

ORIGINAL RESEARCH

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# Prostate-specific antigen increase after urethral catheterisation: fact or myth

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## Abstract

**Background:** To find out any association of urethral catheterisation with rise in serum PSA.

**Methods:** This study was conducted in 80 patients of BPH who had to undergo catheterisation because of acute urinary retention. Patients were divided into two groups: Group A (n = 43 patients), age group 40–60 years, and Group B (n = 47 patients), age group 60–75 years. Values of PSA, free/total PSA and PSA density were recorded in both age groups before catheterisation and one and three days after catheterisation.

**Results:** PSA, PSA density and free/total PSA were not statistically different before and after urethral catheterisation.

**Conclusions:** In the absence of urinary tract infection, urethral catheterisation does not elevate serum PSA. PSA, PSA density and free/total PSA were not statistically different before and after urethral catheterisation.

**Keywords:** Urethral catheterisation, Prostate hyperplasia, Prostate-specific antigen

## 1 Background

Serum PSA is organ-specific but not disease-specific biomarker. Besides prostate carcinoma, PSA is elevated in urinary tract infections, any urinary tract instrumentation. Presumably PSA should be elevated in patients on indwelling catheter.

## 2 Methods

This study was conducted in the Department of Urology and Surgery from November 2016 till date. This was an analytic study. This manuscript follows ethical guidelines and complies with guidelines for human studies and animal welfare regulations. The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki and in accordance with ethical guidelines of practice. Patients have given their written informed consent and that the study protocol follows institute's and ethically approved guidelines.

During this study period involving correlation of serum PSA with transurethral resection of the prostate, 80 patients of BPH who had to undergo urethral catheterisation because of acute urinary retention were enrolled in the study. Urinary tract infection was ruled out in all these patients by taking urine for culture at time of catheterisation. All patients whose urine culture reports after three days suggested urinary tract infection were excluded from study. Patients included in the study were divided into two groups: Group A (n = 43 patients), age group 40–60 years, and Group B (n = 47 patients), age group 60–75 years. Blood sample was simultaneously collected in all patients at time of catheterisation to calculate baseline serum PSA, free/total PSA and PSA density. Further serum samples were taken at 1 and 3 days post-urethral catheterisation to calculate serum PSA, free/total PSA and PSA density.

## 3 Results

The mean age in group A was  $52 \pm 2.1$  years, and it was  $67 \pm 6.4$  years in group B. The mean prostate volume in Groups A and B was 45.26 ml and 43.27 ml, respectively. Serum PSA levels in Group A patients rose from baseline level of  $1.08 \pm 0.12$  ng/ml to  $1.42 \pm 0.24$  ng/ml after 1 day

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of catheterisation and to  $1.37 \pm 0.25$  ng/ml after 3 days of catheterisation and in Group B patients, baseline serum PSA level rose from  $1.68 \pm 0.39$  ng/ml to  $1.84 \pm 0.47$  ng/ml after 1 day of catheterisation and to  $1.87 \pm 0.48$  ng/ml after 3 days of catheterisation. Changes in serum PSA levels in both these groups were not statistically significant. We also calculated baseline PSA density and free/total PSA values 1 and 3 days after catheterisation. As shown in Tables 1 and 2, PSA, PSA density and free/total PSA were not statistically different before and after urethral catheterisation. This result was same in both age groups, and even in older patients, urethral catheterisation did not change PSA, PSA density and free/total PSA.

#### 4 Discussion

PSA is a tumour marker commonly used in diagnosis and treatment of prostate carcinoma. This biomarker is organ-specific but not disease-specific. PSA can be raised in a variety of conditions like urinary tract infections, any instrumentation and prostate carcinoma.

There are very few studies concentrating on correlation of serum PSA with indwelling catheterisation. Rather, it is a commonly held belief that serum PSA is elevated in patients of BPH and patients on indwelling catheter. It is also a well-known fact that patients of BPH can have recurrent urinary tract infections. After excluding patients of urinary tract infection from our study, we observed that serum PSA is not elevated in BPH patients and also non-traumatic urethral catheterisation has no impact on elevation of PSA.

Urethral catheterisation is common procedure performed to treat acute urinary retention. It has been hitherto believed that serum PSA levels are higher in patients on catheter. One study has proposed that prostate biopsy is not necessary in patients with PSA < 10 ng/ml and prostate volume > 60 ml [1]. None of our patients had

prostate volume more than 60 ml, and we are of opinion that treatment of patients with raised serum PSA levels should be tailored as per standard protocols, and at no point of time, rise of serum PSA be correlated with catheterisation.

Gazy F et al. [2] observed that indwelling catheter in patients with BPH who underwent urinary retention did cause a significant elevation of serum PSA in those patients having an elevated PSA at baseline and did not change significantly with normal baseline levels. This means elevation of PSA in the absence of urinary tract infection should not be attributed to catheterisation, as we may be missing some underlying serious problem like prostate carcinoma; diagnosis and treatment of which may be delayed. Again, rise in serum PSA should follow standard protocols, as non-traumatic, aseptic catheterisation causes no rise in serum PSA levels. In our study, all patients had baseline serum PSA less than 4 ng/ml. Most of patients in our study had baseline PSA less than 2 ng/ml, thereby excluding patients with other pathologies of prostate which could indirectly influence results of our study by acting as confounder.

Aslan Y et al. [3] in their study concluded that no alteration was found in total and free serum PSA due to in and out urethral catheterisation in patients of BPH, which is consistent with our study.

Serum PSA does not rise after non-traumatic catheterisation and clean intermittent catheterisation (CIC) in patients with neurogenic bladders [4]. Patients with neurogenic bladder were excluded from our study. However, study by Alisgari M does corroborate our findings that urethral catheterisation has no impact on PSA rise.

Toricelli FC [5] observed that although PSA levels were higher in patients with urethral catheterisation than those on cystostomy tube, it was not clinically significant. We did not include any patients with cystostomy in our

**Table 1 PSA, PSA density and free/total PSA levels in Group A**

Parameter	Before catheterisation	1 day after catheterisation	3 days after catheterisation	P value
PSA (ng/ml)	$1.08 \pm 0.12$	$1.42 \pm 0.24$	$1.37 \pm 0.25$	> 0.05
Free/total PSA	$28.65 \pm 2.21$	$28.15 \pm 2.10$	$28.35 \pm 1.9$	> 0.05
PSA density	$0.045 \pm 0.003$	$0.057 \pm 0.008$	$0.053 \pm 0.007$	> 0.05

**Table 2 PSA, PSA density and free/total PSA levels in Group B**

Parameter	Before catheterisation	1 day after catheterisation	3 days after catheterisation	P value
PSA (ng/ml)	$1.68 \pm 0.39$	$1.84 \pm 0.47$	$1.87 \pm 0.48$	> 0.05
Free/total PSA	$26.15 \pm 1.41$	$27.19 \pm 4.10$	$27.07 \pm 4.9$	> 0.05
PSA density	$0.040 \pm 0.005$	$0.044 \pm 0.005$	$0.46 \pm 0.006$	> 0.05

study. However, findings of our study are in consonance with study by Torricelli F that PSA is not elevated after urethral catheterisation.

Our findings are also in contrast to normally observed PSA in patients of BPH. It is a commonly held belief that about 70% of BPH patients have elevated serum PSA. In our clinical practice, we have observed that many patients with large size prostates have normal PSA and vice versa. This makes us revisit standard dictum that “PSA is organ-specific but not disease-specific.” Our patients under study had maximum prostate volume of 45.26 ml. We tried to eliminate all confounding variables from our study which could independently influence PSA levels. We suggest that as per standard protocols, it is always important to rule out associated urinary tract infection in BPH patients by urine culture. We observed that PSA was not elevated in patients on catheter provided such patients had no urinary tract infection or underlying prostate carcinoma.

## 5 Conclusions

Urethral catheterisation does not lead to rise in serum PSA, if it is performed using sterile precautions and atraumatically. Rise in PSA warrants investigation as per standard protocols, and it should not be correlated with catheterisation only.

### Abbreviations

UTI: Urinary Tract Infections; PSA: Prostate-Specific Antigen; TRUS: Transurethral Resection of Prostate; TURP: Transurethral Resection of Prostate.

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### Authors' contributions

AA and SG collected data of all patients and analysed data to arrive at conclusion. All authors have read and approved the final manuscript.

### Funding

None.

### Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### Ethics approval and consent to participate

This manuscript follows ethical guidelines and complies with guidelines for human studies and animal welfare regulations. The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki and in accordance with ethical guidelines of practice in Government Medical College, Jammu, vide Institutional Ethics Committee number IEC/2017/467. There was no new surgical intervention against the ethical guidelines. During correlation of serum PSA with transurethral resection of prostate, levels of serum PSA were measured to correlate any rise in serum PSA after clean urethral catheterisation. Patients have given their written informed consent.

### Consent for publication

There are no images or other personal or clinical details of patients' that compromise anonymity, so not applicable.

### Competing interests

This is one of the rarest studies to find any alteration in serum PSA following urethral catheterisation. There is no conflict of interest involved in this study.

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