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Review

Epidemiology of clinical benign prostatic hyperplasia

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Abstract Clinical benign prostatic hyperplasia (BPH) is one of the most common diseases in ageing men and the most common cause of lower urinary tract symptoms (LUTS). The prevalence of BPH increases after the age of 40 years, with a prevalence of 8%–60% at age 90 years. Some data have suggested that there is decreased risk among the Asians compared to the western white population. Genetics, diet and life style may play a role here. Recent reports suggest the strong relationship of clinical BPH with metabolic syndrome and erectile dysfunction, as well as the possible role of inflammation as a cause of the prostatic hyperplasia. Lifestyle changes including exercise and diet are important strategies in controlling this common ailment.

1. Introduction

Clinical benign prostatic hyperplasia (BPH) is one of the most common diseases in ageing men which can lead to lower urinary tract symptoms (LUTS). The relation between clinical BPH and LUTS is complex, because not all men with clinical BPH develop LUTS and not all men with LUTS have clinical BPH.

Hence, a better strategy to prevent and delay the onset and development of clinical BPH is to understand the epidemiology of the disease and possible control of the disease in the population.

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2. Prevalence of BPH

2.1. Age

The prevalence of BPH rises markedly with increased age. Autopsy studies have observed a histological prevalence of 8%, 50%, and 80% in the 4th, 6th, and 9th decades of life, respectively [1]. Observational studies from Europe, US, and Asia have also demonstrated older age to be a risk factor for clinical BPH onset and progression [2–4]. Furthermore the prostate volume increases with age based on data from the Krimpen and Baltimore Longitudinal Study of Aging suggesting a prostate growth rate of 2.0%–2.5% per year in older men [5,6]. Continued prostate growth is a risk factor for LUTS progression and larger prostates are associated with benign prostatic enlargement (BPE) and

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increased risks of clinical BPH progression, urinary retention and need for prostate surgery [7].

2.2. Race

No clear patterns have emerged with respect to BPH risk and race. Observational studies comparing black, Asian and white men have produced variable results. Studies of black men in the US have observed an increased prostate transition zone and total volume compared with white men [8,9]. Large analyses of the US Prostate, Lung, Colorectal and Ovarian (PLCO) Cancer Screening Trial and the Health Professionals Follow-Up Study observed no differences in clinical BPH risk between black and white men. Some data have suggested a decreased risk of clinical BPH in Asian compared with white men [10].

2.3. Genetics

Evidence suggests a strong genetic component to BPH. A case control analysis, in which men below 64 years underwent surgery for BPH, noted that male relatives and brothers had a 4-fold and 6-fold increase, respectively of age-specific risks for BPH surgery [11]. These investigators further estimated that 50% of men below 60 years undergoing surgery for BPH had a heritable form of disease. In a subsequent study, they observed that heritable disease was associated with larger prostate volume and younger age of onset compared with sporadic BPH [12]. These and other findings suggest an autosomal dominant pattern of inheritance [13].

2.4. Lifestyle

It has increasingly been observed that modifiable lifestyle factors substantially influence the natural history of BPH.

2.4.1. Diet

There are some indications that both macronutrients and micronutrients may affect the risk of BPH although the patterns are inconsistent. For macronutrients, increased total energy intake, energy-adjusted total protein intake, red meat, fat, milk and dairy products, cereals, bread, poultry and starch all potentially increase the risks of clinical BPH and BPH surgery, while vegetables, fruits, polyunsaturated fatty acids, linoleic acid and vitamin D potentially decrease the risk of BPH [14,15]. With respect to micronutrients, higher circulating concentrations of vitamin E, lycopene, selenium and carotene have been inversely associated with BPH. Zinc has been associated with both increased and decreased risk [14—16].

2.4.2. Physical activity

Increased physical activity and exercise have been consistently linked to decreased risks of BPH surgery, clinical BPH, histological BPH and LUTS [14,17]. A meta-analysis of 11 published studies ($n = 43\,083$) indicated that moderate-to-vigorous physical activity reduced the risk of BPH by as much as 25% relative to a sedentary lifestyle, with the magnitude of the protective effect increasing with higher levels of activity [18].

2.4.3. Alcohol

Like exercise, moderate alcohol intake also appears to be protective against multiple outcomes related to BPH. A meta-analysis of 19 published studies ($n = 120\,091$) observed up to a 35% decreased likelihood of BPH among men who drank daily [19].

3. Metabolic syndrome

3.1. Obesity

Studies have consistently observed that increased adiposity is positively associated with prostate volume—the greater the amount of adiposity, the greater the prostate volume. Body weight, body mass index (BMI), and waist circumference have all been positively associated with prostate volume in multiple different study populations [20—22]. In the Baltimore Longitudinal Study of Aging, each 1 kg/m^2 increase in BMI corresponded to a 0.41 mL increase in prostate volume and obese participants (BMI > 35 kg/m^2) had a 3.5-fold increased risk of prostate enlargement compared to non-obese (BMI < 25 kg/m^2) participants [20]. Epidemiological evidence also demonstrates that obesity increases the risks of BPH surgery, urinary symptom progression and initiation of BPH medical therapy [23,24].

3.2. Diabetes and disruptions in glucose homeostasis

Physician-diagnosed diabetes, increased serum insulin and elevated fasting plasma glucose have been associated with increased prostate size and increased risk of prostate enlargement, clinical BPH and BPH surgery [14,25,26].

3.3. Lipids

There are relatively little data on potential associations between lipids and BPH. Some studies have shown positive associations while others did not find any association between them [14,18].

4. Erectile dysfunction

There is overwhelming evidence to support that erectile dysfunction (ED) and LUTS are related [27—30]. Common underlying pathophysiology between these two conditions have been hypothesized but there is no indication that one condition precedes the other [31].

5. Inflammation

It is likely that inflammation plays a role in the development and progression of BPH as evidenced by the strong links between BPH and histological inflammation in specimens obtained from prostate biopsies and BPH surgery. Furthermore, inflammatory cytokines are over-expressed in BPH tissues [32—34]. The underlying causes of prostatic inflammation remains unclear although there are several hypotheses: 1) response to tissue damage because of

infection, 2) autoimmune response, 3) obesity and abdominal fat, because of excess production of inflammatory cytokines from adipose tissue.

Inflammation has been implicated as a primary stimulus for prostate carcinogenesis and it is possible that BPH represents a non-malignant pathway of unregulated prostate growth promoted by oxidative stress, inflammatory mediators and insulin growth factors.

It would be reasonable to hypothesize then, that inhibition of inflammatory pathways would potentially attenuate BPH risk. In the Olmsted cohort, men who reported daily non-steroidal anti-inflammatory drug (NSAID) or statin use had significantly decreased risks of both low urinary flow rate and prostate volume enlargement [35,36]. However, use of NSAIDs was not associated with decreased risk of clinical BPH in other large cohorts [37,38].

As inflammation is thought to be involved in the pathogenesis of LUTS, the presence of inflammatory markers may be used as objective risk factors for LUTS. This was demonstrated by Choi et al. [39], who found significantly greater high-sensitivity C-reactive protein (hsCRP) levels in men with moderate to severe LUTS than in men with mild or no LUTS. However, in their study of men from a urology clinic, Chang et al. did not find a relationship between hsCRP and LUTS, leaving the usefulness of hsCRP open to debate [40].

6. Conclusion

With a changing demographic profile and an increasingly ageing population in almost all societies, it is inevitable that this disorder will become even more prevalent and a major challenge for all health care systems in the future. Apart from medications, one important strategy is advice on exercise and diet, encouraging the patient to self-manage his disease. This may help to reduce the need for surgery with its many possible side effects and long term recurrence.

Conflicts of interest

The author declares no conflict of interest.

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