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Urology

IS DURATION OF SYMPTOMS AN UNDERSTUDIED SURGICAL INDICATION IN BENIGN PROSTATIC HYPERPLASIA?

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ABSTRACT **Introduction:** BPH is the most common cause of Bladder outlet obstruction in men. Bladder decompensation is the final irreversible change in the bladder in longstanding BPH. The exact time when the bladder decompensates due to bladder outlet obstruction is not adequately studied. **Objectives:** To assess the decompensation of bladder function in patients with bladder outlet obstruction due to BPH in relation to duration of symptoms **Methods:** 30 patients with BPH were evaluated with Urodynamics and their bladder function was assessed by calculating the bladder contractility index. This was compared with the duration of obstructive symptoms, severity of symptoms, prostate size for each patient **Results:** It was found that patients with longer duration of obstructive symptoms had worse bladder function as measured by the Bladder contractility index. 8 patients (80%) with symptoms longer than 12 months had a BCI less than 100 while only 1 patient (9%) who had symptoms less than 6 months had a BCI less than 100 **Conclusion:** The longer the duration and severity of obstruction the worse is the decompensation of the bladder. Urodynamics may be used as an initial evaluation tool to detect bladder function deterioration in BPH in patients with symptoms longer 1 year.

KEYWORDS : Bladder decompensation, BPH, Bladder outlet obstruction, Urodynamics

INTRODUCTION

Benign hypertrophy of prostate is common in the elderly male poplulation.[1] Many histological alterations happen in the prostate which lead to bothersome lower urinary tract symptoms (LUTS). These LUTS affect the daily activities of the individual and negatively affect quality of life parameters.[2] By far the most common cause of BOO is benign prostatic hyperplasia (BPH), which is both chronic and progressive.[3] In patients with BPH the obstruction slowly worsens over time, causing a progression from initial obstructive symptoms (e.g., urinary hesitancy) to early stage irritative problems such as urinary frequency that can be quite bothersome to patients. Over the course of time this disorder can progress to a chronic stage characterized by bladder decompensation with urinary retention and overflow incontinence.[4] This bladder decompensation vastly increases the chance of associated disorders, such as urinary tract infections and bladder stone formation.[5]

The progressive urinary dysfunction associated with BOO has been known to be the result of an ongoing inflammatory response.[6,7,8,9,10] This response is triggered by at least three interrelated insults: *1*) high pressure, *2*) excessive stretch, and *3*) hypoxia/reperfusion (oxidative stress), all of which occur repeatedly with each micturition cycle as the bladder contracts with greater force to overcome the outflow resistance.[11] This leads to bladder decompensation where the bladder is no longer able to generate sufficient pressure to empty. After bladder decompensation, the deposition of collagen and elastin between smooth muscles leads to weakened contractions by the bladder. This is analogous to the model of hypertensive cardiomyopathy where an increase in peripheral vascular resistance leads to cardiomyopathy and congestive heart failure.

The bladder response to generate higher forces is accomplished through a 2 to 10-fold increase in bladder mass through hypertrophy of bladder smooth muscle cells.[12] By increasing the thickness and musculature of the bladder, complete emptying of the bladder is possible. During the hypertrophy process, pressure 2–4 times larger than normal intravesical pressure may be reached by the trabeculated bladder in an attempt to empty the bladder and push urine past the obstruction. This pressure tends to lead to diverticula formation. Diverticula are basically pouches that have no muscle wall and therefore are unable to contract and force their contents into the bladder even once the obstruction is removed. Their presence leads to a constant presence of residual volume in the bladder. Residual volume can cause infections and to prevent them from coming back the diverticula may need to be surgically removed.[13]

The time frame from the initial onset of symptoms to when the bladder starts irreversible decompensation is not clearly defined in previous studies.[14] Our aim in this study to is to correlate duration of obstructive symptoms with bladder functional deterioration determined by urodynamic pressure flow studies.

MATERIALS AND METHODS

A retrospective study was conducted on men who presented to the urology OPD with symptoms of obstruction in the department of Urology from Jan 2022 to October 2022. All patients had been evaluated with a detailed clinical history as to the duration and severity of obstructive symptoms and examination with digital rectal examination. The patients had been subjected to an ultrasound examination to look for prostate size and postvoid residual urine. The patients who had undergone urodynamic evaluation with pressure flow studies were selected for the study.

From the urodynamic data the Bladder contractility Index(BCI) was calculated using the formula BCI = Pdet Qmax(Detrussor pressure at maximum flow rate) + 5 Qmax(maximum urine flow rate)[15]

The bladder contractility index was used as an index of bladder decompensation.

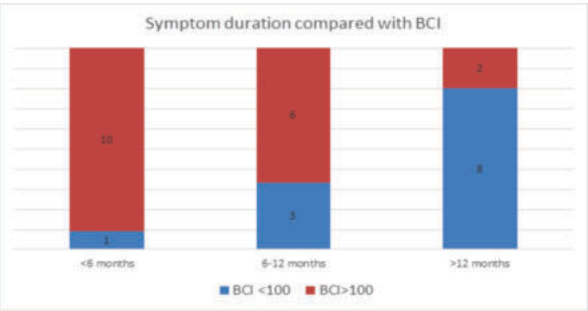
Decreased bladder contractility indicating decompensation was taken as a BCI value less than 100. A BCI value greater than 100 was taken as equivocal to normal contractility of the bladder.

The severity of symptoms were classified as mild moderate and severe based on the International Prostate symptom score. A score of 0-7 was classified as mild, a score of 8-19 was classified as moderate and a score of 20-35 was classified as severe.[16] The duration of symptoms, severity, prostate volume and PVR was compared with the bladder contractility index. The results were analyzed using standard statistical methods for nominal data such as the chi square test and a p value of <0.05 was considered statistically significant.

RESULTS

1. Comparison of duration of symptoms with Bladder contractility Index

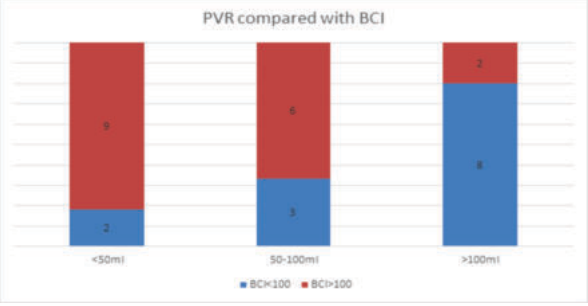
Duration	BCI <100	BCI >100
<6 months	1 (3.33%)	10 (33.3%)
6-12 months	3 (10%)	6 (20%)
>12 months	8 (26.6%)	2 (6.67%)



The chi-square statistic is 11.2121. The *p*-value is .003676. The result is significant at $p < .05$.

2. Comparison of Post residual urine volume(PVR) with Bladder contractility index

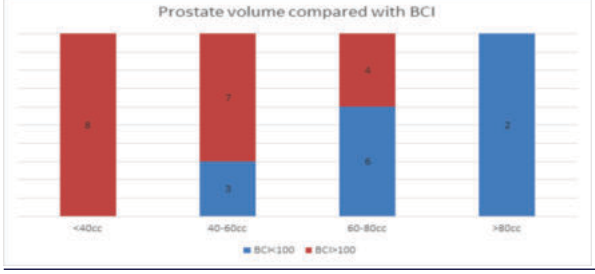
PVR	BCI<100	BCI>100
<50ml	2 (6.67%)	9 (30%)
50-100ml	3 (10%)	6 (20%)
>100ml	8 (26.6%)	2 (6.67%)



The chi-square statistic is 8.6754. The *p*-value is .013066. The result is significant at $p < .05$.

3. Comparison of Prostate volume with Bladder contractility Index

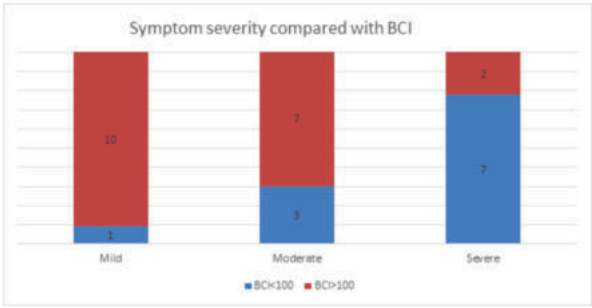
Prostate volume	BCI<100	BCI>100
<40cc	0	8 (26.6%)
40-60cc	3 (10%)	7 (23.3%)
60-80cc	6 (20%)	4 (13.3%)
>80cc	2 (6.67%)	0



The chi-square statistic is 4.701. The *p*-value is .195051. The result is *not* significant at $p < .05$.

4. Comparison of Symptom severity with Bladder contractility Index

Symptom Severity	BCI<100	BCI>100
Mild	1 (3.33%)	10 (33.3%)
Moderate	3 (10%)	7 (23.3%)
Severe	7 (23.3%)	2 (6.67%)



The chi-square statistic is 10.3436. The *p*-value is .005674. The result is significant at $p < .05$

DISCUSSION

30 patients with bladder outlet obstruction due to BPH were selected for the study.

On comparing the duration of symptoms with the bladder contractility index 8 (80%) patients with symptoms longer than 1 year had decreased bladder contractility, 3 (33.3%) patients with symptom duration between 6-12 months had decreased bladder contractility while 1 (9%) patient with symptoms less than 1 year had decreased bladder contractility. These results are similar to results obtained by Wasson et al who followed 556 patients of BPH with moderate symptoms over a period of 3 years.[17]

On comparing post residual urine volume with bladder contractility index 8 (80%) patients with PVR greater than 100ml had a BCI less than 100, 3 (33%) patients with PVR between 50-100ml had a BCI less than 100, 2 (18%) patients with PVR less than 50ml had a BCI less than 100. PVR is an index of bladder decompensation. Indicating that the hypertrophied, morphologically altered detrusor with collagen and Extracellular matrix is unable to completely empty the bladder with each void leading to progressively larger residual urine volumes.

On comparing prostate volume with bladder contractility index all patients with prostate volume greater than 80cc had BCI less than 100, 6 (60%) of patients with prostate volume between 60-80cc had BCI less than 100, 3 (30%) patients with prostate volume between 40-60cc had BCI less than 100 while none of the patients with prostate volume less than 40cc had BCI less than 100. The results from this study were not significant. This was comparable to results obtained from post hoc analysis of the REDUCE trial data where men with prostate volume 40-60cc were 67% more likely to develop symptoms as compared to men with prostate volumes 40cc or less.[18]

On comparing Symptom severity with bladder contractility index 7 (77.7%) patients with severe symptoms had BCI less than 100, 3 (30%) patients with moderate symptoms had BCI less than 100 while 1 (9%) patient with mild symptoms had BCI less than 100. This probably reflects the greater degree of obstruction in patients with more severe symptoms causing detrusor changes. The results of this study were comparable to the results obtained by Flannigan et al. In their study initial symptom severity was a major predictor of operative intervention.[19]

CONCLUSION

The study shows that increased duration of symptoms of obstruction leads to worsening bladder function and decompensation.

A 1 year symptom duration limit could be recommended as a cut off to initiate urgent surgical treatment of BPH causing bladder outlet obstruction. Medical or conservative management is less preferable in this patient population.

Further longitudinal prospective trials are needed to exactly

characterize the time of irreversible bladder decompensation in BPH patients.

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