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EFFICIENCY OF THE SERUM PROSTATE SPECIFIC ANTIGEN LEVELS AS A PREDICTOR OF PROSTATE VOLUME AND LOWER URINARY TRACT SYMPTOMS REPRESENTED BY INTERNATIONAL PROSTATE SYMPTOMS SCORE

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ABSTRACT

Benign prostatic hyperplasia (BPH) has a high prevalence in the elderly male population in which Prostate Volume is increased. BPH is one of the most common cause of Lower Urinary Tract Symptoms (LUTS) and affect Quality of life which can be scored by International Prostate Symptoms Score (IPSS).Serum Prostate Specific Antigen (PSA) level is a possible predictor for prostate volume and LUTS. So, this study was done to correlate serum PSA with prostate volume and lower urinary tract symptoms and find out Quality of life. This Prospective observational study was conducted on 64 men >40 years, who had Received on : 13-12-2019 Accepted on : 30-01-2020

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LUTS and were admitted in the Surgery department at ELMC and Hospital, Lucknow from June 2017 to May 2019. Patients with LUTS as characterized in IPSS with the serum PSA level <10 ng/ml. were included in this study, and the values of serum PSA, PV, and IPSS were assessed in all patients. To determine the cut off values of PSA was assessed on receiver operating characteristics-derived area under the curve (ROC-AUC) for assessing IPSS and PV. A significant association was shown between PSA and PV, and the IPSS also PSA was significantly correlated after adjusting the age. The area under the curves of PSA for predicting PV > 20 ml, >25 ml, and >35 ml were found to be 0.829, 0.886 and 0.868, respectively. The AUCs of PSA for predicting IPSS >7, >13 and >19 were observed as 0.816, 0.968, and 0.895, respectively. Serum PSA was associated significantly with PV and IPSS, the predictive values of PSA for PV and PSA for IPSS were found to be excellent above the cutoff levels.

KEYWORDS: Lower urinary tract symptoms (LUTS), serum Prostate specific-antigen (PSA), International Prostate Symptom Score (IPSS), prostate volume (PV), Quality Of Life (QoL).

INTRODUCTION

Benign prostatic hyperplasia (BPH) has a high prevalence in the male population that increases with age (1-3). It is one of the most common causes of lower urinary tract symptoms (LUTS) in men and starts after the age of 50 and by the age of 60 years 50.0% of men have the histological evidence of BPH (4). The AUA-& symptom index being adopted by the WHO as an International prostate symptom score (IPSS) after addition of one disease specific question as the means of assessing the global impact of BPH on the Quality of Life (QoL) (5). On validation, AUA-7 index being shown to have the excellent test retest reliability and also is internally consistent (6).

MATERIALAND METHOD

This Prospective observational study was conducted on 64 men >40 years (1). who had LUTS and were admitted in the Surgery department at ELMC and

Hospital, Lucknow from June 2017 to May 2019. A total 64 LUTS patients (7-8). who were found fit according to inclusion criteria were studied during the study period of 2 years. We used IPSS points ranging from (0-35) for the assessment of LUTS. The seven questions of the IPSS comprise a question on postmicturition symptoms, on voiding symptoms and bladder storage symptoms. Significant LUTS is usually defined as a total IPSS of at least 8 (moderate or severe) (9). Physical examination of the patients was carried out who performed Digital Rectal Examination (DRE) to evaluate prostate size. Five mill-litres (5ml) of blood was collected and centrifuged to obtain the serum used for total PSA assay using the electro-chemiluminescence method. Trans-Abdominal ultrasonography was performed to Measure Prostate volume (10).

In this study, PV and IPSS were assessed according to the PSA level, and the proportion of men reaching each

stratification level was also analyzed. Because IPSS of 13 was the median value, we determined the target IPSSs were >7, >13 and >19. The target levels of PV were >20 ml, >25 ml and >35 ml based on interquartile ranges (IQRs). The proportions of subjects reaching each PV and IPSS target level were observed and evaluated for a relationship with PSA.

The relationships between PSA and PV, PSA and IPSS were analyzed using log-linear regression analyses after adjusting for age. Multivariate regression analyses were used to predict PV and IPSS. The predictive value of PSA for each target level was analyzed using the receiver-operating characteristics (ROC)-derived area under the curve (AUC). PV and PSA were analyzed using a regression analysis after logarithmic transformation to ensure a normal distribution. Microsoft Excel was used in creating the database and producing graphs, while the data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 23 for Windows and the P<0.05 was considered to be statistically significant.

RESULTS

Below Table No.1, Majority of patients 59 (92.9%) were shows the Incomplete Emptying symptoms while Weak Stream was in 25 (39.1%) patients.

| Presenting Symptoms | Frequency (n=64) | Percentage (%) |
|---------------------|---------------------|---------------------|
| Incomplete Emptying | 59 | <mark>92.</mark> 9% |
| Frequency | 43 | 67.2% |
| Intermittency | 35 | 54.7% |
| Urgency | 42 | 65.6% |
| Weak Stream | 25 | 39.1% |
| Straining | 29 | 45. 3% |
| Nocturia | 30 | 46.9% |

 Table 1 : Lower Urinary Tract Symptoms

 Frequency and Percentage in Studied Patients

In below Table No.2, shows the Trans abdominal USG, majority of the patients 34 (53.1%) were in Grade 1 Prostatomegaly followed by Grade 2 Prostatomegaly were in 15 (23.4%) and Grade 3 Prostatomegaly were in 15 (23.4%) patients.

| Trans-Abdomional USG | Frequency (n=64) | Percentage (%) |
|---------------------------|---------------------|-------------------|
| Grade 1 Prostatomegaly | 34 | 53.1% |
| Grade 2 Prostatomegaly | 15 | 23.4% |
| Grade 3 Prostatomegaly | 15 | 23.4% |

Table 2 : Trans-Abdominal USG Findings of Prostatomegaly in Studied Patients

As shown in below Table No.3, of all 64 men analyzed, 42.2% had a PSA level of 0-1.0 ng/ml, 23.5% a PSA of 1.0–2.0 ng/ml and 34.3% a PSA >2 ng/ml. According to PSA level, the proportions of subjects with PVs above 20, 25 and 35 ml were calculated. For men with a PSA level of 0-0.5 ng/ml, only 12.5% (2/16) had a PV.35 ml, but for a PSA level above 4.0 ng/ml, 100.0% (12/12) of the men had a large prostate (>35 ml).

| Prostate- | No of Patientsn | Prostate Volume | | |
|--------------------|--------------------|-----------------|-------------|-------------|
| Antigen (ng/ml) | =64 | >20ml | >25ml | >35ml |
| <0.5 | 16 (25.0%) | 13 (81.25%) | 3 (18.7%) | 2 (12.5%) |
| 0.5-0.7 | 6 (9.4%) | 5 (83.3%) | 4 (66.7%) | 1 (16.7%) |
| 0.7-1.0 | 5 (7.8%) | 5 (100.0%) | 4 (80.0%) | 1 (20.0%) |
| 1.0-1.5 | 9 (14.1%) | 9 (100.0%) | 6 (66.7%) | 4 (44.4%) |
| 1.5-2.0 | 6 (9.4%) | 6 (100.0%) | 5 (83.3%) | 2 (33.3%) |
| 2.0-4.0 | 10 (15.6%) | 10 (100.0%) | 10 (100.0%) | 8 (80.0%) |
| 4.0-10.0 | 12 (18.8) | 12 (100.0%) | 12 (100.0%) | 12 (100.0%) |

 Table 3: Percentage of Men with a Prostate Volume

 Above a Specific Cutoff Value According to Various

 Prostate-Specific Antigen Ranges in Studied Patients.







Fig 2: Percentage of Men with a Prostate Volume above a Specific Cut off Value According to Various Prostate Specific Antigen Ranges in Studied Patients

Below Table No. 4 shows the AUCs for the prediction of prostate volume >20, <25 and <35 ml) using serum PSA. For a PV >35 ml, the ROC AUC was 0.868 (95% CI: 00.775-0.960, S.E.: 0.047). For PVs >25 ml and >20 ml, the ROC AUCs were 0.886 and 0.829, respectively.PSA was a better predictor of PV in the higher PV range (larger AUC).

| Prostate Volume | Area Under the Curve | Standard error | 95% CI |
|-----------------|----------------------|----------------|-------------|
| PV >20 | 0.829 | 0.065 | 0.702-0.956 |
| PV >25 | 0.886 | 0.41 | 0.806-0.967 |
| PV >35 | 0.868 | 0.047 | 0.775-0.960 |

 Table 4: Predicting Value of Prostate-specific Antigen for Prostate Volume (PV) by Measurement of Areas

 Under the Receiver-operating Curve and 95% CI



Fig 3: Predicting Value of PSA for Prostate Volume by Measurement of Areas Under the Receiver Operating Curve and 95% Confidence Interval

As shown in below Table No.5, of all 64 men analyzed, according to PSA level, the proportions of subjects with IPSS above 7, 13 and 19 were calculated. For men with a PSA level of 0-0.5 ng/ml, 0.0% (0/16) had a IPSS >19, but for a PSA level above 4.0 ng/ml, only 8.3% (1/12) of the men had a large IPSS score (>19 ml).

| Prostate-Specific Antigen | No of Patients (%) | International Prostate Symptom Score | | |
|---------------------------|--------------------|--------------------------------------|------------|-----------|
| | | >7 | >13 | >19 |
| <0.5 | 16 (25.0%) | 7 (43.7%) | 0 (0.0%) | 0 (0.0%) |
| 0.5-0.7 | 6 (9.4%) | 1 (16.7%) | 0 (0.0%) | 0 (0.0%) |
| 0.7-1.0 | 5 (7.8%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%") |
| 1.0-1.5 | 9 (14.1%) | 4 (44.4%) | 0 (0.0%) | 0 (0.0%) |
| 1.5-2.0 | 6 (9.4%) | 5 (83.3%) | 1 (16.7%) | 0 (0.0%) |
| 2.0-4.0 | 10 (15.6%) | 9 (90.0%) | 6 (60.0%) | 1 (10.0%) |
| 4.0-10.0 | 12 (18.8) | 12 (100.0 <mark>%</mark>) | 11 (91.7%) | 1 (8.3%) |

 Table 5: Percentage of Men with an International Prostate Symptom Score Above a Specific Cutoff Value

 According to Various Prostate-Specific Antigen Ranges in Studied Patients



Fig 4: Percentage of Men with an International Prostate Symptoms Score Above a Specific Cutoff Value According to Various Prostate Specific Antigen Ranges in Studied Patients

Below Table No.6 shows the AUCs for the prediction of IPSS >19, the ROC AUC was 0.895 (95% CI: 0.737-1.000). For IPSSs of >13 and >7, the ROC AUCs were 0.968 and 0.815, respectively, In my study suggesting that PSA is a good predictor of IPSS.

| IPSS SCORE | Area Under the Curve | Standard error | 95% CI |
|----------------|----------------------|----------------|-------------|
| IPSS >7 | 0.815 | 0.056 | 0.704-0.925 |
| IPSS >13 0.968 | | 0.18 | 0.932-1.000 |
| IPSS >19 | 0.895 | 0.081 | 0.737-1.000 |

 Table 6: Predicting Value of Prostate-specific Antigen for IPSS, International Prostate Symptom Score (IPSS)

 by Measurement of Areas Under the Receiver-operating Curve and 95% CI



Fig 5: Predicting Value of Prostate Specific Antigen for IPSS by Measurement of Areas Under the Receiver Operating Curve and Confidence Interval 95%

Below Figure No.6 shows a significant relationship between Prostate-Specific Antigen and Prostate Volume, and the International Prostate Symptom Score and Prostate-Specific Antigen were also significantly correlated after adjusting by age.

| | | IPSS Score | Prostate Volume |
|-----|-------------------------|-------------|-----------------|
| | Pearson Correlation | 0.449 | 0.366 |
| Age | P value | <0.001 | 0.003 |
| | 95% Confidence Interval | 0.256-0.625 | 0.132-0.558 |
| PSA | Pearson Correlation | 0.774** | 0.553 |
| | P value | <0.001 | <0.001 |
| | 95% Confidence Interval | 0.665-866 | 0.351-0.722 |

Fig 6: Linear Regression Analysis of Prostate Volume and IPSS According to Age and PSA

Quality of Life (QOL): If you were to spend the rest of your life with your urinary condition the way it is now, how would you feel about that?



Fig 7: Quality of Life

DISCUSSION

Serum PSA is currently the most widely used marker for lower urinary tract symptom's detection. There is a strong log-linear relationship between serum PSA and prostate volume in men with lower urinary tract symptoms. In the present study, we enrolled all suspected cases of lower urinary tract symptoms were included in the assessment of Prostate specific-antigen (PSA) value and correlate with predict prostate volume (PV) and lower urinary tract symptoms (LUTS) severity as represented in the IPSS. Parker DS et al. (11) has discussed the Serum PSA as a predictor of prostate volume and lower urinary tract symptoms in a community-based cohort. Gyasi-Sarpong CK et al (12)., which has descriptive cross-sectional study of the Predictors of the international prostate symptoms scores for patients with lower urinary tract symptoms and correlate with age, PSA and PV. Kenneth A et al (13). studied the lower urinary tract symptoms suggestive of benign prostatic hyperplasia among Ghanaian men and observed the IPSS, PSA, and PV. Park DS et al (11), and El-Din Mohamed MN et al (14). also used similar tools in their respective studies. The proportions of subjects reaching each PV and IPSS target level were observed and evaluated for a relationship with PSA. The relationships between PSA and PV, PSA and IPSS were analyzed using linear regression analyses after adjusting for age. The receiver operating characteristic curve (ROC) used to test the impact of the prostate volume and PSA on the response of the patients. In this current study, it was found that the prevalence of LUTS increased with age with higher proportion (64.1%) of the subjects being older than 50 years of age. In present study, 60 (93.75%) men shows the prostate volume >20ml, 44 (68.75%) men shows the prostate volume >25ml and 30 (46.87%) men shows the prostate volume >35 ml. PSA levels of 0-1.0 ng/ml were found in 42.2% studied patients, 23.5% were having PSA of 1.0-2.0 ng/ml and 34.3% were having PSA >2 ng/ml. According to the PSA level, the proportions of subjects

with PVs above 20, 25 and 35 ml were calculated. For men with a PSA level of 0-0.5 ng/ml was 12.5%(2/16)with PV > 35 ml, but for a PSA level above 4.0 ng/ml, 100.0% (12/12) of the men with large prostate (>35 ml). The prediction of PV (>20, <25 and <35 ml) using serum PSA. For a PV >35 ml, the ROC AUC was 0.868 (95% CI: 00.775-0.960, standard error: 0.047). For PVs >25 ml and >20 ml, the ROC AUCs were 0.886 and 0.829, respectively. PSA was a better predictor of PV in the higher PV range (larger AUC). In our study International Prostate Symptom Score >7 was found in 38 (59.4%) men, 18 (18.1%) men shows the International Prostate Symptom Score >13 and 2 (3.1%) men shows the International Prostate Symptom Score >19.According to PSA level, the proportions of subjects with IPSS above 7, 13 and 19 were calculated. For men with a PSA level of 0-0.5 ng/ml were 0.0% (0/16) with IPSS >19, but for PSA level above 4.0 ng/ml, only 8.3% (1/12) of the men had a high IPSS score (>19). The AUCs for the prediction of IPSS >19, the ROC AUC was 0.895 (95% CI: 0.737-1.000). For IPSSs of >13 and >7, the ROC AUCs were 0.968 and 0.815, respectively, present study suggesting that PSA is also a good predictor of IPSS score and Quality of life.

CONCLUSIONS

Lower urinary tract symptoms mostly occur in older age.PSA is a better predictor of PV in the higher PV range (larger AUC). PSA is also a good predictor of IPSS. The significant relationship between PSA and PV and the IPSS and PSA were also significantly correlated after adjusting by age. The majority of patients were satisfied by the IPSS=QOL score. Our results indicated that PSA levels have a strong association with PV and are also a strong predictor of PV in the present study area. PSA also had a significant correlation with IPSS.

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