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