



## The Effect of Bilateral Orchiectomy on Total Prostate Specific Antigen (TPSA) Levels in Prostate Adenocarcinoma Patients

\* Wikan Kurniawan

Universitas Gadjah Mada Academic Hospital

\*Corresponding author: [wikankurniawan@ugm.ac.id](mailto:wikankurniawan@ugm.ac.id)

Publish: March 2024

---

### Abstract

**Background:** Hormonal therapy is one treatment option for prostate cancer. There are two main categories of hormone therapy: surgical therapy and non-surgical therapy. Orchiectomy is the surgical method of hormone therapy; medication supplementation is the non-surgical method. Many kinds of indicators are used to track the advancement of patients with prostate cancer receiving hormone therapy. tPSA levels are one of the markers that are regularly evaluated.

**Methods:** In this retrospective study, PSA levels in patients with prostate adenocarcinoma cancer were evaluated before and after bilateral orchiectomy. Use the search terms "prostate cancer" and "orchiectomy" to find research subject data in the UGM Academic Hospital's medical records installation between 2020 and 2023. The study's findings will be shown in a graphic and statistical analysis while protecting the subjects' anonymity.

**Results:** Most of the participants (n=18, 60.0%) have pre-orchiectomy tPSA level of more than 30 ng/mL, while only almost a quarter (n=7, 23.3%) of participants have post-orchiectomy tPSA level of more than 30 ng/mL. The two research groups ( $p < 0.0001$ ) before and after the orchiectomy procedure, significantly differ between the two research groups based on Wilcoxon paired sample test analysis.

**Conclusion:** tPSA levels are considerably decreased by bilateral orchiectomy.

**Keywords:** Prostate cancer, Orchiectomy, PSA levels

## 1. Introduction

Hormonal therapy is one treatment option for prostate cancer. In the treatment of prostate cancer, hormonal therapy is crucial. The proliferation of most prostate cancer cells may be theoretically suppressed by androgen ablation achieved through surgical or pharmacological castration. This happens because, following castration, the serum testosterone concentration falls to less than 50 ng/mg. Since hormonal therapy works in over 90% of instances, it remains the primary line of treatment for advanced prostate cancer. For elderly patients with localized prostate cancer, hormonal therapy is also the main course of treatment (1).

Due to its affordability and effectiveness as a castration technique, orchiectomy is a mainstay in the treatment of severe PCa. By removing the testicles surgically, tumor burden and related indicators of androgen responsiveness are reduced due to a decrease in serum testosterone (2,3).

A drop in PSA to less than 4 ng/mL in men using ADT alone is indicative of a favorable response. PSA tests, if the patient has no symptoms, might be planned for every three to six months. Changes in serum PSA levels as well as results from CT and bone scans can be used to assess treatment response, while opinions on how frequently these tests should be carried out are divided. Typically, an increase in PSA levels occurs many months before clinical symptoms manifest (4).

PSAt levels were compared in this study between pre- and post-orchietomy. The stage at which the malignancy was detected was correlated with PSAt levels both before and after orchietomy. Diagrams or pictures that are relevant will be used to display the data. To determine significance, a non-parametric statistical analysis will be performed. To evaluate the association with the cancer diagnosis stage, multivariate analysis was done.

## 2. Methods

This research employed a retrospective cross sectional study design using a clinical data obtained from patient medical records to identify the differences of tPSA level among patients with

prostate adenocarcinoma cancer between pre-orchietomy and post-orchietomy in Academic Hospital Universitas Gadjah Mada. This study adheres to The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (5).

In this retrospective study, PSAt levels in prostate adenocarcinoma cancer patients were evaluated before and after bilateral orchietomy. The search terms "prostate cancer" and "orchietomy" were used to find data on research subjects in the medical records installation of the Academic Hospital Universitas Gadjah Mada who underwent orchietomy between January 1, 2020 and December 31, 2023. The inclusion criteria for this patient were prostate adenocarcinoma patients with an ECOG score of 3 or 4 who underwent bilateral orchietomy during the study period. Exclusion criteria if the required medical record data is incomplete.

Data analysis of this study used Saphiro-Wilk test and followed with Wilcoxon paired sample test to assess the difference tPSA values between the two groups, pre-orchietomy and post-orchietomy. This analysis uses a confidence level of 95%.

Ethics permission for performing this study was granted from the Medical and Health Research Ethics Committee, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia, with the letter number KE/FK/0499/EC/2024 that published on March 28, 2024.

## 3. Results

A total of thirty over 60 years old men suffering from prostate adenocarcinoma with an ECOG score of 3 or 4 who underwent bilateral orchietomy between January 1, 2020 and December 31, 2023 were recruited. Most participants (n=18, 60.0%) showed pre-orchietomy tPSA levels of more than 30 ng/mL, while only almost a quarter (n=7, 23.3%) of participants had post-orchietomy tPSA levels of more than 30 ng/mL. mL (Figure 1 and Figure 2).

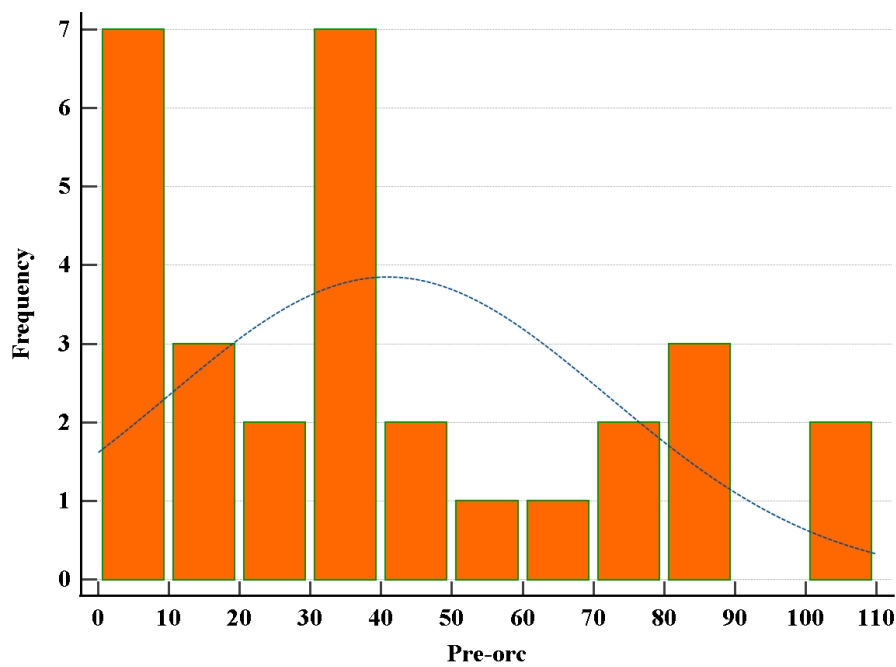


Figure 1. Distribution of pre-orchietomy tPSA levels histogram

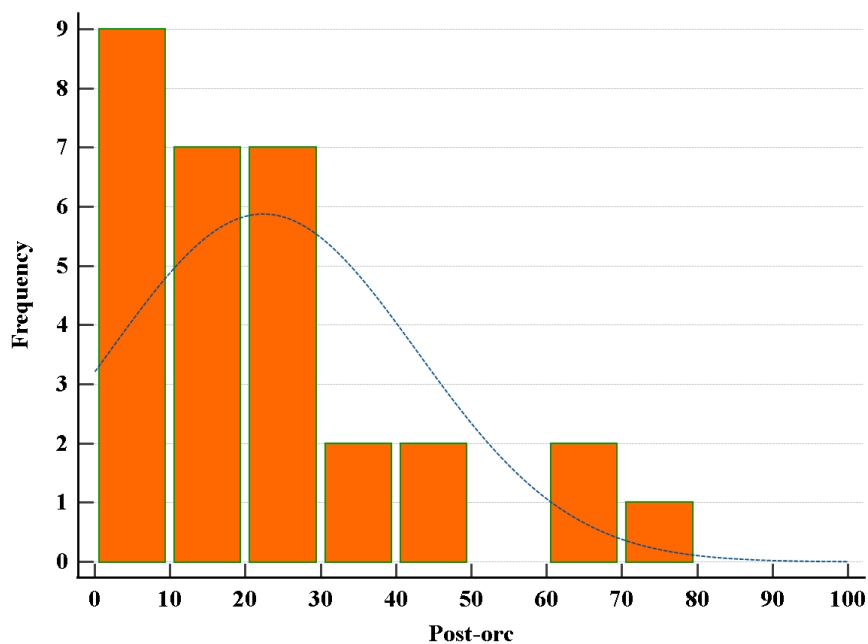


Figure 2. Distribution of tPSA values following orchietomy histogram

The variations in median values of tPSA measure during the course of the study, both before and after orchietomy procedure, is significantly different between the two research groups ( $p < 0.0001$ ) based on Wilcoxon paired sample test

analysis (Table 1). Generally, the median level of pre-orchietomy tPSA (95% CI 18.16 – 45.22) is higher than post- orchietomy tPSA (95% CI 10.17 – 24.08), 34.88 ng/mL and 15.60 ng/mL, respectively.

**Table 1.** Changes in tPSA levels following orchiectomy procedure among patients with prostate adenocarcinoma (n=30)

Characteristics	Range	Median	95% CI	P value
Pre- orchiectomy tPSA levels	4.11 – 100.00	34.88	18.16 – 45.22	<0.0001
Post- orchiectomy tPSA levels	1.11 – 76.24	15.60	10.17 – 24.08	

#### 4. Discussion

In the 1940s, Huggins and Hodges provided evidence of the therapeutic benefits of gonadal testosterone deprivation. Since then, it has been established that prostate cancer is a condition that is heavily androgen-dependent (6). At first, hormonal therapy methods consisted of surgical castration and/or estrogen therapy. Such treatment is only used in advanced prostate cancer, because the results of surgical castration are permanent androgen deficiency. Hormonal therapy is often used as neoadjuvant and/or adjuvant therapy in patients undergoing radical prostatectomy or radiotherapy. Moreover, hormonal therapy is sometimes used as primary therapy treatment for localized prostate cancer, especially in the elderly patient (1). Orchiectomy is regarded as a straightforward, safe technique that can be used to treat prostate cancer without causing any major negative effects (7). Orchiectomy involves the surgical removal of the testes (8). Very old patients who have an ECOG score of 3 or 4 prefer the orchiectomy procedure because it has fewer risks and is also cheaper from an economic perspective. Economically, using the orchiectomy method is much cheaper than using the luteinizing hormone releasing hormone (LH-RH) method. According to Mariani et al (2001) the luteinizing hormone releasing method (LH-RH) exceeds the cost of surgery in less than 4.2 to 5.3 months (9). In addition, the orchiectomy method can help relieve symptoms, prevent complications and extend the life expectancy of prostate cancer patients. Patients at UGM Hospital are generally elderly and many of them have poor ECOG scores. Radical therapy cannot be carried out if the patient's general condition is not good so the patient chooses this therapy.

Serum prostate specific antigen (PSA) levels after definitive treatment for prostate cancer (PC) are a strong predictor of outcome (10). There are many types of modalities to assess patient progress. Both sophisticated and expensive modalities and simple but quite accurate ones.

The use of tPSA to assess the progress of prostate cancer therapy in addition to using CT scans, MRI, bone surveys and bone scintigraphy. On this occasion, researchers presented tPSA in assessing the development of prostate cancer therapy. This study showed that tPSA levels were lowered with hormone therapy along with bilateral orchiectomy. Kan et al (2017) recommend a bilateral orchiectomy as a cancer prostate treatment. Bilateral orchiectomy is a medical procedure that declines testosterone to castration levels within twelve hours (11). This suggests that there is a growth inhibition of prostate cancer. But regular surveillance is required.

Overall, patients receiving definitive curative treatment are thought to have a recurrence incidence of between 25% and 40% following definitive therapy (radiation or major surgery) (12). So routine and ongoing follow-up is needed for prostate adenocarcinoma cancer patients.

#### 5. Conclusion

Bilateral orchiectomy in patients with prostate adenocarcinoma reduces PSA levels significantly. Research is needed over a longer period of time to assess disease progression.

#### 6. Statement

This research was carried out after obtaining approval from the Medical and Health Research Ethics Committee (MHREC) Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada - DR Sardjito General Hospital, Ref. no.: KE/FK/0499/EC/2024 on March 28 2024.

#### References

- Namiki, M., Ueno, S., & Kitagawa, Y. (2012). Role of hormonal therapy for prostate cancer: Perspective from Japanese experiences. *Translational Andrology and Urology*, 1(3), 160–172. <https://doi.org/10.3978/j.issn.2223-4683.2012.07.03>
- Atta, M. A., Elabbady, A., Sameh, W., Sharafeldeen, M., & Elsaqa, M. (2020). Is there

- still a role for bilateral orchidectomy in androgen-deprivation therapy for metastatic prostate cancer? *Arab Journal of Urology*, 18(1), 9–13. <https://doi.org/10.1080/2090598X.2019.1690270>
3. Sarin Itty, R. H. G. (2020). How do we define “castration” in men on androgen deprivation therapy? *Asian Journal of Andrology*, 21(July), 1–4. <https://doi.org/10.4103/aja.aja>
  4. N. Motet, P. Cornford, R.C.N. van den Berg, E. Briers, D. E. et al. (2023). EAU Guidelines. Prostate cancer. European Association of Urology, 1–234.
  5. von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., Vandenbroucke, J. P., & STROBE Initiative. (2008). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *Journal of Clinical Epidemiology*, 61(4), 344–349. <https://doi.org/10.1016/j.jclinepi.2007.11.008>
  6. Desai, K., McManus, J. M., & Sharifi, N. (2021). Hormonal therapy for prostate cancer. *Endocrine Reviews*, 42(3), 354–373. <https://doi.org/10.1210/endrev/bnab002>
  7. Charig, C. R., & Rundle, J. S. (1989). Flushing long-term side effect of orchiectomy in treatment of prostatic carcinoma. *Urology*, 33(3), 175–178. [https://doi.org/10.1016/0090-4295\(89\)90385-3](https://doi.org/10.1016/0090-4295(89)90385-3)
  8. Okoye E, Saikali SW. Orchiectomy. [Updated 2023 Aug 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan. Available from: [https://www.ncbi.nlm.nih.gov/books/NBK562336/Mariani\\_AJ\\_Glover\\_M\\_dan\\_Arita\\_S\\_Terapi\\_penekanan\\_androgen\\_medis\\_versus\\_bedah\\_untuk\\_kanker\\_prostat\\_studi\\_biaya\\_longitudinal\\_10\\_tahun\\_Jurnal\\_Urologi\\_\(2001\)\\_165\\_tidak\\_1\\_104-107\\_2-s2.0-0034747655](https://www.ncbi.nlm.nih.gov/books/NBK562336/Mariani_AJ_Glover_M_dan_Arita_S_Terapi_penekanan_androgen_medis_versus_bedah_untuk_kanker_prostat_studi_biaya_longitudinal_10_tahun_Jurnal_Urologi_(2001)_165_tidak_1_104-107_2-s2.0-0034747655).
  9. Leibovici, D., Spiess, P. E., Agarwal, P. K., Tu, S. M., Pettaway, C. A., Hitzhusen, K., Millikan, R. E., & Pisters, L. L. (2007). Prostate cancer progression in the presence of undetectable or low serum prostate-specific antigen level. *Cancer*, 109(2), 198–204. <https://doi.org/10.1002/cncr.22372>
  10. Kan, H.-C., Hou, C.-P., Lin, Y.-H., Tsui, K.-H., Chang, P.-L., & Chen, C.-L. (2017). Prognosis of prostate cancer with initial prostate-specific antigen >1,000 ng/mL at diagnosis. *OncoTargets and Therapy*, 10, 2943–2949. <https://doi.org/10.2147/OTT.S134411>
  11. David, M. K., & Leslie, S. W. (2022). Prostate Specific Antigen—StatPearls—NCBI Bookshelf. In StatPearls (pp. 1–40). StatPearls Publishing LLC.

