Overactive bladder (OAB) and its association with prostatic parameters

Wei Shen Tan, Wah Yun Low, Chirk Jenn Ng, Ee Ming Khoo, Evelyn L.M. Ho and Hui Meng Tan

Abstract

Background: Overactive bladder (OAB) is an idiopathic condition characterized by urgency with or without urge incontinence often associated with frequency or nocturia. In this study, we hypothesized that prostatic parameters might be responsible for symptoms seen in OAB patients.

Methods: This is a cross-sectional study involving 1007 men ≥40 years old; with a response rate of 53.6%. Face-to-face interviews were carried out with semi-structured questionnaires which included socio-demography, self-reported medical illness and an OAB questionnaire using a 6-point Likert scale. OAB was defined as ‘quite a bit’ to ‘a very great deal’ in either questions: “An uncomfortable urge to urinate”, “A sudden urge to urinate with little or no warning”, “An uncontrollable urge to urinate” and “Urinary loss associated with a strong desire to urinate”. Prostatic parameters were assessed using transrectal ultrasound, International Prostate Symptom Score (IPSS) questionnaire, urinalysis and uroflow studies.

Results: Results from 537 men with a mean age of 58±8.1 years were analysed. The prevalence of OAB was 16.9% (n=91). The prevalence of lower urinary tract symptoms or LUTS (IPSS moderate-severe) was 36.1% (n=195). Men with OAB were significantly more likely to score worse on IPSS (OAB: 30%, non-OAB: 15%; p<0.001) (mid-moderate VS severe). Prostate calcification (OAB: 70.3%, non-OAB: 58.4%, p=0.035), prostate volume ≥30cc (OAB: 35.2%, non-OAB: 19.5%, p=0.002), and urine white cell count or WCC (>SWCC(L) (OAB: 5.5%, non-OAB: 1.3%, p=0.025) were significantly associated with OAB. Multivariate regression analysis revealed that men with severe LUTS (p<0.001, OR: 6.7, 95% CI: 3.4–13.4) and prostate volume ≥30cc (p=0.07, OR: 2.0, 95% CI: 1.2–3.4) were independently associated with OAB.

Conclusions: OAB was significantly associated with prostatic calcification, larger prostate volume (≥30cc) and urinalysis WCC (>SWCC(L)). However, only severe LUTS and prostate volume ≥30cc were independently associated with OAB. © 2011 WPMH GmbH. Published by Elsevier Ireland Ltd. All rights reserved.

Introduction

Overactive Bladder (OAB) is an idiopathic chronic medical condition due to underlying detrusor over-activity, which can adversely affect the quality of life of sufferers [1]. The International Continence Society defines it as ‘urgency with or without urge incontinence often associated with frequency or nocturia after the exclusion of any obvious pathology such as infection and stones’ [2]. The diagnosis of OAB is essentially a clinical diagnosis, which encompasses the storage components of lower urinary tract symptoms (LUTS). However, patients suffering from OAB often have many concurrent pathologies resulting in detrusor overactivity such as bladder outlet obstruction (BOO), neurogenic bladder, renal calculi, stress incontinence, pelvic organ prolapse and previous surgery.

Benign prostatic hyperplasia (BPH) commonly causes LUTS secondary to BOO. It has been suggested that BOO results in detrusor myocyte hypertrophy, which is less stable and contracts at a lower threshold [3]. Urgency seen in OAB can be explained by increased connective tissue infiltration causing enhanced electrical coupling leading to spontaneous mechanical activity [4]. However, studies have failed to show a correlation between total prostate size and LUTS [5,6]. Interestingly, recent studies have shown that tolterodine, an antimuscarinic used in the treatment of OAB, is effective in treating patients with LUTS secondary to BPH [7].

Prostate calcification is a common incidental finding in men, although they generally do not cause symptoms. However, recent evidence suggests that prostatic calcification is associated with increase inflammation and bacterial colonization [8]. Inflammatory cytokines such as ATP, substance P and calcitonin gene related peptide is known to activate afferent neurons in the bladder leading to symptoms of OAB [9].

Taken together, we hypothesized that prostatic parameters, in particular prostate volume and prostatic calcification, might be responsible for symptoms seen in OAB patients.

Methods

Between 2008 and 2009, 1007 men who were previously randomly selected in the Subang Men’s Health Study were invited for a subsequent cross-sectional study. Of these, 537 men (53.0%) participated in the current study. All
men were ≥40 years old in the urban town of Subang Jaya, Malaysia. Face-to-face interviews were carried out with a semi-structured questionnaire which included socio-demography, self-reported medical illness, International Prostate Symptom Score (IPSS) questionnaire and an OAB questionnaire, which had a 6-point Likert scale ranging from (1) Not at all to (6) A very great deal. OAB was defined as a report of ‘quite a bit’ to ‘a very great deal’ in either of the following questions (2) “An uncomfortable urge to urinate”, (3) “A sudden urge to urinate with little or no warning”, (7) “An uncontrollable urge to urinate” and (8) “Urine loss associated with a strong desire to urinate”. Uroflow studies, urinalysis and a prostate specific antigen (PSA) test were undertaken for all men.

Prostate size was assessed by transrectal ultrasound (TRUS) and calculated using the ellipsoid formula, i.e., multiplying the largest anterioposterior (height), transverse (width), cephalocaudal (length) and prostate diameters by 0.524 (H-W-L⋅π/6), as provided in the software programme of the Siemens Sonoline G60S ultrasound unit. The dimensions of the prostate as specified above were measured using the EC-9 endorectal 4–9 MHz transducer on a Siemens Sonoline G60S by a single radiologist (ELMH).

The data were managed and analysed using SPSS version 16 (SPSS Inc, Chicago, IL, USA). We used the Person’s chi-square test to test the significance of the associations between categorical variables while t test to test the significance of continuous variables. Multiple logistic regression technique was used to identify the independently associated variables with OAB. For statistical significance, we set the level at p < 0.05.

Ethical approval was obtained from the University of Malaya Medical Center, Kuala Lumpur, Malaysia. In addition, written consent was obtained from all the participants.

**Results**

Results from 537 men with a mean age of 58.2±8.1 yrs were analysed. The prevalence of OAB was 16.9% (91) while the prevalence of LUTS (IPSS moderate-severe) was 36.1% (195). Men who suffered with OAB were significantly older than their non-OAB counterparts (59.8±8.5 yrs versus 57.8±8.0 yrs, p = 0.032). Not surprisingly, men with moderate-severe LUTS were also significantly older than men with mild/no LUTS (59.5±7.8 yrs versus 57.4±8.1 yrs, p = 0.004). Men with OAB were significantly more likely to score low on IPSS (OAB 30.0% versus non-OAB 4.7%, p ≤ 0.001) (mild-moderate versus severe).

Three fifth men (60.5%) had radiologically confirmed prostatic calcification/stones. These men were significantly more likely to be older (59.0±8.1 yrs versus 56.8±6.8 yrs, p = 0.002). Univariate analysis showed that prostatic calcification/stones were associated with OAB (p = 0.034) (Table 1). However, OAB had significant association neither with prostatic calcification type nor with severity.

Prostate volume ≥30 cc was found among more than one fifth of men (22.3%). Increasing age was associated with enlarged prostate (≥30 cc) (63.4±±8.1 yrs versus 56.6±7.4 yrs, p < 0.01). Men with OAB had significantly larger

| Table 1: Comparison of age and prostatic variables between men with OAB and without OAB |
|-----------------|-------------------|-------------------|
| Variable        | With OAB          | Without OAB       |
| Age             | Mean ± SD (years) | 59.8±8.3          | 57.8±8.0          |
|                 | Range (years)     | 40–87             | 41–80             |
| LUTS            | No–mild           | 31 (34.1)         | 312 (70.0)        | 4.5 (2.8–7.3)∗∗ | 4.5 (2.7–7.3)∗∗ |
|                 | Moderate–severe   | 60 (65.9)         | 134 (30.0)        |                 |                 |
| Prostatic calcification type |        |                   |                   |                 |                 |
|                 | Fine              | 64 (70.3)         | 257 (58.4)        | 1.7 (1.0–2.8)∗  | 0.6 (0.4–1.1)   |
|                 | Coarse            | 35 (55.6)         | 159 (62.8)        | 0.8 (0.4–1.4)   |                 |
|                 | Mild              | 28 (43.5)         | 95 (37.3)         |                 |                 |
|                 | Moderate–severe   | 48 (76.2)         | 212 (82.5)        | 1.5 (0.8–2.9)   |                 |
| Prostate volume | ≥30 cc            | 15 (23.8)         | 45 (17.5)         |                 |                 |
| Urinary WCC     | 5 WCC/mL         | 32 (35.2)         | 86 (19.5)         | 2.2 (1.4–3.6)∗  | 1.9 (1.1–3.2)∗  |
| PSA             | >4.1              | 5 (5.5)           | 6 (5.3)           | 4.3 (1.3–14.3)* | 2.6 (0.7–10.0)  |
| Peak flow (Qmax)| ≤10.0 mL/s       | 11 (12.1)         | 29 (6.5)          | 2.0 (0.9–4.1)   |                 |
| Intravascular extension | 18 (19.8) | 62 (13.9)        | 0.65 (0.37, 1.12) |                 |                 |

∗p < 0.05, ∗∗p < 0.01.
mean prostate volume compared to non-OAB men (27.2±14.6 cc versus 24.3±10.9 cc, p = 0.0036). Interestingly, moderate-severe LUTS was not associated with enlarged prostate (≥30 cc) (p = 0.067). In addition, urine white cell count (WCC) (>5 WCC/μL) (OAB 5.5% versus non-OAB 1.3%, p = 0.025) was significantly associated with OAB.

Multivariate regression analysis revealed that men with moderate-severe LUTS (p ≤ 0.001, OR: 4.5, 95% CI: 2.7–7.3) and prostate volume ≥30 cc (p = 0.015, OR: 1.9 95% CI: 1.1, 3.2) were independently associated with OAB.

Discussion

LUTS is important condition in the face of changing demographics particularly in Europe where aging is a significant problem [10]. Studies have indicated that although voiding symptoms are the most prevalent, OAB symptoms in particular are the most bothersome [11]. Patients with OAB have been shown to have significantly lower health related quality of life (QoL) scores in all criteria such as psychological, occupational, domestic, physical and sexual aspects [12].

Previous attempts to investigate the correlation between prostatic size and severity of LUTS have produced inconsistent results [13,14]. McNeel provides vital histological evidence demonstrating that only the transitional zone of the prostate is involved in BPH. This provided evidence of why men with large prostates may be unobstructed and asymptomatic, while small prostates can cause outflow obstruction. Kaplan et al. reported a weak non-significant correlation between total prostate volume (TV) (r = 0.17) and IPSS, although transitional zone volume (TZV) (p = 0.03, r = 0.48) and transitional zone index (TZI) (p = 0.001, r = 0.75) were significantly correlated with increasing IPSS [14]. However, a more recent study by Franciosi et al. indicates that there is a weak but statistically significant correlation between TV (r = 0.15), TZV (r = 0.16) and TZI (0.14) and increasing IPSS [15]. Almost similarly, in our study, there was a weak association between TV and IPSS severity (p = 0.001, r = 0.15) (unreported data).

Our study revealed that prostatic volume (≥30 cc) was independently associated with OAB. Studies have shown a correlation between BOO and prostate volume [16]. OAB can occur secondary to BOO or be independent of prostatic pathology. Where BOO plays a role, symptoms of OAB may be mediated by supersensitivity of muscarinic receptors to acetylcholine secondary to cholinergic denervation [17]. Additionally, there is increasing evidence that OAB and LUTS are increasingly linked to metabolic syndrome (MS) [18]. It is hypothesized that MS causes autonomic nervous system over-activity leading to the development of LUTS [18]. Animal studies have shown that majority of MS-induced male mice developed detrusor over-activity compared to none in controls [19]. MS has also been shown to be associated with BPH and actually responsible for increasing prostate growth rate [20,21]. However, the association between OAB, MS and BPH is out of the scope of this paper. We report that although prostatic calcification and pyuria (>5 WCC/μL) were significantly associated with OAB, they were not independent predictors of OAB. This is in keeping with other studies. A recent study by Shoskes et al. did not find an association between the presence of prostatic calcification and symptoms, although prostatic calculi was significantly associated with increased duration of symptoms and inflammation [8]. A large case series by Park and colleagues also concluded that prostatic calculi was not an independent predisposing factor for LUTS [22]. Geramoutsos et al. demonstrated that larger prostatic calculi was significantly correlated with storage symptoms and suggested that small calculi maybe part of the aging process and is insignificant [23]. Therefore, our study suggests that men with prostatic calcification and pyuria develop OAB secondary to increase prostate volume.

Conclusions

Prostatic pathology directly causes LUTS storage symptoms in a subset of patients diagnosed with OAB. We found that OAB was significantly associated with prostate calcification, larger prostate volume (≥30 cc) and urinary WCC (>5 WCC/μL). However, only severe LUTS and prostate volume (≥30 cc) were independently associated with OAB.

Conflict of interest statement

The authors have no conflict of interest to report.
References


