‘CLAMP Score’ to Predict Acute Urinary Retention in Benign Prostatic Hyperplasia Patients

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Article

'CLAMP Score' to Predict Acute Urinary Retention in Benign Prostatic Hyperplasia Patients

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Abstract: Introduction**:** In men older than 50 years, benign prostatic hyperplasia (BPH) is a common and progressive disease. Acute Urinary Retention (AUR) is one of the most common and painful long-term outcomes of BPH. Our study aimed at determining the risk factors which are responsible for developing AUR and formulating a novel scoring system known as "Retention Score" or "CLAMP Score" to predict the risk of developing AUR in BPH patients in future and manage them in advance. Materials and Methods: The present study was a hospital-based comparative study which was conducted at the department of Urology, Nil Ratan Sircar Medical College and Hospital. Two groups were compared one 'with AUR' and another 'without AUR'. Various risk factors have been studied including age, international prostate symptom score (IPSS), comorbidities like diabetes mellitus, serum PSA etc. From the study we have formulated and validated a simple out-patient based risk scoring known as "Retention Score" by which we can stratify the BPH patients into various risk groups risk groups of developing AUR. Result: A total of 240 patients has been divided into two groups; 120 in each group. It was found that, majority number of patients with AUR are more than 60 years of age (92.5%) and has comorbidities (84.0%). 68% of these patients has a serum PSA over 1.4 ng/dl and a history of AUR (75%). The mean IPSS was 26.8 and intravesical prostatic projection is more than 12 mm. Our proposed scoring system has a significant association with the patients with AUR group. Conclusion: Our study provides valuable insights into the associations between various risk factors and AUR in BPH patients. Our proposed scoring system will be of great help in predicting AUR in BPH patients on out-patient basis and treat them accordingly in advance.

Keywords: acute urinary retention; benign prostatic hyperplasia; intravesical protrusion prostate

Introduction

The incidence of benign prostatic hyperplasia (BPH) in men over 50 years old is approximately 19-30% [1]. BPH is a progressive condition, and acute urinary retention (AUR) is one of its long-term and most significant complications [2]. The estimated incidence rate of AUR is between 5 and 25 cases per 1,000 person-years [3], translating to roughly 0.5% to 2.5% annually. AUR is characterized by the inability to void, increasing discomfort, and the need for catheterization. The treatment of AUR can be painful and time-consuming, often requiring follow-up visits and trials of voiding. If these trials fail, surgical intervention may be necessary. Our study aims to identify factors that predict which patients are likely to experience urinary retention, thereby developing a simple outpatient risk scoring system. This system will help categorize BPH patients into risk groups for developing AUR in the future, allowing for timely and appropriate treatment.

Methodology

A comparative analysis has been done between two groups one 'with AUR' and another 'without AUR' but both having lower urinary tract symptoms. Data from last two years has been

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compiled. Patients with history of urinary retention due to other causes like stricture urethra, hypocontractile bladder and previously operated patients or patients with carcinoma prostate were excluded from the study. The following data has been collected using various parameters including clinical radiological and biochemical tests.

- Clinical
  - Age of the patient
  - Presence or absence of comorbidities mainly diabetes
  - Past history of AUR
  - Lower urinary tract symptoms (LUTS) scoring by International Prostate Symptom Scoring (IPSS)
  - Digital rectal examination (DRE) grading of prostate
- Radiological findings by ultrasonography (USG)
  - Prostate volume
  - Intravesical prostatic projection (IVPP) in cm
- Biochemical
  - Serum prostate specific antigen (PSA)

Patients were divided into three age groups, 50 – 60 yrs, 60- 70 yrs, 70-80 yrs. Diabetes is the most common comorbid condition which was found to be associated with AUR in BPH patients. It has been studied whether diabetes is present in both the groups of patients. Presence of any past history of AUR has been taken into account. LUTS has been assessed and scored according to IPSS scoring. DRE has been done in each patient and prostatic grading done according the findings in DRE. On USG, two things were noted; prostate volume and IVPP and grading done accordingly. Patients baseline PSA has also been measured at presentation.

Based on the risk factors of developing AUR, risk stratification has been proposed in terms of low, intermediate and high-risk groups for developing AUR. Statistical Analysis was performed with help of Epi Info (TM) 7.2.2.2 which is a trademark of the Centres for Disease Control and Prevention(CDC).Using this software, basic cross-tabulation and frequency distributions were prepared. Chi-square test was used to test the association between different study variables under study. Corrected test was used in case of any one of cell frequency was found less than 5 in the bivariate frequency distribution. Test of proportion (Z-test) was used to test the significant difference between two proportions. t-test was used to test the significant difference between means.

Results

Total 240 patients were studied in the span of 24 months. 120 patients with AUR and 120 patients without AUR. In patients with AUR group, 9 (7.5%) were 51-60 years of age, 39 (32.5%) patients were 61- 70 years of age, and 72 (60.0%) patients were 71-80 years of age. So, most of the patients were in >60 yrs age group (92.5%). In patients without AUR group, 12 (10%) patients were ≤50 years of age, 81 (76.5%) patients were 51-60 years of age, and 27 (22.5%) patient were 61-70 years of age. So, most of the patients were in<60 years age group (86.5%). Association of Age in Years with Group was statistically significant (p=0.0026).

Diabetes is the most common comorbid condition which was found to be associated with AUR in BPH patients. In patients with AUR, 66 (84.0%) had Diabetes. In patients without AUR, 18 (15.0%) patients had Diabetes. Association of Diabetes with AUR Group was statistically significant (p=0.0450).

In patients with AUR, 90 (75.0%) had history of AUR making it statistically significant (p<0.0001).

In patients with AUR, the mean PSA (ng/ml) (mean± s.d.) of patients was 2.6000±.8582. In patients without AUR, the mean PSA (ng/ml)(mean± s.d.) of patients was 0.9000±2.9803. Distribution of mean PSA (ng/ml) with Group was statistically significant (p=0.0462). In patients with AUR, 42

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(35.0%) had PSA < 1.4 and 78 (65.0%) patients had PSA ≥1.4. In patients without AUR, 75 (62.5%) had PSA < 1.4 and 45 (37.5%) patients had PSA ≥1.4. Association of PSA with AUR Group was statistically significant (p=0.0138).

In patients with AUR, the mean IPSS (mean± s.d.) was 26.6850±2.8520. In patients without AUR, the mean IPSS (mean± s.d.) was 16.0000±4.3901. Distribution of mean IPSS with Group was statistically significant (p=.0454). In With AUR, 12 (10.0%) patients had IPSS <15 and 108 (90.0%) patients had IPSS ≥15. In Without AUR, 87 (72.5%) patients had IPSS <15 and 33 (27.5%) patients had IPSS ≥15. Association of IPSS score with AUR Group was statistically significant (p<0.0001).

In patients with AUR, the mean USG IVPP (mean± s.d.) was 12.0000±1.5819. In patients without AUR, the mean USG IVPP (mean± s.d.) was 3.0002±2.1595. Distribution of mean USG IVPP with Group was statistically significant (p=0.0041). In patients with AUR, 33 (27.5%) had IVPP <5 and 87 (72.5%) patients had IVPP ≥5. In patients without AUR, 63 (77.5%) had IVPP <5 and 27 (22.5%) patients had IVPP ≥5. Association of IVPP with AUR Group was statistically significant (p<0.0001).

From the analysis of the risk factors of developing AUR in BPH patients we found following factors are significantly associated with developing AUR:

1. Age ≥ 60 years
2. Associated with Diabetes
3. Severity of LUTS assessed by IPSS ≥15
4. Median lobe enlargement ≥ 5 mm as measured by IVPP by USG
5. Serum PSA ≥ 1.4

From the above risk factors, we hereby propose here a scoring system (Table 1) by which we can counsel our patients that they have a high, moderate or low chance of developing AUR in future. The scoring system is as follows (Table 1):

Table 1. RETENTION SCORE or CLAMP SCORE.

Abbreviation	Parameters	Scoring	
		0	1
C	Comorbidities (diabetes)	No	yes
L	LUTS (Assessed by IPSS)	<15	≥ 15
A	Age	<60 yrs	≥ 60 yrs
M	Median lobe enlargement (measured by USG IVPP)	<5 mm	≥ 5 mm
P	PSA (ng / dl)	< 1.4 ng/dl	≥ 1.4 ng/dl
	Risk stratification of developing AUR		
0, 1,2	Low risk		
3	Intermediate risk		
4, 5	High risk		

Table 1.

We have validated our scoring system in our study and the results are as follows (Table 2):

Table 2. Table association between Retention score: Group.

	GROUP		
Retention Score	**With AUR**	**Without AUR**	**TOTAL**
Retention score-1	0	51	51
Row %	0.0	100.0	100.0
Col %	0.0	42.5	21.3
Retention score-2	0	51	51
Row %	0.0	100.0	100.0
Col %	0.0	42.5	21.3

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Retention score-3	12	18	30
Row %	40.0	60.0	100.0
Col %	10.0	15.0	12.5
Retention score-4	54	0	54
Row %	100.0	0.0	100.0
Col %	45.0	0.0	22.5
Retention score-5	54	0	54
Row %	100.0	0.0	100.0
Col %	45.0	0.0	22.5
TOTAL	120	120	240
Row %	50.0	50.0	100.0
Col %	100.0	100.0	100.0

Chi-square value: 70.4000; DF: 4 p-value:<0.0001.

In patients with AUR, 48 (40%) patients had Retention score of 4 and 60 (50%) patients had Retention score of 5. So, a 90% of patients had a retention score of 4 or 5 (Table 2). In patients without AUR 51 (42.5%) patients had Retention score of 1 and 51 (42.5%) patients had Retention score of 2. So, 85% patients had a retention score of 1 or 2 (Table 2). Association of Retention Score (**CLAMP score**) with AUR Group was statistically significant (p<0.0001).

Discussion

Acute urinary retention represents a significant and painful event in the natural history of benign prostatic hyperplasia [4,11]. The present study was a hospital-based comparative study. Our main aim was to study the risk factors for developing AUR in BPH patients and to propose a risk score by which we can assess the patients of BPH who are at high risk of developing AUR in future. We have studied various risk factors of developing AUR in BPH patients like age, PSA, presence of diabetes, median lobe enlargement, IPSS, prostate volume by USG, etc. We have proposed a risk scoring system which can be done at outpatient department itself without any invasive procedures.

In our study, Age (Yrs.) was higher in 'With AUR' Group [72.1800±4.9019] compared to 'Without AUR' Group [53.7000±5.5036] and this was statistically significant (p=0.0421). In patients 'With AUR' group, 9 (7.5%) were 51-60 years of age, 39 (32.5%) patients were 61-70 years of age, and 72 (60.0%) patients were 71-80 years of age. So, most of the patients were in >60 years age group (92.5%). In patients 'Without AUR' group, 12 (10%) patients were ≤50 years of age, 81 (76.5%) Patients were 51-60 years of age, and 27 (22.5%) patient were 61-70 years of age. So, most of the Patients were in <60 years age group (86.5%). Association of Age in Years with Group was statistically Significant (p=0.0026). Regarding diabetes, it was found that, majority number of patients had Diabetes [96 (84.0%)] in 'With AUR' Group compared to 'Without AUR' Group [18 (15.0%)] and this was statistically Significant (p=0.0450). It was showed that, majority number of patients had history of AUR [90 (75.0%)] in 'With AUR' Group compared to 'Without AUR' Group [18 (20.5%)] but this was statistically significant (p<0.0001).It was found that, maximum number of patients had PSA >1.4 [78 (65.0%)] in 'With AUR' Group compared to 'Without AUR' Group [45 (37.5%)] and this was statistically significant (p=0.0138). It was showed that, a greater number of patients had IPSS >15 [108 (90.0%)] in 'With AUR' Group Compared to Without AUR Group [33 (27.5%)] but this was statistically significant (p<0.0001). We found that, IPSS was less in Without AUR Group [16.0000±4.3901] compared to With AUR Group [26.6850±2.8520] but this was not statistically significant (p=02829). We examined that, IVPP measured by USG was higher in 'With AUR' Group [12.0000±1.5819] compared to 'Without AUR' Group [3.0002±2.1595] but this was statistically significant (p=0.0041). It was found that, higher number of patients had IVPP <5 [63 (77.5%)] in Without AUR Group compared to With AUR Group [33 (27.5%)] and this was statistically significant (p<0.0001). It was observed that, majority number of patients had Prostate size Vol. <40 cc [78 (65.0%)]

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In 'Without AUR' Group compared to 'With AUR' Group [75 (62.5%)] but this was not statistically Significant (p=0.8160).

Cahn D Bet al [5] (2014) found that men with elevated post-void residuals (PVRs) were at increased risk to develop AUR. There was a strong correlation between PSA and prostate Volume (0.787) also. A regression analysis was then repeated excluding prostate volume. PSA then Became a statistically significant predictor of AUR (p = 0.007). A 1-SD increase in PSA (1.377 Ng/ml) increased the patients' risk of developing AUR by 12.3%. Mahakalkar C C et al. [6] (2016) showed that acute urinary retention (AUR) is one of the most Significant complications or long-term outcomes of benign prostatic hyperplasia (BPH). The outcome of the study was analyzed by these factors: Age in years, Symptom severity, Prostate Volume, DRE and USG Grade. The mean age of presentation was 64.87±7.85 with median age of 65 years (range 45-82 years) with mean IPSS score of 17.45and the mean PVR was 110.80 ± 85.52 with Median 110 (range 0-500). Atalay H A et al. [7] (2018) found that older age, higher serum PSA level, and higher prostate volume were independently associated with BPH-related surgery. But in our study we found that prostate volume itself is not an independent predictor of having AUR in future. Elnaggar A A et al. [8] (2019) in a prospective study compared the sensitivity, specificity, and accuracy of intravesical protrusion of prostate (IVPP), prostate volume (PV), detrusor wall thickness (DWT), and post-voiding residual urine (PVR) for diagnosis of bladder outlet obstruction (BOO) and predicted acute urinary retention (AUR) in patients with benign prostatic hyperplasia. There were significant differences in PV, IVPP, DWT, maximum flow rate (Qmax), and PVR between obstructed and non-obstructed patients, with a significant correlation with the BOOI. There was a significant correlation between IVPP and DWT with PFS in the diagnosis of BOO in patients complaining from benign prostatic hyperplasia. IVPP more than 7.5 mm had the best accuracy (90.5%) in the diagnosis of BOO. IPP more than 7.5 mm and DWT more than 2 mm diagnosed acute retention of urine in 90% of patients. IVPP measurement is the best non-invasive test in detecting BOO in comparison with other index tests. Our study also corroborates with the findings that IVPP is one of the best indicator of developing AUR in future. Thapa Net al [9] (2021) showed that increasing age, high prostate volume, high serum PSA, diabetes and smoking had Increased incidence of AUR among patients with BPH.

Based on the studied risk factors for AUR in BPH patients, we have proposed a risk Stratification score known as '**RETENTION SCORE**" or "**CLAMP SCORE**". The Parameters are:

- C – Comorbidities (Diabetes)
- L – Lower urinary tract symptoms assessed by IPSS
- A – Age
- M – Median lobe enlargement measured by USG as IVPP
- P – PSA

Minimum score is 0 and maximum score is 5. Risk categories are as follows.

- Score 0, 1, 2 – low risk of developing AUR.
- Score 3 – intermediate risk of developing AUR.
- Score 4, 5 – high risk of developing AUR.

It has been seen that 90% of patients with AUR has a Retention score of 4 or 5 and on the other hand 85% of patients without AUR has a score of 0, 1 or 2 (Table 2). This association is also found to be statistically significant (p<0.0001). This scoring system Might be helpful in an out-patient department of Urology to counsel patients with BPH regarding Their risk of developing AUR in future. Further studies with greater sample size is required to validate. Understanding these Associations and using our proposed scoring system can help clinicians in the identification, Counselling, decision making regarding treatment strategies to reduce the incidence of AUR in BPH patients.

We have no conflict of interest to disclose.

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