https://doi.org/10.48047/AFJBS.6.15.2024.14975-14984

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Pre and Post Mean Serum Prostatic Specific Antigen Levels After Transurethral Resection of the Prostate (TURP) in Patients with Benign Prostatic Hyperplasia

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Volume 6, Issue 15, Nov 2024

Received: 15 Aug 2024

Accepted: 05 Sep 2024

Published: 21 Sep 2024

doi: 10.48047/AFJBS.6.15.2024.14975-14984

ABSTRACT

Background: Benign prostatic hyperplasia is a condition that becomes more prevalent as individuals grow older and is associated with the process of ageing. There is a correlation between the volume of the prostate and the age of the patient. Ageing is associated with microvascular abnormalities and inflammation, leading to reduced blood flow and increased oxidative stress, ultimately contributing to the development of BPH.

Objective: To ascertain the pre and post mean serum prostatic specific antigen levels following transurethral resection of the prostate (TURP) in individuals diagnosed with benign prostatic hyperplasia

Methodology: An observational study was undertaken in the Department of Urology, SIUT, Karachi, Pakistan. The duration spans six months, specifically from February 1, 2022 to July 31, 2022. All patients who met the specified criteria and visited SIUT in Karachi were included in the study. After providing a detailed explanation of the technique, as well as the potential risks and advantages of the study, informed consent was obtained. The serum PSA levels will be assessed after the surgery, namely on the 30TH and 90th day following the transurethral resection of the prostate (TURP), during a follow-up visit.

Result: The age of the patients varied between 55 and 75 years, with a mean age of 69.50. The levels in the blood of prostatic specific antigen were evaluated before, as well as 30 and 90 days after transurethral resection of the prostate (TURP). The initial prostate-specific antigen (PSA) level before surgery was 9.35±6.22, and after the transurethral resection of the prostate (TURP), the PSA level at the 90th day was 5.28±3.68. The mean disparity in levels was 4.07±2.54, and this disparity was found to be highly significant with a P-value of 0.0001.

Conclusion: There is evidence to suggest that there was a substantial reduction in prostate specific antigen levels after undergoing TURP.

Keywords

Prostate Specific Antigen Levels, TURP, Benign Prostatic Hyperplasia

INTRODUCTION

Prostate-specific antigen (PSA), a glycoprotein enzyme, is released by the epithelial cells of the prostate gland. The presence of normal PSA is largely observed in the epithelium of the central and peripheral zones of the prostatic tissue, indicating its exclusivity to this specific tissue.[1]It is considered the most important and demanding indicator for diagnosing prostate cancer. Prostate cancer, benign prostatic hyperplasia (BPH), prostatitis, digital rectal examination (DRE), and prostatic massage are some of the situations that elevate blood levels of prostate-specific antigen (PSA) [2]. Prostate volume and serum PSA have a high correlation. Currently, transurethral prostate removal is the primary treatment for benign prostatic hyperplasia. Several studies have shown significant changes in PSA levels after TURP.[3] However, there is a lack of sufficient research to assess the impact on resection size, serum PSA levels in persons with benign prostatic hyperplasia

after TURP, or if hyperplastic prostate epithelium can accurately express PSA. The secretion of serum PSA is primarily determined by the transition zone of the prostatic gland, with a notable increase in PSA levels for each gram of tissue [7].

After approximately four weeks following Transurethral Resection of the Prostate (TURP), the levels of prostate-specific antigen (PSA) in the blood recover to their normal values. These levels undergo considerable changes and mostly fall within the range considered normal.[8] The molecular pattern of inflammation has been demonstrated to have an impact on the growth of the prostate. The number of pro-inflammatory cytokines, including as interleukins, transforming growth factor-beta (TGF-β), and tumour necrosis factor-alpha (TNF-α).[9] The presence of growth factors induced by inflammation has been consistently linked to a linear advancement of benign prostatic hyperplasia (BPH).[10] Research has confirmed that testosterone, especially when used in testosterone replacement therapy, leads to an increase in the size of the prostate. Dihydrotestosterone, the biologically active version of the hormone, promotes prostate development by activating the androgen receptor.[11]Prostate-specific antigen (PSA), a biomarker produced by epithelial cells in the prostate, should be strongly correlated with increased levels of benign prostatic hyperplasia (BPH). An enlarged prostate transitional volume, resulting from an unknown direct mechanism, was seen in association with the process of ageing.[12] TURP, or transurethral resection of the prostate, is considered a highly effective treatment for obstruction caused by prostatic hyperplasia.[18] An acknowledged variable that can affect the outcome after transurethral resection of the prostate (TURP) is the alteration in prostate-specific antigen levels. Transurethral resection of the prostate leads to a notable reduction in serum PSA levels, provided that the volume of the prostate removed is more than 30% of its total size. In research articles, Pakistan does not include this type of data as the primary emphasis is on the treatment of the illness rather than the analysis of the physiological changes experienced by patients while they are managing it. Our study aims to determine the average levels of serum prostatic specific antigen before and after transurethral resection of the prostate (TURP) in individuals with benign prostatic hyperplasia. As of now, there has been no research conducted on this subject in Pakistan. This study aims to bridge the existing knowledge gap, initiate a new discourse, and provide valuable insights and data regarding the medical evaluation of patients with BPH. Moreover, these standards and processes would have added significance in the handling of these persons.

METHODOLOGY

An observational study was carried out in the Department of Urology, SIUT, Karachi, between February 1, 2022, and July 31, 2022. Sample size was calculated through Open Epi sample size calculator by using pre and post (90^{th} day) mean ± standard deviation of PSA as (9.82±9.60 v/s 2.56±1.13)[4] ng/ml, Confidence Level (C.I) =95%, Power of test (1-β) =80% then the estimated sample size came out to be n=38, as per statistical assumption of normality we included 40 patients. Sampling technique was non-Probability, Consecutive Sampling. Male patients aged 55 to 75 years with diagnosis of benign prostatic enlargement, gave informed consent were included in study. The following patients were excluded: individuals with cancer detected in their TURP

biopsy, individuals who rejected to participate in the investigation, and those who were lost to follow-up. People who have neurogenic bladder, urethral stricture, or a prostate specific antigen level of >15ng/ml. Individuals who have previously experienced low blood pressure or severe untreated high blood pressure, undergone surgery on the prostate or urethra, have a history of substance abuse, or have significant mental health disorders. Data collection commenced subsequent to obtaining approval from the ethical review committee at SIUT. All patients who visited the Department of Urology at SIUT and met the specified criteria were included in the study. Prior to their involvement in the study, participants provided informed written consent. Patients were chosen from a specialised prostate clinic if they had not responded to medication therapy in terms of symptoms or had experienced urinary retention and had failed two attempts at a trial without a catheter. These patients were considered suitable candidates for surgery, which was carried out by an experienced surgeon. The lead investigator conducted a thorough history and examination. Prior to the surgery, a comprehensive set of tests were conducted, including a complete blood analysis, measurement of urea, creatinine, and electrolyte levels, urine analysis with culture (if positive, it was treated first), serum PSA assessment, and evaluation of prostate volume. The excised tissue was measured immediately after transurethral resection of the prostate (TURP) using an electronic weighing instrument in the operating room. The procedure was performed by the operating urologist, who was aided by a researcher. The TURP specimen was then sent for histopathological analysis. The serum PSA levels will be assessed after the surgery, namely on the 90th day following the transurethral resection of the prostate (TURP), during a follow-up visit. The entirety of the gathered data was inputted into the prearranged proforma. The study was pertinent and focused on its purpose, and appropriate exclusion criteria were employed to mitigate any bias or confounding factors. The data was inputted and analysed using SPSS version-22.0, developed by IBM Corp. Published in 2012. The software being referred to is IBM SPSS Statistics for Windows, specifically Version 22.0. Armonk, NY: IBM Corporation. The normality of the continuous data was assessed using the Mean ± standard deviation. Age, prostate volume, and pre- and post-operative PSA levels were calculated accordingly. A t-test based on paired samples was used to compare the PSA levels prior to and following the surgery on the thirty and the ninety- day. The significance threshold (α) used was 5%. The impact of effect modifiers on before and after PSA levels was evaluated by categorising age and prostate size. Subsequently, the assessment was assessed via a paired sample t-test. A P-value equal to or less than 0.05 is the established criterion for statistically significant differences in assessments.

RESULTS

This study utilised a group of 40 individuals to evaluate the average level of prostatic specific antigen in the circulatory system before and after transurethral resection of the prostate (TURP) in patients diagnosed with benign hyperplasia of the prostate. The ages of the participants ranged from 55 to 75 years, with a mean age of 69.50. The duration of symptoms for benign prostatic hyperplasia (BPH) in the individual ranged from 7 to 36 months. The participants' prostate volume

varied from 1.20 to 12.90 ml. The pre-operative prostate-specific antigen (PSA) values of patients ranged between 0.30 and 18.20 ng/ml, as indicated in Table1. The postoperative prostate-specific antigen (PSA) readings of the patients on the 30th day ranged from 0.50 to 6.70 ng/ml. The postoperative prostate-specific antigen (PSA) levels of the patients fluctuated between 1.50 to 11.20 (ng/ml) on the 90th day as depicted in Table 2. The average ± standard deviation of serum prostatic specific antigen levels prior to and following transurethral resection of the prostate (TURP) on the 30th day were found to be 9.35±6.22 and 3.35±2.27, respectively. The average change was 6.00±3.95, with a very significant P-value of 0.0001. The mean and ± standard deviation of serum prostatic specific antigen levels prior to and following transurethral resection of the prostate (TURP) on the 90th day were determined to be 9.35±6.22 and 5.28±3.68, respectively. The mean change was determined to be 4.07±2.54, and the P-value was found to be very significant (P=0.0001), as stated in Table 2.

Age, duration of BPH, and prostate volume were stratified based on pre-operative and post-operative PSA levels at the 90th day to evaluate any statistical differences, as shown in Table 3.

Table 1 DESCRIPTIVE STATISTICS (n=40)

VARIABLE	MEAN	SD	MINIMUM	MAXIMUM
AGE(years)	**66.50**	**6.790**	**55**	**75**
DURATION OF BPH(months)	**15.25**	**8.092**	**7**	**36**
PROSTATE VOLUME(ml)	**5.89**	**3.62140**	**1.2**	**12.9**
PRE-OPERATIVE PSA LEVEL(ng/ml)	**9.35**	**6.22**	**0.30**	**18.2**
POST-OPERATIVE PSA LEVEL AT 30TH DAY(ng/ml)	**3.35**	**2.27**	**0.5**	**6.70**
PSA LEVEL AT 90TH DAY (ng/ml)	**5.28**	**3.68**	**1.5**	**11.2**

Table 2: COMPARISON OF PRE-OPERATIVE PSA LEVEL AND POST-OPERATIVE PSA LEVEL AT 30TH DAY/90th day (n=40)

COMPARISON	MEAN	±SD	CHANGE	P-VALUE
PRE-OPERATIVE PSA LEVEL (ng/ml)	**9.35**	**6.22**	**6.00±3.95**	**0.0001**

POST-OPERATIVE PSA LEVEL AT 30TH DAY (ng/ml)	**3.35**	**2.27**		
COMPARISON	**MEAN**	**±SD**	**CHANGE**	**P-VALUE**
PRE-OPERATIVE PSA LEVEL (ng/ml)	**9.35**	**6.22**	**4.07±2.54**	**0.0001**
POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**5.28**	**3.68**		

Table 3 STRATIFICATION OF AGE GROUP/DURATION OF BPH/ PSA VOLUMEWITH PRE-OPERATIVE PSA LEVEL AND POST-OPERATIVE PSA LEVEL AT 90TH DAY n=40

AGE GROUP [In Years]		**MEAN**	**±SD**	**CHANGE**	**P-VALUE**
55 – 65 (n=15)	**PRE-OPERATIVE PSA LEVEL (ng/ml)**	**8.38**	**6.43**	**3.05±2.71**	**0.055**
	POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**5.33**	**3.72**		
>65 (n=25)	**PRE-OPERATIVE PSA LEVEL (ng/ml)**	**9.94**	**6.16**	**4.68±2.44**	**0.002**
	POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**5.26**	**3.72**		
DURATION OF BPH [In Months]		**MEAN**	**±SD**	**CHANGE**	**P-VALUE**
7 – 15 (n=25)	**PRE-OPERATIVE PSA LEVEL (ng/ml)**	**9.48**	**6.41**	**3.52±2.47**	**0.015**
	POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**5.96**	**3.94**		

>15 (n=15)	**PRE-OPERATIVE PSA LEVEL (ng/ml)**	**9.14**	**6.11**	**4.98±3.12**	**0.005**
	POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**4.16**	**2.99**		

PROSTATE VOLUME [In ml]		**MEAN**	**±SD**	**CHANGE**	**P-VALUE**
1.2 – 5.8 (n=20)	**PRE-OPERATIVE PSA LEVEL (ng/ml)**	**7.81**	**4.97**	**4.13±2.04**	**0.0001**
	POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**3.68**	**2.93**		
>5.8 (n=20)	**PRE-OPERATIVE PSA LEVEL (ng/ml)**	**10.89**	**7.06**	**4.00±3.36**	**0.040**
	POST-OPERATIVE PSA LEVEL AT 90TH DAY (ng/ml)	**6.89**	**3.70**		

DISCUSSION

Benign prostatic hyperplasia (BPH) is a common condition that often leads to elevated levels of prostate-specific antigen (PSA) in the blood, surpassing 4 ng/ml. This occurrence is more widespread than malignancy. When benign prostatic hyperplasia (BPH) leads to substantial blockage of urine flow, the recommended therapy is prostatectomy. This can be done either through transurethral resection (TURP) or open enucleation of the adenomatous tissue, with the goal of completely removing all adenomatous tissue. Prior research conducted by our group and other researchers has demonstrated a strong correlation between the quantity of removed adenomatous tissue and the volume of the transition zone, as determined using trans rectal ultrasonography (TRUS) measurements. [13,14] The prostate volume, measured in cubic centimetres, can be directly converted into the weight of tissue that is removed during surgery due to the similar density of prostate tissue, which is approximately 1.0.[15] The decrease in serum PSA levels following TURP has been documented, however, no associations have been shown between this reduction and the extent of the resection.[16] According to Chun-Te Wu *et al*, it is a well-established fact that blood PSA levels typically fall after undergoing a TURP operation.[17]

A recent study discovered that the levels of serum prostate-specific antigen (PSA) had fluctuations on both the 30th day and 3 months following the surgery. The pre-operative blood prostate-specific antigen (PSA) level was measured to be 9.82 ±9.60 (ng/ml). The blood PSA levels were measured

to be 5.40±4.04 ng/ml on day 5, 3.5±3.15 ng/ml on day 30, and 2.56±1.13 ng/ml on day 90 after the surgery.[4] A study conducted in Sweden found that the mean levels of prostate-specific antigen (PSA) reduced by 70% within a period of three to four months, decreasing from 6.0 to 1.9 ng/ml. The prostate's volume reduced from 63.3 to 26.5 ml, yielding in a 58% reduction.[5] An investigation carried out in Iran revealed that people who underwent TURP (transurethral resection of the prostate) exhibited a significant decrease in PSA (prostate-specific antigen) levels, with a mean reduction of 67.3 percent. In addition, there was a consistent decrease of 0.15 ng/ml in PSA values for each gram of prostatic tissue that was removed.[6]
The study found that the mean ± standard deviation of serum prostatic specific antigen levels before and after TURP at 30 days were 9.35±6.22 and 3.35±2.27, respectively. The variation had a mean value of 6.00, accompanied by a standard deviation of 3.95. The P-value, representing the statistical significance of the change, was determined to be 0.0001. The average ± variability of serum prostatic specific antigen levels 90 days before and after TURP were 9.35±6.22 and 5.28±3.68, respectively. The mean decrease was 4.07±2.54, having a significant statistical P-value (P=0.0001).
Further research is required to assess the statistical significance of the findings in the current investigation. This can be achieved through expanding the number of participants and considering additional parameters in different study locations in Pakistan.

CONCLUSION:
The present study demonstrates that TURP results in a significant reduction in prostate specific antigen levels.

CONFLICT OF INTEREST: Authors declared no conflict of interest.

ACKNOWLEDGEMENT: None to declare

FUNDING: No specific funding was taken from any public or private organizations

AUTHORS' CONTRIBUTION:

Vikram seetlani, Faisal hanif, Kanwal Naz Sanjeet : Conception and designing, collection and analysis of data, primary drafting of the paper and final approval.

Vikram, kanwal: Acquisition of data, critical review of the paper.

Izhar, Rabiullah, Tanzeel : Critical review and final approval of the manuscript.

REFERENCES

1. Nadji M, Tabei SZ, Castro A, Chu TM, Murphy GP, Wang MC, et al. Prostatic-specific antigen: an immunohistologic marker for prostatic neoplasms. Cancer. 1981;48(5): 1229-32.
2. Schatteman PH, Hoekx L, Wyndaele JJ, Jeuris W, Van Marck E. Inflammation in prostate biopsies of men without prostatic malignancy or clinical prostatitis. Eur Urol. 2000;37(4): 404-12.
3. Roehrborn CG, Boyle P, Gould AL, Waldstreicher J. Serum prostate-specific antigen as a predictor of prostate volume in men with benign prostatic hyperplasia. Urology 1999;53 (3):581-9.
4. Liu J, Tang J, Gong D, Kong C. Level change of prostate-specific antigen in patients with benign prostatic hyperplasia after transurethral prostatic resection. J Integr Nephrol Androl 2017;4(1):10-3.
5. Aus G, Bergdahl S, Frösing R, Lodding P, Pileblad E, Hugosson J. Reference range of prostate-specific antigen after transurethral resection of the prostate. Urology. 1996;47 (4):529-31.
6. Hosseini SY, Salimi MR, Hosseini MS. Changes in serum prostate-specific antigen level after prostatectomy in patients with benign prostatic hyperplasia. 2005;2:183-8.
7. Pahwa M, Pahwa M, Pahwa AR, Girotra M, Chawla A, Sharma A. Changes in S-PSA after transurethral resection of prostate and its correlation to postoperative outcome. Int Urol Nephrol. 2013;45(4):943-9.
8. Fonseca RC, Gomes CM, Meireles EB, Freire GC, Srougi M. Prostate specific antigen levels following transurethral resection of the prostate. Int Braz J Urol 2008;34(1):41-8.
9. Oka AA, Duarsa GW, Novianti PA, Mahadewa TG, Ryalino C. The impact of prostatetransurethral resection on erectile dysfunction in benign prostatic hyperplasia. Res Rep Urol. 2019;11:91-6.
10. Duarsa GW, Oka AA, Maliawan S, Soebadi DM, Astawa P, Bakta M, et al. Elevated tumor necrosis factor-α and transforming growth factor-β in prostatic tissue are risk factors for lower urinary tract symptoms after transurethral resection of the prostate in benign prostatic hyperplasia patients with urinary retention. Open Urol Nephrol J. 2018; 11(1):46-53.
11. Putra IBOW, Hamid ARAH, Mochtar CA, Umbas R. Relationship of age, prostate-specific antigen, and prostate volume in Indonesian men with benign prostatic hyperplasia. Prostate Int. 2016;4(2):43-8.
12. Duarsa GW, Dau DO, Pramana IB, Tirtayasa PM, Yudiana IW, Santosa KB, et al. Risk factors for prostate volume progression after prostate-transurethral resection. Res Rep Urol. 2020;12:175.
13. Aus G, Bergdahl S, Hugosson J, Norlen L. Volume determinations of the whole prostate and of adenomas by transrectal ultrasound in patients with clinically benign prostatic hyperplasia: correlation of resected weight, blood loss, and duration of operation. Br J Urol 1994;73:659-63.

14. Lloyd SN, Collins GN, McKelvie GB, Hehir M, Rogers AC. Predicted and actual change in serum PSA following prostatectomy for BPH. Urology 1994;43:472-9.
15. Watanabe H, Igari D, Tanashi Y, Harada K, Saitoh M. Measurements of size and weight of prostate by means of transrectal ultrasonotomography. Tohoku J Exp Med 1974;114: 277-85.
16. Stamey TA, Yang N, Hay AR, McNeal JE, Freiha FS, Redwine E. Prostate-specific antigen as a serum marker for adenocarcinoma of the prostate. N Engl J Med 1987;317:909-16.
17. Wu CT, Huang YC, Chen WC, Chen MF. The predictive role of prostate-specific antigen changes following transurethral resection of the prostate for patients with localized prostate cancer. Cancers. 2020 Dec 29;13(1):74.
18. Chen Z, Zhang R, Lin R, Lin L, Zhu Q, Ye L, Li T, Wei Y. Comparisons of cancer-specific and overall mortality in patients with biopsy-and TURP-diagnosed prostate cancer: a population-based propensity score-matching study. Journal of Men's Health. 2024;20(2):72-83.