

Significance of Prostate Volume (PV) and Prostate Specific Antigen (PSA) in the Diagnosis of various Prostatic Diseases

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Abstract

Original Research Article

Background: The serum prostate specific antigen for the early detection and screening for prostate cancer are very common used among physicians as the best screening tool for prostate cancer. **Objective:** The objective is to determine the Significance Of Prostate Volume And Prostate Specific Antigen In The Diagnosis Of various Prostatic Diseases. **Methodology:** This prospective study was carried out at on 120 patients from July 2018- May 2019. All patients with lower urinary tract symptoms (LUTS), suggestive of prostate enlargement, were included. Patients with urethral strictures, calculi or with a previous history of surgeries and procedures on the prostate were excluded. All patients underwent digital rectal examination, serum PSA measurement and transrectal ultrasonography to measure prostate volume. Prostatic pathology was confirmed by biopsy in all patients after obtaining informed written consent. **Results:** The mean age was 70.05 ± 8.35 years. 52% of the patients had PSA values between 4- 10 ng/ ml. There was no statistical correlation between age and PSA. Digital rectal examination had a sensitivity of 65. 5% for detection of prostate cancer. Prostatic volume, as an independent variable, was not significant in predicting malignancy. Total PSA done in all cases was significant for the detection of cancer at levels >10 ng/ ml. **Conclusion:** Changes in prostate volume (PV) and serum prostate specific antigen (PSA) vary among different ages. Age is found to be significant but showed weak positive correlations with PV and PSA. Only PSA and PV demonstrated a significant and strong positive correlation. The study also demonstrated that serum PSA correlates with age, and this is due to increasing prostate volume with advancing age.

Keywords: Prostate Specific Antigen (PSA), Prostate Volume, Digital rectal Examination (DRE).

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INTRODUCTION

The prostate specific antigen (PSA) assay is considered as the most useful marker for detection of prostate cancer [1, 2]. The prostate cancer is one of the most common malignancies in the world and is the second leading cause of cancer mortality in men. The cancer progress very slowly and asymptomatic at the early stage, patients are unlikely to seek medical help in the early stages. Prostate marker is the only biomarker routinely used in screening and early detection even it has generated considerable debate among physicians as a screening tool. Although PSA is highly specific for prostate, an elevated level is not specific for prostate cancer; some studies have shown increased serum levels of PSA total (tPSA) in benign pathologies [3, 4]. The importance of tPSA and PSA free (fPSA) as tumor marker in evaluation of prostate cancer and also patient at risk is well reported in many studies [5, 6]. Some studies have shown that screening for prostate cancer

may have reduced prostate cancer mortality rates, but this remains controversial [7].

PSA is a prostate-specific, but not specific to prostate cancer, and is also increased in other diseases of the prostate (prostatitis, benign prostatic hyperplasia), and in diagnostic procedures, as well as some of the physiological processes. PSA is increased to about 0.4 ng/mL per gram in benign prostatic hyperplasia (BPH) while this level per gram in cancer rises 10 times, or 4 ng/mL. The increased value of PSA is found in 20% to 50% of men with benign prostatic hyperplasia [8, 9]. Approximately 10% of the male population has a PSA value higher than 10 ng/mL, but don't have cancer.

MATERIAL & METHOD

This prospective study was carried out at Parul Sevashram hospital, Vadodara, Gujarat, India on 120

patients from July 2018- May 2019. All patients with lower urinary tract symptoms (LUTS), suggestive of prostate enlargement, were included. Patients with urethral strictures, calculi or with a previous history of surgeries and procedures on the prostate were excluded. All patients underwent digital rectal examination, serum PSA measurement and transrectal ultrasonography to measure prostate volume. Prostatic pathology was confirmed by biopsy in all patients after obtaining informed written consent.

Serum PSA was estimated on the day of admission before any procedures on the prostate or urethra.

Patients were prepared with proctoclysis enema in the night and early morning, and a transrectal ultrasound was performed on all patients to measure the prostate volume and to calculate the prostate specific antigen density. Prostatic pathology was confirmed by transrectal biopsy in all patients after obtaining informed written consent.

Collected data were tabulated and analyzed for possible association using Chi- square Test, along with sensitivity, specificity and predictive values.

Inclusion Criteria

All patients were admitted with lower urinary tract symptoms (LUTS) suggestive of prostate pathology between 50-80 yr of age group.

Exclusion Criteria

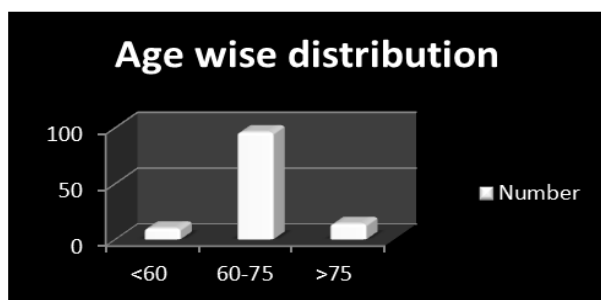
1. Patients with other causes of LUTS like urethral strictures or calculi.
2. Previous history of surgeries or procedures on the prostate.

RESULTS

Study includes Total 120 participants of age group 50-80 year. The mean age in our patient group was 70.05 ± 8.35 yr. 80% of the patients were in the age group between 60 to 75 years (Table-1, Fig-1).

Table-1: Age wise distribution of participants

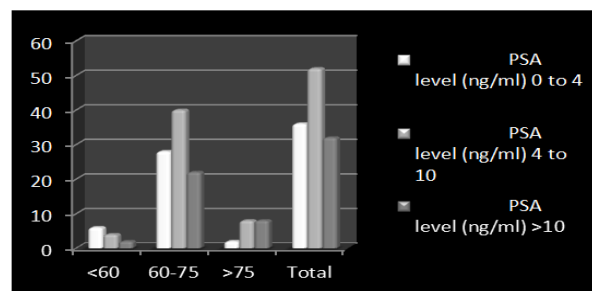
Age group (yr)	Number	Percentage (%)
<60	10	8
60-75	96	80
>75	14	12



Graph-1: Age wise distribution of participants

Table-2: Showing correlation of S.PSA value with different age group

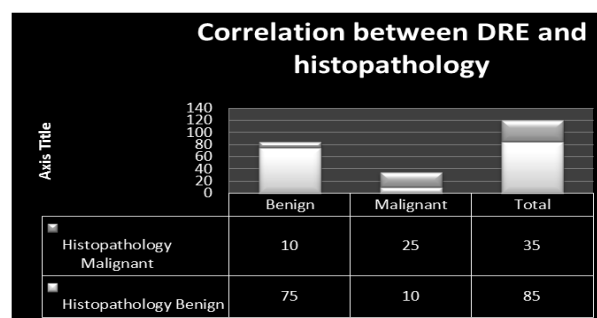
Age group(yr)	PSA level (ng/ml)			Total
	0-4	4-10	>10	
<60	06	04	02	12
60-75	28	40	22	90
>75	02	08	08	18
Total	36	52	32	120



Graph-2: Showing correlation of S.PSA value with different age group

Table-3: Correlation between digital rectal examination and histopathology

DRE	Histopathology		Total
	Benign	Malignant	
Benign	75	10	85
Malignant	10	25	35
Total	85	35	120



Graph-3: Correlation between digital rectal examination and histopathology

Table-4: Correlation between PSA range and histopathology

PSA(ng/ml)	Histopathology		Total
	Benign	Malignant	
0-4	36	-	36
4-10	50	2	52
>10	5	27	32
Total	91	29	120

Table-5: Correlation between PSA >10 ng/ml and histopathology

PSA (ng/ml)	Histopathology		Total
	Benign	Malignant	
<10	78	10	88
>10	04	28	32
Total	82	38	120

DISCUSSION

Prostate-specific antigen (PSA) has been used for prostate cancer detection since 1994. PSA testing has revolutionized our ability to diagnose, treat, and follow-up patients. In the last two decades, PSA screening has led to a substantial increase in the incidence of prostate cancer (PC). This increased detection caused the incidence of advanced-stage disease to decrease at a dramatic rate, and most newly diagnosed PC today are localized tumors with a high probability of cure [10]. PSA screening is associated with a 75% reduction in the proportion of men who now present with metastatic disease and a 32.5% reduction in the age-adjusted prostate cancer mortality rate through 2003. Although PSA is not a perfect marker, PSA testing has limited specificity for prostate cancer detection, and its appropriate clinical application remains a topic of debate. Due to its widespread use and increased over-detection, the result has been the occurrence of over-treatment of indolent cancers. Accordingly, several variations as regards PSA measurement have emerged as useful adjuncts for prostate cancer screening. These procedures take into consideration additional factors, such as the proportion of different PSA isoforms (free PSA, complexed PSA, pro-PSA and B PSA), the prostate volume (PSA density), and the rate of change in PSA levels over time (PSA velocity or PSA doubling time).

The advent and refinement of ultrasound technology has provided a new and important method to examine the prostate. Prostatic volume estimation by transrectal ultrasound is a common clinical procedure. Its uses include the pre-treatment assessment of prostate size and interpretation of elevated prostate specific antigen (PSA) levels. Transrectal ultrasound (TRUS) was initially described as a technique to evaluate rectal pathology. In 1963, Takahashi and Ouchi [11-13]. Were the first to describe the use of TRUS to evaluate the prostate. The first clinically applicable images of the prostate obtained with TRUS, were described in 1967 by Watanabe et al., [14].

Prostate growth appears to be related to prostate volume. Numerous studies have confirmed that prostate volume is an important predictor of BPH progression [15].

In a study by Bohnen et al., 52% of men with PSA ranging from 1.1–1.5 ng/ml and in 65% with PSA ranging from 1.6–2.0 ng/ml, were found to have PV >30cc. They reported that a serum PSA level >1.5 ng/ml could be a functional cut-off value to detect men with PV more than 30 cc.¹⁵ In a retrospective study, patients with PV >40 cc who were treated with different alpha-blockers demonstrated increased risk of treatment failure.¹⁶ In another study, patients receiving tamsulosin and having smaller total PV responded better on flow parameters.¹⁷ PV >30–40 cc is an indication for 5-ARI therapy in patients with moderate-

to-severe LUTS, which is according to the BPH guidelines of the European Association of Urology. ⁹ Thus, patients with bothersome LUTS and PV ≤40 cc may get benefit using alpha-blocker medication, while 5-ARI therapy (with or without an alpha-blocker) is appropriate for those with PV ≥40 cc.

In prostate cancers, a study by Stephen JF [16] concluded that men with smaller prostates had more high-grade cancers and more advanced disease, and suggested that prostate size may be an important prognostic variable that should be evaluated to predict biochemical progression pre- and postoperatively.

1. PSA Density enhances PSA performance. PSA density is calculated as the ratio of Total Serum PSA (ng/ ml) to the Prostatic Gland Volume (ml). Isikay et al., [17] a studied the role of prostate-specific antigen density in the early detection of prostate cancer and assessed the hypothesis that PSAD offers significant advantages over prostate-specific antigen (PSA) alone in the evaluation of patients with benign (BPH), pre-malignant (PIN) and malignant prostatic diseases.

Total serum PSA and Prostate volume were the two main indices taken into consideration in our study. A majority of patients were in the age group of 60-75 years in our study, which corresponds to extensive studies done by other researchers [18, 19]. The relatively higher percentage of patients in the PSA range between 4-10ng/ ml, when compared to larger studies, may be attributed to the other associated features like urinary tract infection and acute retention of urine, as many patients presented to the emergency set up with the above complaints. In the present study, there was no significant rise in serum PSA values with age. This is in contrary to the findings in other larger study populations [20] and may be attributed to the relatively small sample size.

The first clue to a malignant prostate disease is digital rectal examination. In our study, DRE had a sensitivity of 65.5 % in detecting prostate cancer [21]. In a rare study that reported long-term outcome, Gerber et al., [22] and Chodak et al., [23] found that men who had cancer that was discovered on a serial digital rectal examination, seemed to have a more favourable stage shift than men who had cancer that was discovered on initial examination. So, in spite of being a subjective finding in the diagnosis of prostate diseases, it gives the examiner a useful insight to the pathology that he is dealing with.

The PSA density had a high sensitivity (96.55%) and specificity (87.3%) in our study. This is comparable to the larger study done by Van Iersel et al., [24], who had a sensitivity of 92% for the detection of prostatic malignancy at PSAD values > 0.15.

CONCLUSION

Changes in prostate volume (PV) and serum prostate specific antigen (PSA) vary among different ages. Age is found to be significant but showed weak positive correlations with PV and PSA. Only PSA and PV demonstrated a significant and strong positive correlation. The study also demonstrated that serum PSA correlates with age, and this is due to increasing prostate volume with advancing age.

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