Urodynamic Outcome after Transurethral Prostatectomy is Related to Percent Area Density of Prostate Smooth Muscle in Patients with Benign Prostatic Hyperplasia

O. ICHIYANAGI, I. SASAGAWA, Y. SUZUKI, M. ISHIGOOKA, T. NAKADA
Department of Urology, Yamagata University School of Medicine, Yamagata, Japan

We investigated the relationship between histological composition of the prostate and urodynamic outcome after transurethral resection of the prostate (TURP) in 27 patients with symptomatic benign prostatic hyperplasia (BPH). The histological analysis was performed using computer-assisted quantitative morphometry. Before and after TURP, group-specific urethral resistance factor (URA) was estimated by pressure-flow study. A significant correlation was found (p = 0.01) between the area density of prostate smooth muscle and the improvement in URA. However, no other histological components correlated with the improvement in URA. These facts suggest that the percent area density of prostate smooth muscle in prostatic adenoma appears to be a useful predictive factor for treatment of BPH.

Introduction

Transurethral resection of the prostate (TURP) is a very efficient treatment for patients with benign prostatic hyperplasia (BPH) [1]. However, TURP is still associated with perioperative or postoperative complications, such as incontinence, urethral stricture, bladder neck stenosis, loss of ejaculation and impotence [2, 3]. Moreover, the magnitude of perioperative and postoperative mortality rates suggests that TURP cannot be viewed as low risk or minor surgery [4]. Therefore, it is very important to screen for patients who will not benefit from TURP. Relationships between clinical findings of BPH and its histological compositions have been investigated [5–7]. The increase in the stromal tissue component was demonstrated in BPH compared with normal prostate [5, 6]. According to Shapiro et al. [8], the clinical efficacy of alpha-adrenergic blockers and the degree of bladder outlet obstruction are determined by the proportion of smooth muscle element in BPH tissue. However, little is known about the relationships between efficacy of TURP and histological components in patients with BPH. Herein, we investigated the improvement in group-specific urethral resistance factor (URA) after TURP and the area density of histological composition in BPH patients and discussed the relationship between them.
Materials and methods

The study comprised 27 male patients with symptomatic BPH. All patients underwent TURP, and were diagnosed as BPH from surgical specimens by staff pathologists. Preoperatively, prostate volume was measured by transrectal ultrasonography. Before and after TURP, spontaneous uroflowmetry with the measurement of post-void residual urine, and pressure-flow study were performed using a Urdyn 5500 system (Dantec Elektronik, Skovlunde, Denmark). Group-specific urethral resistance factor (URA) [9] was calculated as an indicator of infravesical obstruction. An international prostate symptom score (IPSS) was completed for assessment of lower urinary tract symptom. The improvement in the bladder outlet obstruction after TURP was evaluated by the changes between pre- and post-operative URA as follows: The improvement (%) in URA = \[ \frac{\text{URA}_{\text{post}} - \text{URA}_{\text{pre}}}{\text{URA}_{\text{pre}}} \times 100 \]. The subscripts mean pre- and post-operative, respectively. Patients with a history of previous transurethral surgery, neurogenic bladder, prostatic cancer and urethral stricture were excluded from the study. The terminology is used in accordance with the proposal of the International Continence Society [10].

Specimens obtained by TURP were stained with Masson-Trichrome, and subjected to quantitative morphometry using light microscopic stereological analysis as previously reported [5–7]. The area density (%) of the following tissue components was determined: smooth muscle; fibrous tissue; glandular epithelium; glandular lumen; stromal component (= smooth muscle + fibrous tissue); glandular component (= epithelium + lumen). The total area of each component was calculated using a computer-assisted image analysis system (EM manual, Rise Corp., Sendai, Japan) and a microcomputer. At least 30 systemic test areas were analyzed on each of the resected specimens. The Statview 4.5 software (Abacus Concept, Berkeley, CA) was used for statistical analysis. Wilcoxon’s signed rank test was performed for comparison of the data before and after TURP. Relations between urodynamic and morphometric results were analyzed with Spearman’s correlation. Results were presented as mean ± standard error (SE). P<0.05 was considered statistically significant.

Results

In the 27 patients, age, prostate volume and tissue volume resected by TURP were 71.5±1.1 years, 30.0±4.1 ml and 18.3±2.7 ml, respectively. Clinical and urodynamic parameters before and after TURP are summarized in Table 1. The improvement in URA and total symptom score were 30.2% and 46.6%, respectively. Voided urine volume significantly increased and post-void residual urine significantly decreased after TURP.

As shown in Table 2, the stromal component shared the major part of the specimens, and fibrous tissue element was predominant in prostatic enlargement.