The incidence of diverticula of urinary bladder in patients with benign prostatic hypertrophy and the comparison between cystoscopy and cystography in detecting bladder diverticula

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Abstract

Background: The majorities of bladder diverticula are acquired and are secondary to either bladder outlet obstruction or the upper motor type of neurogenic bladder. This study was undertaken to increase awareness and understanding the putative role of BPH (Benign Prostatic Hyperplasia) in the development of bladder diverticula and to compare cystoscopy and cystography in detecting bladder diverticula.

Methods: During a 4-month period, 106 patients with BPH, who were admitted in the hospital for surgery, were examined by cystoscopy to detect bladder diverticula. Thirty-one patients were selected randomly and underwent cystography.

Results: In this study, the rate of bladder diverticula in patients with BPH was 27.4% by cystoscopy while by cystography, it was 48%. There was a slight increase of bladder diverticula with increasing age. This research also depicted that the detection rate of diverticula cystography in of urinary bladder was much greater than that of cystoscopy.

Conclusion: This study shows that the prevalence of bladder diverticula is considerably high. The detection rate of cystography in diverticula of urinary bladder was much greater than that of cystoscopy. Considering this high prevalence and potential complications, we suggest cystography for the early diagnosis and possible treatment of bladder diverticula in older patients with lower urinary tract symptoms.

Keywords: Bladder Diverticula, Benign Prostatic Hypertrophy, Cystoscopy, Cystography

Introduction

Bladder diverticula, an outpouching of the bladder wall, is often asymptomatic and most are never diagnosed.1 Bladder diverticula are either congenital or acquired and can occur at any age, but most are usually detected in middle or old age. While congenital diverticula are commonly a consequence of an inherent weakness and occasionally may cause bladder outlet obstruction2 and acute urinary retention,3 the majorities of bladder diverticula are acquired and secondary to either bladder outlet obstruction or the upper motor

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type of neurogenic bladder. Increased intravesical pressure causes vesical mucosa to insinuate itself between hypertrophied muscle bundles; so that a mucosal extravasational sac develops. Urine in a diverticula may not be evacuated completely and cause infection and or stone. The bladder diverticula may also harbor malignancies. Although bladder tumors originating from a diverticula are rare, but it is estimated that in 2%–7% of patients with bladder diverticula, develop neoplasm within diverticula; on the other hand, carcinoma arising within urinary bladder diverticula has a poorer prognosis than do neoplasms that originate within the main bladder lumen as a result of early transmural tumor infiltration. Thus bladder diverticula, are significant and should be investigated.

Males are far more commonly affected than females, with a prevalence of 9:1. This conspicuous diversity among men and women, presumably, is secondary to development of benign prostatic enlargement or BPH in older men. The prevalence of BPH defined as enlargement of the prostate gland with a weight of >20 g in presence of symptoms of urinary dysfunction and/or a urinary peak flow rate <15 mL/s which was reported 25.3% in a community, rising from 13.8% in men aged 40–49 years to 43% in men aged 60–69 years. Presence of big or complicated diverticula in a BPH patient is one of indications for surgical treatment of BPH accompanied by diverticulectomy. In this situations, open surgery is recommended. Although in recent years, laparoscopic and endoscopic diverticula have also been introduced.

Our aim from this study was to determine the prevalence of bladder diverticula in BPH patients and to compare diagnostic accuracy of cystoscopy and cystography.

**Patients and Methods**

*Subject recruitment and characteristics:* In a 4-month period, 106 BPH patients who were candidates for surgery enrolled in this study. All patients underwent cystoscopy under local anesthesia by an expert urologist (the first author) using 17 French rigid cystoscope. After evaluating urethra and prostate, urinary bladder was carefully examined looking for any diverticula formation. Retrograde cystography was done in 31 out of 106 randomly selected patients. After inserting the internal Foley catheter into bladder through urethra and emptying the bladder from urine
completely, the contrast medium (Urographin 60% which was diluted with normal saline with ratio of 1:5) was infused into bladder from a bottle standing 60–80 cm above the supine patient. The infusion of the medium was continued, till the patient felt the sense of bladder filling (200 to 350 mL). All cystograms were done under fluoroscopy each 5 min to monitor the bladder filling (Fig. 1). All cystograms were done the day before surgery and all were reported by a single radiologist. The study design was double-blind. Neither the urologist was aware of the result of the patient’s cystogram nor did the radiologist know the cystoscopy findings.

**Statistic Analysis**

First, the prevalence rate of bladder diverticula detected in cystoscopy among all patients was determined. The BPH was independent variable and bladder diverticula were dependent variable. The age was the possible confounding variable. Secondly, for illuminating the effect of age on bladder diverticula and efficacy of cystoscopy versus cystography, primary, and secondary null hypotheses were founded, respectively; as followings:

Statistic analysis was performed using SPSS software version 10.0. The primary null hypothesis was that the rate of bladder diverticula would not differ with increasing age. The secondary null hypothesis was that cystography would not have any more privilege than cystoscopy in detecting bladder diverticula. The primary hypothesis was tested using both a Student’s *t* test (all patients put in one group in which bladder diverticula were entered as a dependent variable) and a Chi-Square test [Patients were divided into 4 groups by age (51–60, 61–70, 71–80 and ≥81 year-old) in which bladder diverticula were entered as a dependent variable]. The second hypothesis was tested by means of a Kappa test, in which cystography and cystoscopy were compared with each other in detecting

![Figure 2: Age distribution of patients](image-url)
bladder diverticula.

Results

We enrolled 106 BPH patients in our study. All patients were male aged between 51 and 95 years. Cystoscopy was done for all study groups. The detection rate of bladder diverticula in cystoscopy was 27.4% (29 positive results in 106 subjects). Then, the patients were divided by age into 4 groups, 51–60 year-old (n=13), 61–70 (n=50), 71–80 (n=32), and ≥81 year-old (n=11). More specifically, the most common age was 65 and 70 years old age groups with 15 subjects in each (Fig. 2).

In 51-60 year-old group, we had 13 patients, among whom three (24.6%) had bladder diverticula in cystoscopy; in 61–70 year-old group, we had 50 patients, that 13 (26%) patients had bladder diverticula; in 71-80 year-old group, we had 32 patients, that 9 (28%) patients had bladder diverticula; and in ≥80 year-old group, we had 11 subjects, that 4 (36%) of them had bladder diverticula. The rate of bladder diverticula increased slightly in those four groups by age (Fig. 3).

We randomly selected 31 patients among 106 patients and did retrograde cystography for them. Among these 31 patients, bladder diverticula were detected in seven (22.5%) patients by cystoscopy while by cystography, we found bladder diverticula in 15 (48.3%) patients interestingly including all seven patients who were diagnosed by cystoscopy. The rate of bladder diverticula detected in cystoscopy and cystography were 22.58% and 48.39%, respectively. This means that urologists miss more than 50% of bladder diverticula during cystoscopy. In this study the efficacy of cystography in detecting bladder diverticula was significantly higher than cystoscopy (P = 0.001).

Discussion

Considering the high prevalence of BPH in old men, many of these patients are in danger of bladder diverticula and its complications. Nowadays, before operation for BPH, ure-
throscopy is done for all patients to evaluate the urethra and bladder. This is a useful method to find diverticula of bladder but it deeply depends on the experience of the urologist. There are some technical difficulties in detecting the diverticula by cystoscopy, such as the orifice of diverticulum that deduce observer; or too big or too small diverticula that make the urologist detect them as a normal part of bladder or miss them, respectively. On the other hand, radiologists believe that retrograde cystography is the single most helpful diagnostic procedure for uncovering bladder diverticula but it is not free of complications.

We designed the present study to determine the prevalence of bladder diverticula in BPH patients and to compare cystoscopy and retrograde cystography for diagnosis of bladder diverticula. The prevalence of bladder diverticula in this study group by cystoscopy was 27.4%. It means that in more than 1/4 of patients, we could find bladder diverticula. Our study showed that BPH had a significant role in developing bladder diverticula. There are several studies reporting high rate of complications of bladder diverticula. In one study only 16% of resected diverticula were free of any disease and chronic inflammation was detected in 81% of diverticula. In another study they included the propensity of chronic inflammation within bladder diverticula, the high incidence of squamous metaplasia and the association of carcinoma and diverticula. A higher incidence of carcinoma was observed in patients with bladder outlet obstruction confirmed by IVP than in controls that had no IVP evidence of obstruction. Faysal and Freiha proposed that stasis of carcinogens in diverticula predisposes the epithelium to the formation of neoplasm. So, the mandatory role of diagnosis and early treatment of both BPH and bladder diverticula becomes obvious. Some specialists suggest surgical removal of any diverticulum when it is discovered. It is reasonable to investigate carefully the urinary bladder of a BPH patient for possible presence of diverticula and its potential complications.

Our study showed a little increase in rate of bladder diverticula with increasing age. Since the age of onset of BPH in patients was not known; no obvious correlation may be made between age and bladder diverticula. In the last part of our research, we found that, the accuracy of cystography in detecting bladder diverticula was much greater than cystoscopy (nearly 2-fold), demonstrating that cystography is a better method of detecting bladder diverticula. The great diversity may be due to a better visualization of urinary bladder in cystography; and the radiologist reviewing the films, whenever he or she wants but the surgeon can see the bladder wall only once. The other reason is that, the diverticulum’s characteristics most often cannot significantly influence the cystography; but detecting bladder diverticula with cystoscopy deeply depends on the characteristics of the diverticulum. The detection of the diverticulum of urinary bladder is determined much easier and more practical by means of cystography than cystoscopy. On the other hand, cystoscopy is prerequisite of surgery for BPH and has no absolute contraindication to perform but cystography is not included in routine BPH patients candidate of surgery, which adds to the cost and maybe the complications such as infection, hematuria and urethral trauma.

Conclusion
The diverticula are mucosal outpouching of the bladder not having the muscle layer and contractile activity and are a place of urine stasis resulting into complications like stone formation and UTI. The presence of diverticula acts as a POP-OFF and decreases the force of urine. Chronic irritation secondary to urine stasis, UTI and stone may cause malignancy in diverticula. In our study, the rate of bladder diverticula among patients with BPH was 27.4% by cystoscopy and 48% by cystography. The diagnostic accuracy of cystography was more than cystoscopy in detecting bladder diverticula while cystoscopy misses more than half of the bladder diverticula. There was an increase in incidence of bladder diverticula with increase of age. Early diagnosis and proper management of BPH can prevent or at least decrease the rate of formation of bladder diverticula. We suggest urologists to examine the urinary bladder more carefully for presence of diverticula during cystoscopy in BPH patients especially among those with longstanding symptoms of BPH. However, we do not recommend cystography for all patients with BPH, due to its complications, but we suggest cystography after treatment of BPH, if the symptoms persist, or the presence of RBC or WBC in urine continues.

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References