Proceedings of Anticancer Research, 2024, Volume 8, Issue 1
http://ojs.bbwpublisher.com/index.php/PAR
ISSN Online: 2208-3553
ISSN Print: 2208-3545

Effect of TSH Suppression Therapy on Sex Hormone Levels after Thyroid Cancer Surgery

Shenglin He[1], Ya Su[1], Bo Zhao[2], Xudong Gao[2]*

[1]Department of Endocrinology, Shaanxi Provincial People's Hospital, Xi'an 710068, China
[2]Department of Otorhinolaryngology, Head and Neck Surgery, Shaanxi Provincial People's Hospital, Xi'an 710068, China

***Corresponding author:** Xudong Gao, muzifeng_33@163.com

Abstract: *Objective:* To analyze the effect of thyroid-stimulating hormone (TSH) suppression therapy on sex hormone levels in patients undergoing postoperative treatment for thyroid cancer. *Methods:* A total of 40 patients undergoing postoperative thyroid cancer treatment were selected for data analysis. TSH suppression therapy was implemented during the postoperative period. Patients were grouped according to the TSH level: TSH < 0.1, 0.1 ≤ TSH < 0.5, and TSH ≥ 0.5. *Results:* Among male patients, there were no significant differences in sex hormone levels at different dosing times and TSH levels ($P > 0.05$). For female patients, testosterone levels at different dosing times showed no significant differences under the same circumstances ($P > 0.05$). The comparison of testosterone levels at different TSH levels over 5 years of TSH suppression therapy did not yield significant differences ($P > 0.05$). However, the comparison of testosterone levels within 5 years of TSH suppression therapy yielded significant differences ($P < 0.05$), with the lowest levels observed at 0.1 ≤ TSH < 0.5. *Conclusion:* The use of TSH suppression therapy in postoperative thyroid cancer treatment minimally affects sex hormone levels in male patients. However, it has a significant impact on female patients. Therefore, preoperative sex hormone testing is recommended, and postoperative monitoring should include regular sex hormone testing.

Keywords: Thyroid cancer; Postoperative TSH suppression therapy; Sex hormone levels

Online publication: January 26, 2024

1. Introduction

Thyroid cancer is a relatively common malignant tumor, and surgical resection is one of the primary methods for its treatment. However, postoperative patients require long-term thyroid hormone replacement therapy to maintain normal metabolism and physiological functions in the body. Among these patients, the level of thyroid-stimulating hormone (TSH) significantly influences survival and prognosis. In-depth studies on postoperative management of thyroid cancer highlight the pivotal role of TSH suppression therapy in preventing cancer recurrence and improving patient survival [1].

Despite its direct effect on thyroid function, the question of whether TSH suppression therapy affects patients' sex hormone levels, particularly its potential influence on the secretion and regulatory mechanisms

of sex hormones, remains a topic deserving of in-depth investigation. Sex hormones play a critical role in maintaining the normal physiological functions of the human body [2], especially in terms of fertility and bone density. Therefore, understanding the potential effects of TSH suppression therapy on sex hormone levels holds clinical significance for developing a more individualized and comprehensive postoperative management plan. The aim of this study was to investigate whether TSH suppression therapy has an effect on sex hormone levels in postoperative thyroid cancer patients.

2. Materials and methods

2.1. General information

Forty patients undergoing postoperative thyroid cancer treatment were selected for the data study. The postoperative TSH suppression treatment was 5–6 years, and the surgical visits were conducted between January 2017 and December 2018. The study included 10 males and 30 females.

2.2. Methods

Specimen collection and assays were performed using identical testing methods. Morning peripheral vein blood samples were collected, and serum hormones were then detected through an enzyme-linked immunosorbent assay. For both male and female patients, hormones associated with sex hormone therapy were measured separately.

2.3. Data analysis

SPSS 25.0 was used to conduct the analysis, employing χ^2 and *t*-tests. Results are presented as [*n* (%)] and mean ± standard deviation (SD), with statistical significance set at $P < 0.05$.

3. Results

3.1. Comparison of estradiol (E2) and testosterone (T) in male patients

Table 1 shows that there were no significant differences in sex hormone levels in male patients at different dosing times and TSH levels ($P > 0.05$).

Table 1. Comparison of E2 and T in male patients ($n = 10$)

	Groups	TSH suppression therapy for 3–5 years	TSH suppression therapy for 6 years	*t*	*P*
E2 (pmol/L)	TSH < 0.1 ($n = 5$)	111.45 ± 18.31	115.12 ± 20.75	0.297	> 0.05
	0.1 ≤ TSH < 0.5 ($n = 3$)	117.91 ± 24.37	112.61 ± 19.78	0.292	> 0.05
	TSH ≥ 0.5 ($n = 2$)	113.51 ± 5.61	110.91 ± 2.55	0.597	> 0.05
T (nmol/L)	TSH < 0.1 ($n = 5$)	25.37 ± 5.55	28.31 ± 7.11	0.487	> 0.05
	0.1 ≤ TSH < 0.5 ($n = 3$)	22.88 ± 6.24	24.71 ± 3.77	0.435	> 0.05
	TSH ≥ 0.5 ($n = 2$)	24.21 ± 3.02	25.65 ± 4.11	0.399	> 0.05

3.2. Comparison of T in female patients

In female patients, there was no significant difference in testosterone levels for different dosing durations under the same TSH levels ($P > 0.05$). The comparison of T levels for different TSH levels over 5 years of TSH suppression therapy yielded $P > 0.05$, $F = 1.175$, while the comparison of T levels within 5 years of TSH

suppression therapy yielded $P < 0.05$, F = 4.115, with the lowest T levels for $0.1 \leq TSH < 0.5$ (**Table 2**).

Table 2. Comparison of T in female patients ($n = 30$)

Groups		TSH suppression therapy for 3–5 years	TSH suppression therapy for 6 years	*t*	*P*
T (nmol/L)	TSH < 0.1 ($n = 4$)	2.02 ± 0.41	1.91 ± 0.32	0.423	> 0.05
	0.1 ≤ TSH < 0.5 ($n = 8$)	1.86 ± 0.15	2.01 ± 0.36	1.088	> 0.05
	TSH ≥ 0.5 ($n = 18$)	2.24 ± 0.35	2.19 ± 0.41	0.394	> 0.05

4. Discussion

Thyroid cancer, a prevalent malignant tumor in the endocrine system, is commonly treated with surgery. Following thyroid cancer surgery, TSH suppression therapy is routinely employed to prevent cancer recurrence [3]. The primary objective of this treatment is to maintain TSH levels below the normal range, thereby mitigating the risk of growth and recurrence of thyroid cancer cells. The rationale behind this approach is to impede the proliferation of cancer cells by reducing TSH levels and minimizing stimulation to residual thyroid tissue [4]. Additionally, the analysis underscores the necessity for regular blood tests during TSH suppression therapy to ensure TSH levels remain within the target range [5,6]. Doctors adjust drug dosages based on test results to optimize therapeutic outcomes.

This set of experiments revealed the following:

(1) Male patients: No significant differences were observed in sex hormone changes across dosing times and TSH levels ($P > 0.05$). This suggests that irrespective of TSH levels and treatment duration, male patients experienced no statistically significant alterations in sex hormone levels.

(2) Female patients: Under the same TSH levels, no statistically significant differences in testosterone levels were noted based on treatment duration ($P > 0.05$). In female patients with TSH suppression therapy for over 5 years, the comparison of testosterone levels with TSH levels showed a *P*-value exceeding 0.05. However, in female patients with TSH suppression therapy for 3–5 years, the comparison of testosterone levels with TSH levels showed a *P*-value less than 0.05. In this scenario, the lowest testosterone levels were observed when TSH ranged from 0.1 to 0.5.

Combining these findings, it can be inferred that the impact of postoperative thyroid cancer treatment with TSH suppression therapy on patients' sex hormone levels exhibits different trends based on gender [7-10]. TSH suppression therapy appears to have an insignificant effect on sex hormone levels in male patients. Conversely, in female patients, treatment duration and TSH level variations influence testosterone levels [11-13]. Particularly in female patients within the initial five years of treatment, TSH level modulation significantly impacts testosterone levels. It is recommended to closely monitor patients' sex hormone levels at the onset of treatment. In addition, TSH level modulation, especially during prolonged treatment, aids in maintaining normal sex hormone levels [14,15].

In conclusion, the use of TSH suppression therapy in postoperative thyroid cancer treatment minimally affects the sex hormone levels of male patients but significantly impacts female patients. Therefore, preoperative sex hormone testing is advisable, and postoperative reviews should include regular sex hormone testing.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Zhu Y, Wang M, Yue Y, et al., 2023, Effect of TSH Suppression Therapy on Thyroid Function in Thyroid Cancer Patients After Radical Surgery. China Health Standard Management, 14(17): 136–139.

[2] Wang X, Zhao F, Yan S, 2022, Effects of Thyrotropin Suppression Therapy on Bone Metabolism, CD44V6 and sIL-2R Levels in Patients with Differentiated Thyroid Cancer. Chinese Journal of Modern Medicine, 32(23): 34–38.

[3] Zhang H, Chang B, 2022, Effect of TSH Suppression Therapy on Thyroid Function and Long-Term Prognosis of Thyroid Cancer Patients After Radical Surgery. Chinese Journal of Drug Abuse Prevention and Treatment, 28(3): 321–325.

[4] Zhao F-L, Kang Y-L, Ma Y-J, et al., 2021, Analysis of the Efficacy of TSH Inhibition Therapy on Elderly Thyroid Cancer Patients After Total Thyroidectomy and Its Effect on Serum Tg, TSH and CEA Levels. Journal of Practical Cancer, 36(12): 1970–1973.

[5] Jin W, Yao X, 2022, Exploring the Efficacy of Thyroid-Stimulating Hormone (TSH) Suppression Therapy in Postoperative Thyroid Cancer Patients. China Medical Digest (Otolaryngology), 37(1): 97–99.

[6] Bai N, Liu C, Zhang X, et al., 2021, Application of TSH Inhibition Therapy in Differentiated Thyroid Cancer Patients After Surgery. Journal of Qiqihar Medical College, 42(24): 2145–2148.

[7] Zuwariya GA, Zhang J, 2023, Retrospective Analysis of Factors Influencing the Achievement of Postoperative TSH Suppression Therapy in Patients with Papillary Thyroid Cancer. China Prescription Drugs, 21(3): 133–135.

[8] Wan Y, 2021, Efficacy of Total Thyroidectomy in the Treatment of Thyroid Cancer and Its Effect on Patients' Parathyroid Hormone Levels. China Modern Drug Application, 15(19): 65–68.

[9] Li X, Wang Y, Xie J, et al., 2021, Analysis of Factors Influencing Patients' Adherence to Postoperative Endocrine Therapy for Differentiated Thyroid Cancer. Tumor Prevention and Treatment, 34(9): 856–861.

[10] Zhang Y, Guo Y, 2022, Effects of Bilateral Thyroidectomy for Thyroid Cancer on Postoperative Stress-Related Hormone Levels, Quality of Life and Inflammatory Factors in Patients. Systemic Medicine, 7(7): 128–131.

[11] Zhang D, Zhang C, Sun G, 2021, Effect of Thyroid Lobectomy on Serum-Related Hormone Levels and Prognosis of Thyroid Cancer Patients. Practical Clinical Medicine (Jiangxi), 22(3): 26–28 + 32.

[12] Li J, Zhao Z, 2021, Effects of Total Thyroidectomy and Subtotal Thyroidectomy on Bone Mineral Density and TSH, TgAb Levels in Patients with Differentiated Thyroid Cancer. Clinical Research, 29(3): 16–18.

[13] Tian R, Wang M, 2022, Effect of Thyrotropin Receptor Antibodies on Long-Term Suppression of Thyrotropin Levels in Graves' Disease Patients After Treatment. Jiangsu Medicine, 48(9): 931–934 + 938.

[14] Zhang D, 2022, Effect of Total Thyroidectomy in the Treatment of Bilateral Nodular Goiter and Its Effect on Postoperative Serum TSH, TgAb and TPO-Ab. Sichuan Journal of Physiological Sciences, 44(12): 2089–2092.

[15] Wang M, Zhao S, Chen Y, et al., 2022, Effect of TSH Inhibition Combined with Radioactive ^{131}I in the Treatment of PTC in Women of Reproductive Age. Journal of Guangxi Medical University, 2022(8): 1297–1302.