The American Urological Association (AUA) symptom index is both valid and reliable in identifying the need to treat patients with benign prostatic hyperplasia (BPH) and in monitoring their response to therapy. We evaluated the relationships between AUA symptom index, disease-specific quality of life question, and prostate volume in patients with BPH. A total of 100 patients who came to Kaohsiung Medical University Hospital, Taiwan, for help due to lower urinary tract symptoms (LUTS) and who were diagnosed with BPH between October 2002 and June 2003 were included in the study. All patients were evaluated using transrectal ultrasonography, AUA symptom index, and disease-specific quality of life question. The disease-specific quality of life question showed good correlation with AUA symptom score \((r = 0.815, p < 0.01)\), but weak correlation with prostate volume \((r = 0.225, p < 0.05)\) and age \((r = 0.274, p < 0.05)\). Prostate volume had weak correlation with AUA symptom score \((r = 0.251, p < 0.05)\) and age \((r = 0.472, p < 0.01)\), but good correlation with prostate specific antigen \((r = 0.638, p < 0.01)\). In addition to AUA symptom index, we suggest using the disease-specific quality of life question to evaluate the influence on quality of life and response to treatment in clinical practice. Moreover, we should assess the impact of BPH symptoms rather than the increase in prostate volume during the management of BPH.

Key Words: benign prostatic hyperplasia, ultrasonography, symptoms, aging

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Benign prostatic hyperplasia (BPH) has a high prevalence in the male population that increases with age [1,2]. It often produces chronic and progressive lower urinary tract symptoms (LUTS) or chronic complications, leading many men to seek treatment [2,3]. The American Urological Association (AUA) symptom index is now widely used to assess patients with suspected BPH. It consists of a series of seven questions that address obstructive and irritative voiding symptoms [4]. The index has been shown to be clinically sensible, reliable, valid, and reproducible [4,5].

The AUA symptom index has been adopted by the World Health Organization (WHO) as the International Prostate Symptom Score (IPSS) after the addition of one disease-specific quality of life question as a means of assessing the global impact of BPH on quality of life [6]. The aim of this study was to evaluate the relationships between AUA symptom index, the disease-specific quality of life question, and prostate volume in patients who came to our hospital for LUTS suggestive of BPH.

Patients and Methods

Patients who came to Kaohsiung Medical University Hospital, Taiwan, between October 2002 and June 2003 complaining of LUTS suggestive of BPH were included in
this study. No patients had received medication for BPH in the previous month. Patients who had a history of neurogenic disease, urethral stricture, or bladder tumor that would interfere with micturition, or who came for help with an indwelling catheter due to urine retention, were excluded from the study. Patients who had concomitant urinary tract infection (UTI) or distal ureter stone were also excluded. During evaluations, any patient with an abnormal digital rectal examination or elevated serum prostate specific antigen (PSA) level (> 4 ng/mL) was asked to undergo prostate biopsy to exclude prostate cancer. If prostate cancer was found, the patient was excluded.

The evaluations included AUA symptom index, the disease-specific quality of life question (bother score), digital rectal examination, transrectal ultrasonography (7-MHz 8551 Probe, 2001 Medical Ultrasound Scanner; B-K Medical A/S, Herlev, Denmark), serum PSA (Immulite 2000 PSA assay; Diagnostic Products Corp, Los Angeles, CA, USA), and urinalysis. Prostate volume was calculated using the prostate ellipsoid formula: \( (\pi \times \text{transverse diameter}) \times (\text{anterior–posterior diameter}) \times (\text{transverse diameter}) \times (\text{sagittal diameter}) \).

The AUA symptom index includes seven items to evaluate LUTS (incomplete emptying, frequency, intermittency, urgency, weak stream, hesitancy, and nocturia), with the score of each item ranging from 0 to 5 points. The total symptom score was obtained by adding the seven scores (range, 0 to 35 points), and was categorized as mild (≤ 7), moderate (8–19), or severe (≥ 20). For symptomatic classification, we divided the symptom score into an obstructive subscore (sum of scores for questions 1, 3, 5, and 6) and an irritative subscore (sum of scores for questions 2, 4, and 7). The disease-specific quality of life question was phrased as follows: “If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about that?”, and the answering scale ranged from 0 (delighted) to 6 (terrible). The AUA symptom index questions and the disease-specific quality of life question were administered to all patients with instruction from doctors.

Results are expressed as mean ± standard deviation, unless otherwise indicated. Pearson’s correlation coefficient is used to express the strength of the correlations between age, prostate volume, PSA level, AUA symptom score, obstructive subscore, irritative subscore, and bother score. Data were considered significant if \( p \) was less than 0.05. Statistical differences between mild, moderate, and severe symptom groups were compared using the ANOVA procedure. A \( p \) value of less than 0.05 was considered statistically significant.

**Results**

From October 2002 to June 2003, 107 patients came to our hospital for help due to LUTS suggestive of BPH. Seven patients were excluded from this study, five for concomitant UTI, one for concomitant bladder tumor, and one for prostate cancer that was confirmed by prostate biopsy initiated for an elevated PSA level. A total of 100 patients were included in the study.

The mean age was 59.6 ± 10.66 years (median, 59 years; range, 40–90 years). The mean prostate volume was 34.89 ± 16.40 mL (median, 29.6 mL; range, 20.0–120 mL). The mean total AUA symptom score was 11.54 ± 6.84 (median, 11; range, 1–33), the mean obstructive subscore was 6.38 ± 4.67 (median, 6; range, 0–20), and the mean irritative subscore was 5.16 ± 2.99 (median, 5; range, 0–13). The mean bother score was 3.37 ± 1.36 (median, 4; range, 0–6). The mean PSA level was 2.71 ± 4.79 ng/mL (median, 0.995 ng/mL; range, 0.12–11.90 ng/mL).

The correlations between age, prostate volume, PSA level, AUA symptom score, obstructive subscore, irritative subscore, and bother score are shown in Table 1.

All patients were divided into groups according to total AUA symptom score: mild (\( n = 31 \)), moderate (\( n = 58 \)), and severe (\( n = 11 \)). There was a statistically significant difference in age among the three groups (\( p = 0.02 \)), with a greater mean age in the severe symptom group. However, there was no statistically significant difference in prostate volume and PSA level among the three groups (Table 2).

**Discussion**

BPH is a common condition among older men, resulting in chronic LUTS that are bothersome, impair physiologic and functional well-being, and interfere with activities of daily living [7,8]. The main reasons for patients to seek treatment for BPH are subjective symptoms, feeling bothered, and negative impact on quality of life [2,3].

The AUA symptom index is a seven-item scale developed by a multidisciplinary measurement committee of the AUA, and is primarily intended for use as an evaluative measure for BPH [4]. The validity (the extent to which a tool measures what it is supposed to measure), reproducibility (the extent to which a tool gives consistent results in stable individuals over time), and responsiveness (the ability to detect clinical change) of the AUA symptom index have been well documented by several studies [4,9–13].

The AUA symptom index is both valid and reliable in
identifying the need to treat patients and in monitoring their response to therapy [4]. The AUA practice guidelines committee recommends that the AUA symptom index should be used as the symptom-scoring instrument in the initial assessment of each patient presenting with BPH. The extent of further evaluation and treatment is suggested according to whether symptoms are mild (0–7), moderate (8–19), or severe (20–35) [14].

However, the AUA symptom index has also received considerable criticism because it is unable to discriminate BPH from other types of voiding dysfunction in either male or female patients [6,15,16], to differentiate obstructed from non-obstructed BPH [17–19], or to differentiate either form of BPH from detrusor hyperreflexia [19,20].

It is critical to assess symptoms and quality of life from a patient’s perspective when deciding BPH treatment. The condition-specific impact score is much more sensitive to differences in symptoms than general measures of quality of life.

The WHO International Consultation on BPH has recommended the use of the AUA symptom index and a single disease-specific quality of life question that asks patients to assess their feelings about their symptoms for studies of BPH treatment. The disease-specific quality of life question is a good single item for assessing the quality of life and treatment outcome, and is more readily interpretable on an individual clinical basis than a numeric index [11].

The symptoms of BPH can be divided into obstructive

<p>| Table 1. Relationship among different variables by Pearson’s correlation coefficient |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Prostate volume</th>
<th>PSA</th>
<th>Total score</th>
<th>Obstructive subscore</th>
<th>Irritative subscore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>r</td>
<td>p</td>
<td>r</td>
<td>p</td>
<td>r</td>
<td>p</td>
</tr>
<tr>
<td>Prostate volume</td>
<td>0.472*</td>
<td>&lt; 0.001</td>
<td>0.420*</td>
<td>&lt; 0.001</td>
<td>0.252†</td>
<td>0.346</td>
</tr>
<tr>
<td>PSA</td>
<td>0.638*</td>
<td>&lt; 0.001</td>
<td>0.933*</td>
<td>&lt; 0.001</td>
<td>0.621†</td>
<td>0.605</td>
</tr>
<tr>
<td>Total score</td>
<td>0.095</td>
<td>0.346</td>
<td>0.052</td>
<td>0.605</td>
<td>0.136</td>
<td>0.077</td>
</tr>
<tr>
<td>Obstructive subscore</td>
<td>0.933*</td>
<td>&lt; 0.001</td>
<td>0.571*</td>
<td>&lt; 0.001</td>
<td>0.763†</td>
<td>0.672*</td>
</tr>
<tr>
<td>Irritative subscore</td>
<td>0.571*</td>
<td>&lt; 0.001</td>
<td>0.621†</td>
<td>&lt; 0.001</td>
<td>0.815*</td>
<td>0.672</td>
</tr>
<tr>
<td>Bother score</td>
<td>0.346</td>
<td>0.605</td>
<td>0.136</td>
<td>0.077</td>
<td>0.046</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

* p < 0.01; † p < 0.05. PSA = serum prostate specific antigen; Bother score = disease-specific quality of life question.

| Table 2. Characteristics of the three symptom groups |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                 | Mild (0–7), n = 31 | Moderate (8–19), n = 58 | Severe (20–35), n = 11 | p |
| Age, yr                         | 57.80 ± 10.60    | 59.03 ± 10.50    | 67.63 ± 8.54    | 0.02 |
| Prostate volume, cm³            | 30.71 ± 12.25    | 36.04 ± 18.41    | 40.56 ± 13.81   | 0.16 |
| PSA, ng/mL                      | 2.70 ± 6.08      | 2.28 ± 3.25      | 4.99 ± 6.98     | 0.23 |
| Total AUA score                 | 3.90 ± 1.94      | 13.29 ± 3.57     | 23.81 ± 3.79    | 0.23 |
| Obstructive subscore            | 1.52 ± 1.87      | 7.47 ± 2.90      | 14.36 ± 3.20    | < 0.01 |
| Irritative subscore             | 2.39 ± 1.52      | 5.83 ± 2.26      | 9.45 ± 2.46     | < 0.01 |
| Bother score                    | 1.97 ± 0.91      | 3.79 ± 0.91      | 5.09 ± 0.83     | < 0.01 |

PSA = serum prostate specific antigen; AUA = American Urological Association.
and irritative complaints. Obstructive symptoms result from mechanical and dynamic obstruction, but irritative symptoms result from the secondary response of the bladder to the increased outlet resistance. As prostatic enlargement occurs, mechanical obstruction may result from intrusion into the urethral lumen or bladder neck, leading to a higher bladder outlet resistance. The prostate stroma is rich in adrenergic nerve supply, so the tone of the prostatic urethra may increase, creating dynamic obstruction when the prostate grows. In our study, we tried to divide the AUA symptom score into obstructive and irritative subscores, to observe which symptoms have better correlation with the bother score. The obstructive subscore \( r = 0.763, p < 0.001 \) had better correlation than the irritative subscore \( r = 0.673, p < 0.001 \). It seems that patients may care more about obstructive symptoms than irritative symptoms. Further studies may be needed to confirm this.

We also found that the bother score had good correlation with the AUA symptom score \( r = 0.815, p < 0.01 \), but weak correlation with prostate volume \( r = 0.225, p < 0.05 \) and age \( r = 0.274, p < 0.05 \). Prostate volume was weakly correlated with the AUA symptom score \( r = 0.251, p < 0.05 \) and age \( r = 0.472, p < 0.01 \), but had good correlation with PSA level \( r = 0.638, p < 0.01 \). The results were similar to those obtained by Bosch et al in 1995 [6], who found good correlation between AUA symptom score and bother score \( r = 0.74, p = 0.001 \), but weak correlation between AUA symptom score and total prostate volume \( r = 0.19, p < 0.001 \) and age \( r = 0.09, p = 0.04 \).

The lack of relationship between prostate volume and symptoms may be due to variable patterns of prostatic enlargement. Excess growth in the transitional zone can produce enlargement without significant obstructive symptoms. Such growth was reported in an autopsy study [21]. On the other hand, periurethral enlargement or nodular growth can produce obstructive symptoms with no great enlargement of the gland as a whole [22].

We also divided patients into three groups according to their AUA symptom scores. No statistically significant differences in prostate volume and PSA level were found among the three groups. However, there was a statistically significant difference in age \( p = 0.02 \); patients in the severe symptom group were older. Chute et al found that incomplete emptying, intermittency, urgency, weak stream, and nocturia were strongly age-related [1]. Kojima et al found similar results [23]. Therefore, aging may also play an important role in the development of LUTS.

Although Garraway et al adopted prostate weight \( \geq 20 \) g as the criterion for BPH [24], some studies preferred the presumed circle area ratio [23,25]. Presumed circle area ratio is the ratio of the area of maximum prostatic section to the area of a presumed circle having the same circumference as that of the section. It is based on the idea that the degree of obstruction in BPH can be evaluated by estimating how closely a horizontal section of the entire prostate approaches a circle on transrectal sonography [23]. Kojima et al found a stronger correlation between presumed circle area ratio and symptom score \( r = 0.150, p < 0.0001 \) than between prostate volume and symptom score \( r = 0.072, p < 0.0001 \) using simple regression analysis, so they suggested that presumed circle area ratio was preferable to prostate volume in representing the degree of BPH in terms of the severity of urinary symptoms [23]. Further studies are needed to evaluate whether the appearance or size of the prostate plays an important role in the development of urinary symptoms.

In conclusion, it is critical to assess symptoms and quality of life from a patient’s perspective in assessing BPH treatment. In addition to the AUA symptom index, we suggest using the disease-specific quality of life question to evaluate the influence of symptoms on quality of life and response to treatment in clinical practice, as recommended by the WHO International Consultation on BPH. We found that the disease-specific quality of life question showed good correlation with the AUA symptom score, but neither AUA symptom score nor the disease-specific quality of life question had good correlation with prostate volume. Therefore, we should focus on the impact of BPH symptoms, rather than the increase in prostate volume, during the management of BPH.

References


美國泌尿科協會症狀指數，攝護腺體積與疾病特定生活品質指數在良性攝護腺肥大病人間的關聯性

劉家駿 王起重 黃書彬 周以和 吳文正 黃俊雄

高雄醫學大學 泌尿科

美國泌尿科協會症狀指數已被證實在分辨出那些病人其良性攝護腺肥大是需要接受治療的，與監測其治療的反應上具有其有效及可信度。本篇研究嘗試去探討在良性攝護腺肥大病人其美國泌尿科協會症狀指數、攝護腺體積與疾病特定生活品質指數間的相關性。在 2002 年 10 月至 2003 年 6 月總共有 100 位因下泌尿道症狀至高雄醫學大學附設醫院泌尿科門診被診斷為良性攝護腺肥大的病人納入本篇研究。所有的病人均接受經直腸超音波、美國泌尿科協會症狀指數以及疾病特定生活品質指數等檢查。結果發現疾病特定生活品質指數與美國泌尿科協會症狀指數有很好的相關性 (r = 0.815, p < 0.01)，但與攝護腺體積 (r = 0.225, p < 0.05) 及年齡 (r = 0.274, p < 0.05) 的相關性則較弱。攝護腺體積與美國泌尿科協會症狀指數 (r = 0.251, p < 0.05) 或年齡 (r = 0.472, p < 0.01) 的相關性較弱，但與血清中攝護腺特異抗原濃度 (r = 0.638, p < 0.01) 的相關性則較好。在臨床上處理良性攝護腺肥大的病人，我們建議除了美國泌尿科協會症狀指數外，可加上疾病特定生活品質指數來評估病人生活品質及其對治療的反應。此外，在治療時應注重的是良性攝護腺肥大所帶來的症狀影響，而非單純只是攝護腺體積的增加。

關鍵詞：良性攝護腺肥大，超音波，症狀，老年化

(高雄醫誌 2004;20:273–8)