Relationship Between Benign Prostatic Hyperplasia/Lower Urinary Tract Symptoms and Total Serum Testosterone Level in Healthy Middle-Aged Eugonadal Men

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ABSTRACT

Introduction. Scant data are available concerning the relationship between lower urinary tract symptoms (LUTS)/benign prostatic hyperplasia (BPH) and total serum testosterone level (TT) in eugonadal state.
Aim. We performed this study to evaluate the relationship between LUTS/BPH and TT in eugonadal men.
Methods. A cross-sectional study was conducted that included a total of 2,308 eugonadal (TT ≥ 3.0 ng/mL) male police officers aged 40–59 years who had participated in a health examination. LUTS/BPH were assessed by prostate-specific antigen level, international prostate symptom score (IPSS), total prostate volume (TPV), maximal flow rate (Qmax), postvoid residual urine volume (PVR), and a full metabolic workup. We then investigated their relationship using the Spearman correlation test, multiple linear regression, and logistic regression analyses.
Main Outcome Measures. Associations of TT with IPSS, Qmax, and PVR.
Results. The median age and TT level were 49.0 years and 5.37 ng/mL, respectively. The TT level showed significant positive correlations with Qmax ($r = 0.043$, $P = 0.048$) and a significant negative correlation with PVR ($r = -0.050$, $P = 0.022$). No significant correlation was found between TT and TPV or IPSS. However, Qmax and PVR as well as TPV and IPSS did not significantly correlate with TT after adjusting for age and/or metabolic syndrome. On logistic regression, no significant difference was found in surrogate measures of LUTS/BPH (TPV > 30 mL, IPSS > 7, Qmax < 15 mL/second, and PVR > 50 mL) between the highest quartile TT group (median: 7.07 ng/mL) and the lowest quartile group (median: 3.92 ng/mL).
Conclusion. In our study, TT was not clearly correlated with LUTS/BPH in middle-aged eugonadal men. **Lee JH, Kim Y, Park YW, and Lee D-G. Relationship between benign prostatic hyperplasia/lower urinary tract symptoms and total serum testosterone level in healthy middle-aged eugonadal men. J Sex Med 2014;11:1309–1315.**

Key Words. International Prostate Symptom Score; Maximum Urinary Flow Rate; Testosterone; Total Prostate Volume; Lower Urinary Tract Symptoms; Testosterone

Introduction

Benign prostatic hyperplasia (BPH), caused by nonmalignant, unregulated growth of the prostate gland [1], is a highly prevalent disease in older men and is a major cause of lower urinary tract symptoms (LUTS) [2,3]. Despite extensive research efforts, the underlying etiology of BPH/LUTS still has not been established. The role of testosterone in LUTS/BPH in men in a hypogonadal state has long been investigated. Castration is known to prompt a reduction in the size of the prostate [4–6], and androgen replacement in castrated animals induces regrowth of prostatic tissue [7].

However, scant data are available concerning the relationship between LUTS/BPH and total serum testosterone level (TT) in eugonadal

state. Therefore, we undertook the present study.

Aims

The aim of our study is to facilitate understandings of the role of testosterone on LUTS/BPH measures (international prostate symptom score [IPSS], total prostate volume [TPV], maximal flow rate [Qmax], and postvoid residual urine volume [PVR]) in healthy middle-aged eugonadal men.

Methods

Study Subjects

The institutional review board of the National Police Hospital in Seoul, South Korea, approved this study in May 2011. From August 2011 to December 2011, 2,308 male police officers aged 40–59 years who had participated in a health examination at the hospital were recruited for the study. A total of 28 hypogonadal men (total serum testosterone <3.0 ng/mL) were excluded from the study to examine the relationship between TT and LUTS/BPH in eugonadal state [8,9]. Patients who took a urological drug, including alpha blockers, anticholinergics, 5-alpha reductase inhibitors, and phosphodiesterase-5 inhibitors once daily, were excluded. Additionally, patients with a prostate-specific antigen (PSA) >4.0 ng/mL, pyuria, or voiding volume <150 mL during uroflowmetry were excluded. All patients provided written informed consent.

LUTS/BPH Assessment

Medical histories were collected using a standardized structural questionnaire. The Korean version of the IPSS was administered to respondents to evaluate urinary symptoms. TPV was calculated using transrectal ultrasonography (UltraView 800, BKmedical, Copenhagen, Denmark), and the gland was examined via digital rectal examination. The maximum flow rate (Qmax) (Medtronic Inc., Minneapolis, MN, USA) and PVR (UltraView 800) were also assessed. Serum was collected in the morning (between 7:00 and 9:00 AM) after an overnight fast, and PSA levels and TT were determined using a radioimmunoassay (RIA).

Metabolic Syndrome Assessment

Two blood pressure (mm Hg) measurements, obtained 5 minutes apart, were averaged using a mercury sphygmomanometer on the right arm. Waist circumference (cm), to the nearest 0.1 cm, was measured midway between the lowest rib and the iliac. Body weight (kg) and body height (cm) were also recorded. Blood samples were collected with the subject in a fasting state at the same time (8:00–9:00 AM) that PSA and testosterone samples were collected. The biochemical analyses included serum glucose, total cholesterol, triglycerides, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol. A diagnosis of metabolic syndrome (MetS) was made if three or more of the National Cholesterol Education Program Adult Treatment Panel III for Asian's criteria [10] were satisfied.

TT Assay

Serum testosterone was measured by RIA using a kit (Parc Marcel Boiteux, Codolet, Cisbio Bioassays, Inc., Codolet, France). The intraassay coefficients of variation for all of the assays were less than 9%, and the interassay coefficients of variation were less than 12%. For each assay, all samples from each subject were measured in the same assay run.

Statistical Analysis

First, the 2,308 male subjects were analyzed to evaluate simple relationships between TT and age, PSA, IPSS, TPV, Qmax, and PVR using the Spearman correlation test. Second, we evaluated the relationship between TT and age, IPSS, TPV, Qmax, and PVR after adjusting for age, MetS, and/or voiding volume during uroflowmetry using multiple linear regression. Finally, odds ratios (ORs) for the highest quartile of TT as compared with the lowest quartile, with relation to surrogate measures of LUTS/BPH (defined as TPV > 30 mL, IPSS > 7, Qmax < 15 mL/second, PVR > 50 mL) [11–15] were calculated using logistic regression.

Statistical analyses were performed using the SPSS version 11.0 (SPSS, Chicago, IL, USA). A $P < 0.05$ was considered to be statistically significant.

Main Outcome Measures

Simple and adjusted correlation coefficient between TT and age, IPSS, TPV, Qmax, and PVR were calculated. Additionally, ORs for the highest quartile of TT as compared with the lowest quartile, with relation to surrogate measures of LUTS/BPH (TPV, IPSS, Qmax, and PVR), were calculated.