

PROSTATE SPECIFIC ANTIGEN LEVEL FOLLOWING TRANSURETHRAL RESECTION OF THE PROSTATE

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ABSTRACT

Objective: To evaluate the correlation of the weight of the resected prostate with the reduction of the PSA level. **Material & Methods:** This is a prospective study of all BPH patients undergoing TURP procedure in Kardinah Hospital, Tegal, with a timeframe of April–June 2018. Patients consumed α -blocker and 5- α reductase inhibitor medication before the procedure were eliminated from the study. The data collected were the estimated prostate weight calculated using transabdominal ultrasonography (TAUS) of the prostate, PSA level before and after the procedure, and the calculated weight of the resected prostate. The resected tissues of the prostate were examined by an anatomy pathologist and the PSA level will be examined at 1, 14, and 30 days after the surgery. Data was analyzed using repeated measure ANOVA with SPSS version 23.0. **Results:** We included 35 cases of prostate enlargement in our center. 2.8% of the patients didn't undergo definitive surgical procedure due to be postponed with various reasons. The patients mean age is 64.2 ± 8.26 with average BMI is $21.8 \pm 3.56 \text{ kg/m}^2$. The median value of the prostate volume is 43.8 mL. The median preoperative PSA level was 8.7 ng/dL, while the median value of the 1st day, 14th days, and 30th days post-operative PSA level were 17.67 ng/dL, 6.93 ng/dL, and 3.2 ng/dL, respectively, with significant reduction of PSA level ($p < 0.001$). **Conclusion:** PSA level post-TURP shows a significant decrease. Every milliliters (mL) prostatic tissue resected could reduce the PSA level for 0.11 ng/mL. This calculation could further be used to predict how much tissue needed to resect, to treat the symptoms, and obtain normal PSA level. In addition, further research is needed, especially with larger sample size and longer follow up period to confirm these findings.

Keywords: Benign prostate hyperplasia, resection of the prostate, prostate specific antigen.

ABSTRAK

Tujuan: Mengetahui korelasi antara berat prostate yang direseksi dengan penurunan kadar PSA. **Bahan & Cara:** Studi ini merupakan studi prospektif dari semua pasien BPH yang menjalani prosedur TURP di RSUD Kardinah, Tegal pada bulan April–Juni 2018. Pasien dengan terapi penyekat alfa dan 5- α reductase inhibitor dieliminasi dari studi. Data yang dikumpulkan adalah perkiraan berat prostat yang didapatkan dari pemeriksaan ultrasonografi prostat transabdominal, kadar PSA sebelum dan setelah prosedur, dan berat prostat yang direseksi. Jaringan prostat yang direseksi diperiksa oleh ahli patologi anatomi dan kadar PSA diperiksa pada hari 1, 14, dan 30 setelah pembedahan. Data dianalisis dengan ANOVA dengan SPSS versi 23. **Hasil:** Terdapat 35 kasus pembesaran prostat. 2.8% pasien tidak menjalani prosedur pembedahan karena berbagai sebab. Rerata usia pasien adalah 64.2 ± 8.26 tahun dengan rerata IMT $21.8 \pm 3.56 \text{ kg/m}^2$. Nilai median volume prostat adalah 43.8 mL. Nilai median kadar PSA preoperative adalah 8.7 ng/dL, sedangkan nilai median kadar PSA hari pertama, hari ke-14, dan hari ke-30 pasca operasi adalah 17.67 ng/dL, 6.93 ng/dL, dan 3.2 ng/dL dengan penurunan yang signifikan dari kadar PSA ($p < 0.001$). **Simpulan:** Kadar PSA pasca TURP menunjukkan penurunan yang signifikan. Setiap milliliter jaringan prostat yang direseksi dapat menurunkan kadar PSA sebesar 0.11 ng/mL. Perhitungan ini dapat digunakan lebih lanjut untuk memperkirakan banyaknya jaringan yang perlu direseksi, untuk mengobati gejala dan untuk mendapatkan kadar PSA normal. Studi lebih lanjut masih diperlukan, terutama dengan sampel yang lebih besar dan waktu follow up yang lebih lama untuk mengkonfirmasi temuan ini.

Kata Kunci: Pembesaran prostat jinak, reseksi prostat, prostate specific antigen.

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INTRODUCTION

Serum prostate specific antigen (PSA) becomes the most useful marker for diagnosis, staging, monitoring, and predicting prognosis of prostate cancer.¹ This PSA level allows early diagnosis and a chance for successful treatment of prostate cancer. However, PSA is not a cancer specific marker, and other factors can increase its level as well.² Serum PSA level may rise in patients with prostate cancer, benign prostate hyperplasia (BPH), infection of prostate, or undergoing transurethral resection of prostate (TURP). The PSA rises are related to the stimulation strength of the procedures. After a patient undergone several procedures, such as prostate massage, rigid cystoscopy, transrectal ultrasonography (USG) guided prostate biopsy, and TURP, the total and free PSA levels increase significantly from 10 min after procedures and the highest level is at 60 min after procedures.¹ Serum PSA levels can decrease after prostatectomy, treatment with 5- α reductase inhibitor, luteinizing hormone-releasing hormone analog and antiandrogen, and radiation.³

Currently, TURP is the established gold standard surgical treatment for benign prostatic hyperplasia (BPH).⁴ Estimated among 3-15% of patients may experience recurrence of BPH after 5 years of TURP and require another intervention.⁵ The incline of the PSA value after TURP can be explained by reduction of prostate volume.⁶ Therefore, we would like to know of the correlation of the weight of the resected prostate with the reduction of PSA level.

OBJECTIVE

To evaluate the correlation of the weight of the resected prostate with the reduction of PSA level.

MATERIAL & METHODS

This prospective observational study was conducted to all BPH patients undergoing TURP procedure in Kardinah Hospital, Tegal, during the timeframe of April-June 2018. However, patients with history of α -blocker and 5- α reductase inhibitor medication before the procedure were eliminated from this study. Estimated prostate weight calculated using transabdominal ultrasonography (TAUS) of the prostate, PSA level before and after the procedure, and the calculated weight of the resected prostate were regarded as patients' characteristics. The resected tissues of the prostate were examined by a pathologist and the PSA level will be examined at 1, 14, and 30 days after the surgery. Data was analyzed using repeated measure ANOVA with SPSS version 23.0.

RESULTS

We included 35 cases of prostate enlargement in our center. Not all of the patients underwent definitive surgical procedure due to be postponed with various reasons (n=1, 2.8%). Means of patients age were 64.2 ± 8.26 years and BMI of 21.8 ± 3.56 . Preoperatively, median prostate volume was found to be 43.8 mL with minimum to maximum value of 13-111 mL with median PSA level of 8.7 ng/dL with minimum to maximum value of 0.98-51 ng/dL. Intraoperatively, median resected prostate volume among study subjects was 32.0 mL with minimum to maximum value of 10-68 mL respectively.

After accounting for normality test, first day post-operative PSA level median among study subjects was 17.67 (1.91-76.20) ng/dL and was set to be the reference value. Significant reduction ($p < 0.001$) was found in the 14th days post-

Table 1. Characteristic of Patients (N=35).

Parameters	N (%)
Age, years (mean \pm SD)	64.2 \pm 8.26
BMI, kg/m ² (mean \pm SD)	21.8 \pm 3.56
Pre-operative parameters	
Prostate Volume, ml (median(min-max))	43.8 (13-111)
PSA Level, ng/dL (median(min-max))	8.7 (0.98-51)
Intraoperative parameters	
Resected Prostate Volume	32.0 (10-68)

Table 2. Statistical Analysis, Comparison between Post-operative PSA level.

Variables	Median (Min-Max)	Overall p value	P value between groups
1 st day post-operative PSA level	17.67 (1.91-76.20)	<0.001 ^a	reference
14 th days post-operative PSA level	6.93 (1.37-64.87)		<0.001 ^b
30 th days post-operative PSA level	3.2 (0.93-11.54)		0.001 ^b

^aFriedmann Test; ^bWilcoxon Test

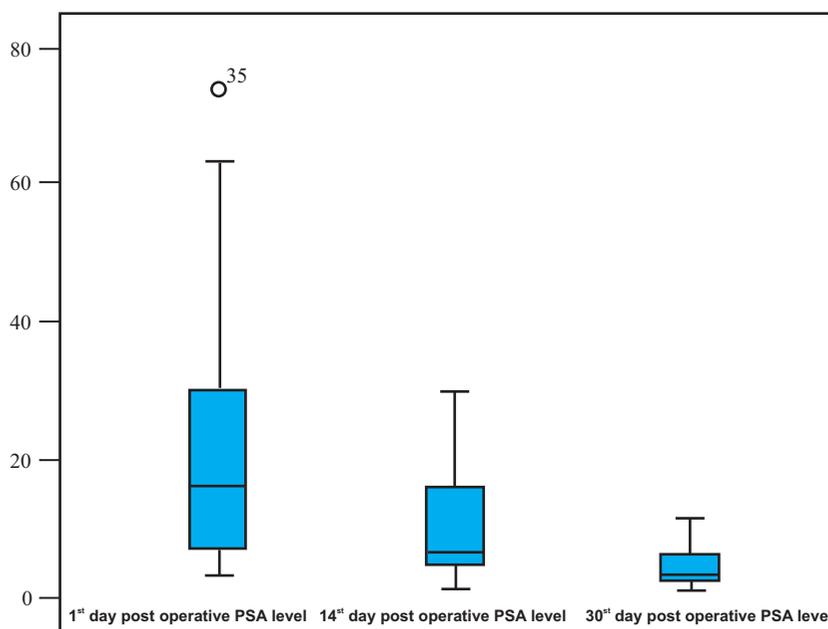


Figure 1. Box plot, trends of post-operative PSA levels.

operatively with median PSA level of 6.93 ng/dL and minimum to maximum value of 1.37-64.87 ng/dL. Similar statistically significant reduction of PSA was also found during remeasurement on the 30th days of post-operative PSA level with median of 3.2 ng/dL and 0.93-11.54 as minimum to maximum value respectively.

DISCUSSION

BPH is a condition which mostly affects men who are more than 45 years old.⁷ The subject of this study is 64.2 ± 8.26 years old on average. The prevalence of BPH or lower urinary tract symptoms (LUTS) increased with age. The prevalence rate is lowest among males 45-49 years of age (2.7%) and increases with age until a maximum at the age of 80 years (24%).⁸ Not only age was a risk factor of BPH, but also body mass index (BMI) was proven as one of the risk factors of BPH. A meta-analysis from Wang et al, concluded several literatures suggested that

BMI was associated with increased risk of BPH. However, further studies needed to confirm the findings the underlying mechanism.⁹

This study was conducted to show how a TURP procedure affecting the PSA level. We found that the median value of the preoperative PSA level was 8.7 ng/dL, while the median value of the 1st day post-operative PSA level increased to 17.67 ng/dL. This elevated PSA level might be due to various reasons, such as bladder outlet obstruction, prostate massage, rigid cystoscopy, TRUS-guided prostate biopsy, and TURP procedures.¹ Other factors might be due to incomplete resection of the prostate, the possibility of cancer, and the presence of inflammatory factors after the procedure.¹⁰ However, 14 days after the surgery, PSA level showed significant deterioration (p<0.001) and reached a normal PSA level on the 30th day post-operative. It is in line with previous studies stated that patients undergoing TURP showed significant decline in IPSS score, prostate size and serum PSA levels.¹⁰

After a complete TURP with benign histological feature, PSA was expected to be within the normal range (<4 ng/mL).¹¹ PSA level might be deployed as a marker or a warning sign to predict any elevation of the PSA level in the future after TURP.¹² In addition, the PSA level might become a surrogate marker for predicting prostate volume. The average PSA level of 1.2 ng/mL, 2 ng/mL, and 3.9 ng/mL correlate with total prostate volume below 25 mL, 25 to 40 mL, above 40 mL, respectively.

Pahwa et al. stated in their study that there was a significant positive correlation of the amount of tissue resected with change in serum PSA levels.¹⁰ There were various results of the mean reduction levels following resection of the prostatic tissue. Stamey et al. calculated that each gram of prostatic tissue resected reduces PSA levels by 0.3 ng/mL. In addition, Lloyd et al. found a reduction of 0.09 ng/mL in serum PSA. However, Marks et al. showed a mean reduction of 0.11 ng/mL of PSA per gram of prostatic tissue resected, that was likely to be similar to the current study.^{2,14,15}

CONCLUSION

TURP procedure remains the gold standard of BPH therapy and postoperative data shows a decrease in PSA level after TURP. Every milliliters (mL) prostatic tissue resected could reduce the PSA level for 0.11 ng/mL. This calculation could further be used to predict how much tissue needed to resect, to treat the symptoms and obtain normal PSA level. In addition, further research is needed, especially with larger sample size and longer follow up period to confirm these findings.

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