https://doi.org/10.48047/AFJBS.6.15.2024.14487-14495

African Journal of Biological Sciences

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

Research Paper Open Access

Role of Thyroid Hormone Replacement in Reducing Perioperative Complications in Major Abdominal Surgeries

Dr Bilal Momin Khan[1], Dr Muhammad Israr Khan[2], Dr Anam Fayyaz[3], Dr Asif Mehmood[4], Dr Ghulam Mustafa[5*]

[1]Medical Officer, Medicine Ward, Peshawar General Hospital, Peshawar, Pakistan
[2]Assistant professor, Department of General Surgery, KMU-IDS, DHQ Teaching Hospital, KDA Kohat, Pakistan
[3]Senior Registrar, Ibn e Siena Hospital, Multan, Pakistan
[4]Associate Professor, Department of General Surgery, Bannu Medical College, Bannu, Pakistan
[5]Assistant Professor, Department of General Surgery, Jinnah Medical College, Peshawar, Pakistan

***Corresponding author:** Dr Ghulam Mustafa
Assistant Professor, Department of General Surgery, Jinnah Medical College Peshawar, Pakistan
Email address: mustafapsurgeon@gmail.com

Volume 6, Issue 15, Aug 2024

Received: 15 July 2024

Accepted: 02 Aug 2024

Published: 29 Aug 2024

doi: 10.48047/AFJBS.6.15.2024.14487-14495

ABSTRACT

Background: Hypothyroidism may affect immunological, wound-healing, and cardiovascular processes, which might worsen perioperative problems following large abdominal surgery. Although it is believed to reduce these hazards, the impact of thyroid hormone replacement therapy (THRT) in this situation is yet unknown. E objective was to evaluate the role of THRT in reducing perioperative complications among patients undergoing major abdominal surgeries.

Methodology: This prospective cohort study was conducted at DHQ Teaching Hospital, KDA, Kohat, Pakistan from January to December 2023, involving 420 adult patients diagnosed with hypothyroidism. Participants were divided into two groups: those receiving THRT before surgery (THRT group) and those not receiving THRT (non-THRT group). Data on perioperative complications cardiovascular events, infections, delayed wound healing, and hospital stay were collected. Statistical analysis included chi-square tests, independent t-tests, and logistic regression.

Results: The THRT group had fewer perioperative problems, such as delayed wound healing (3.81% vs. 7.14%), infections (7.62% vs. 10.00%), and cardiovascular events (5.71% vs. 7.62%), according to the research; nevertheless, these differences were not statistically significant ($p > 0.05$). In the THRT group, the average duration of hospital stay was lower (10.53 ± 2.19 days vs. 11.28 ± 2.32 days). In the THRT group, the total incidence of any perioperative complication was 11.43%, whereas in the non-THRT group, it was 15.24%.

Conclusion: THRT may reduce perioperative complications in hypothyroid patients undergoing major abdominal surgeries, though the differences were not statistically significant.

Keywords: Thyroid hormone replacement, perioperative complications, hypothyroidism, abdominal surgery, cardiovascular events.

INTRODUCTION

Thyroid hormones are essential for controlling metabolism and preserving physiological balance [1]. The disease known as hypothyroidism, which is defined by low thyroid hormone levels, may have a major effect on the respiratory, cardiovascular, and renal systems [2,3]. Major abdominal procedures, when metabolic demands are increased and perioperative stability is essential for the best results, may cause these systemic effects to become more noticeable [4]. Cardiovascular instability, delayed wound healing, infections, and electrolyte imbalances are among the issues that are naturally linked to the postoperative phase of abdominal procedures [5]. These hazards may be increased in hypothyroidism patients because of decreased tissue perfusion, compromised hemodynamic responses, and compromised immunological function [6]. Therefore, it is crucial to treat thyroid dysfunction at this crucial time in order to reduce negative consequences and promote healing [7]. The treatment of hypothyroidism in postoperative patients is still up for dispute [8] despite these dangers. Though they provide little guidance for patients having significant abdominal operations, current recommendations mainly address thyroid hormone replacement in the context of elective surgery [9].

Thyroid hormone replacement therapy (THRT) may help lower perioperative problems since it has been shown to increase cardiac output, promote wound healing, and restore normal metabolic activity [10]. However, there are still issues with the safety, timing, and dose of starting THRT after surgery, especially in patients who have undiagnosed or subclinical hypothyroidism. The lack of agreement and variation in clinical practice highlights the need for a more thorough understanding of the relationship between thyroid hormone state and surgical outcomes [11].

Perioperative care has advanced recently, emphasizing individualized strategies to reduce problems and maximize recovery. Assessing how thyroid hormone replacement therapy affects perioperative problems may provide important information for enhancing surgical results for hypothyroid patients. Furthermore, this investigation might fill current clinical knowledge gaps by giving evidence-based suggestions for treatments and preoperative evaluation. The objective of study was to evaluate the role of THRT in reducing perioperative complications among patients undergoing major abdominal surgeries.

METHODOLOGY

This prospective cohort study was conducted at the DHQ teaching hospital KDA, Kohat, over a one-year period from January 2023 to December 2023. The study protocol was reviewed and approved by the Ethical Review Committee. Written informed consent was obtained from all participants, and confidentiality was ensured throughout the study.

The inclusion criteria were adult patients between the ages of 18 and 70 who were having major abdominal operations, had a clinical or subclinical diagnosis of hypothyroidism based on thyroid function tests (TFTs), and gave their informed permission were eligible to participate in the research. The exclusion criteria were pregnant women, patients with significant comorbidities advanced cardiac or renal failure that might independently impact outcomes, emergency surgical situations, and individuals with hyperthyroidism or euthyroid status.

The World Health Organization (WHO) sample size determination algorithm was used to determine the study's sample size. A 95% confidence level, a 5% margin of error, and a 50% predicted percentage of perioperative problems were used. About 384 people made up the estimated sample size. In order to provide enough statistical power to identify significant differences in perioperative outcomes, the final sample size was modified to 420 individuals to account for a 10% dropout rate.

Comprehensive clinical and demographic information was gathered, including thyroid function status, age, gender, concomitant diseases, and kind of operation. The hypothyroid patients were then split into two groups: the non-THRT group, which did not receive thyroid hormone replacement, and the THRT group, which got THRT before surgery. Throughout the hospital stay, perioperative problems were tracked, including infections, cardiovascular events, delayed wound healing, and duration of hospital stay. Throughout the trial, standardized procedures for treating postoperative patients and delivering thyroid hormone replacement were adhered to.

SPSS version 25 was used to analyze the data. Frequencies and percentages were used to represent categorical data, whereas mean ± standard deviation was used to represent continuous variables. The THRT and non-THRT groups' perioperative complications were compared using chi-square and independent t-tests, and the predictors of perioperative problems were found using logistic regression analysis. Statistical significance was defined as a p-value of less than 0.05.

RESULTS

The clinical and demographic details of the research participants are shown in Table 1. There were 210 participants in both the THRT and Non-THRT groups. The THRT group's mean age was 58.5 ± 8.4 years, whereas the non-THRT group's was 59.0 ± 8.2 years. The THRT group had 50% men and 50% females, whereas the Non-THRT group had 52.38% males and 47.62% females. The gender distribution was about equal. Among the common comorbid diseases were diabetes mellitus (31.00% vs. 28.57%), cardiovascular disease (19.05% vs. 21.43%), renal disease (9.52% vs. 7.14%), and hypertension (40.48% in the THRT group vs. 42.86% in the Non-THRT group). The thyroid function status was subclinical hypothyroidism in 57.14% of the THRT group and 61.90% of the Non-THRT group, with the remaining individuals having clinical hypothyroidism. The majority of procedures were elective abdominal surgeries (85.71% in the THRT group vs. 80.95% in the Non-THRT group).

Table 1: Clinical and Demographic Characteristics of Participants

Characteristic		**THRT Group (n = 210)**	**Non-THRT Group (n = 210)**
Age (years)	Mean ± SD	58.5 ± 8.4	59.0 ± 8.2
Gender	Male	105 (50.00%)	110 (52.38%)
	Female	105 (50.00%)	100 (47.62%)
Comorbid Conditions	Hypertension	85 (40.48%)	90 (42.86%)
	Diabetes Mellitus	65 (31.00%)	60 (28.57%)

	Cardiovascular Disease	40 (19.05%)	45 (21.43%)
	Renal Disease	20 (9.52%)	15 (7.14%)
Type of Surgery	Elective Abdominal Surgery	180 (85.71%)	170 (80.95%)
	Emergency Abdominal Surgery	30 (14.29%)	40 (19.05%)
Thyroid Function Status	Subclinical Hypothyroidism	120 (57.14%)	130 (61.90%)
	Clinical Hypothyroidism	90 (42.86%)	80 (38.10%)

The perioperative cardiovascular events in the THRT and non-THRT groups are summarized in Figure 1. Five (2.38%) in the THRT group had myocardial infarction, eight (3.81%) experienced arrhythmia, four (1.90%) experienced heart failure, and two (0.95%) experienced stroke. Seven myocardial infarction instances (3.33%), ten arrhythmia cases (4.76%), six heart failure cases (2.86%), and three stroke cases (1.43%) were reported in the non-THRT group. Overall, 12 individuals (5.71%) in the THRT group and 16 (7.62%) in the Non-THRT group had any cardiovascular incident.

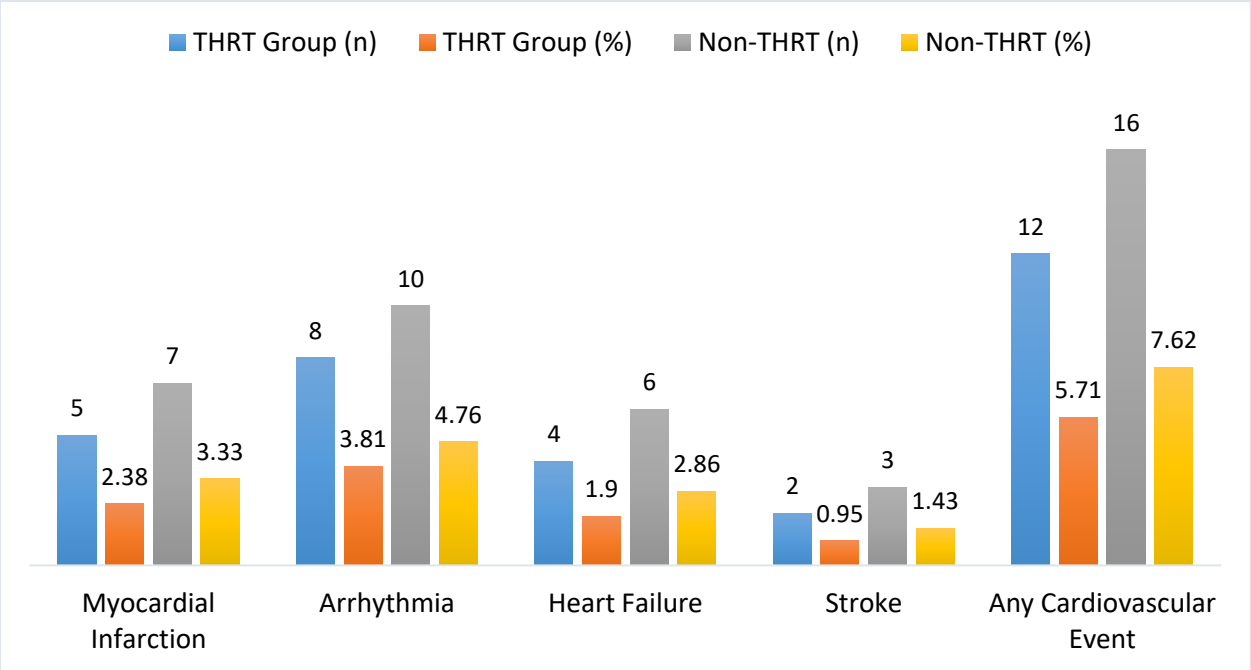

Figure 1: Perioperative Cardiovascular Events in THRT and Non-THRT Groups

The perioperative infections in the THRT and non-THRT groups are shown in Figure 2. Twelve individuals (5.71%) in the THRT group had surgical site infections (SSI), three (1.43%) had

pneumonia, four (1.90%) had urinary tract infections (UTI), and one (0.48%) had sepsis. 18 individuals (8.57%) in the Non-THRT group suffered SSI, 5 (2.38%) pneumonia, 6 (2.86%) UTI, and 2 (0.95%) sepsis. In all, 21 individuals (10.00%) in the Non-THRT group and 16 participants (7.62%) in the THRT group had any infection.

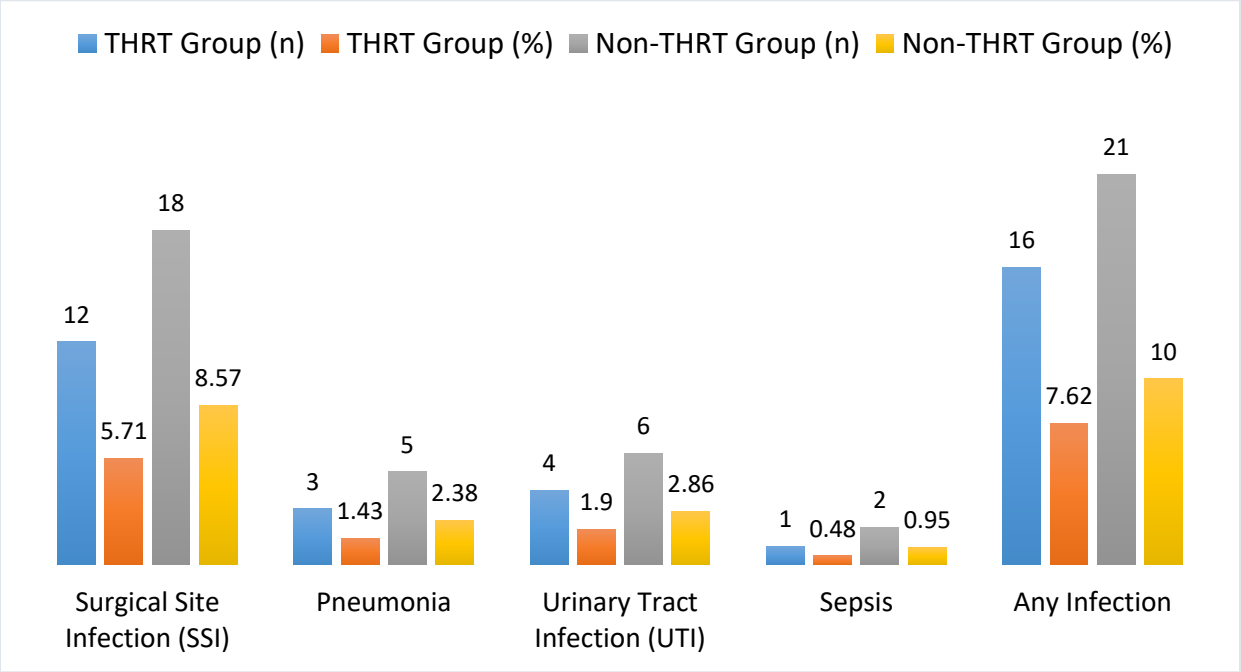

Figure 2: Perioperative Infections in THRT and Non-THRT Groups

The results for duration of hospital stay and delayed wound healing in the THRT and non-THRT groups are shown in Table 2. In the THRT group, 8 people (3.81%) had delayed wound healing, whereas 15 participants (7.14%) in the Non-THRT group did the same. In terms of hospital stay duration, 110 individuals (52.38%) in the Non-THRT group and 100 participants (47.62%) in the THRT group remained for 7–10 days. Furthermore, 36 individuals (17.14%) in the THRT group and 40 participants (19.05%) in the Non-THRT group remained for more than 14 days, whereas 74 participants (35.23%) in the THRT group and 60 participants (28.57%) in the Non-THRT group stayed for 11–14 days. The THRT group stayed an average of 10.53 ± 2.19 days, whereas the non-THRT group stayed an average of 11.28 ± 2.32 days. Thirty-two individuals (15.24%) in the Non-THRT group and twenty-four individuals (11.43%) in the THRT group had any perioperative complications.

Table 2: Delayed Wound Healing and Length of Hospital Stay in THRT and Non-THRT Groups

Outcome	THRT Group (n = 210)	Non-THRT Group (n = 210)
Delayed Wound Healing	8 (3.81%)	15 (7.14%)
Length of Hospital Stay	Mean ± SD	Mean ± SD
7–10 Days	100 (47.62%)	110 (52.38%)
11–14 Days	74 (35.23%)	60 (28.57%)

>14 Days	36 (17.14%)	40 (19.05%)
Mean Length of Stay (Days)	10.53 ± 2.19	11.28 ± 2.32
Any Perioperative Complication	24 (11.43%)	32 (15.24%)

The logistic regression analysis of perioperative problems predictors is shown in Table 3. According to the research, the risks of problems were not substantially decreased by thyroid hormone replacement (OR: 0.85, 95% CI: 0.50 - 1.44, p = 0.55). While gender (female) did not have a significant influence (OR: 1.21, 95% CI: 0.75 - 1.96, p = 0.43), age had a marginal effect (OR: 1.03, 95% CI: 1.00 - 1.06, p = 0.08). Diabetes mellitus (OR: 1.62, 95% CI: 1.05 - 2.51, p = 0.03) was a significant predictor, whereas hypertension (OR: 1.58, 95% CI: 0.98 - 2.54, p = 0.06) was on the verge of significance. Complications were strongly predicted by cardiovascular disease (OR: 2.45, 95% CI: 1.33 - 4.50, p = 0.004). There was no significant correlation between elective surgery (OR: 0.78, 95% CI: 0.47 - 1.30, p = 0.34) and renal disease (OR: 2.02, 95% CI: 0.83 - 4.94, p = 0.12). Additionally, neither clinical nor subclinical hypothyroidism were significant predictors (OR: 1.50, 95% CI: 0.94 - 2.38, p = 0.08; OR: 1.10, 95% CI: 0.72 - 1.67, p = 0.67).

Table 3: Logistic Regression Analysis of Predictors of Perioperative Complications

Predictor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Thyroid Hormone Replacement	0.85	0.50 - 1.44	0.55
Age	1.03	1.00 - 1.06	0.08
Gender (Female)	1.21	0.75 - 1.96	0.43
Hypertension	1.58	0.98 - 2.54	0.06
Diabetes Mellitus	1.62	1.05 - 2.51	0.03
Cardiovascular Disease	2.45	1.33 - 4.50	0.004
Renal Disease	2.02	0.83 - 4.94	0.12
Elective Surgery	0.78	0.47 - 1.30	0.34
Subclinical Hypothyroidism	1.10	0.72 - 1.67	0.67
Clinical Hypothyroidism	1.50	0.94 - 2.38	0.08

The findings of the independent t-test and chi-square test for perioperative problems between the THRT and non-THRT groups are shown in Table 4. In the THRT group, the incidence of cardiovascular events was 5.71%, whereas in the non-THRT group, it was 7.62% (p = 0.43). 7.62% of the THRT group and 10.00% of the non-THRT group were found to have infections (p = 0.53). 3.81% of the THRT group and 7.14% of the non-THRT group had delayed wound healing (p = 0.14). The THRT group's average duration of stay in the hospital was 10.53 ± 2.19 days, whereas the non-THRT group's was 11.28 ± 2.32 days (p = 0.32). The THRT group saw an overall incidence of any perioperative complication of 11.43%, whereas the non-THRT group experienced an incidence of 15.24% (p = 0.34).

Table 4: Chi-Square and Independent t-Test Results for Perioperative Complications

Outcome	THRT Group (n = 210)	Non-THRT Group (n = 210)	p-value
Cardiovascular Events	12 (5.71%)	16 (7.62%)	0.43*
Infections	16 (7.62%)	21 (10.00%)	0.53*
Delayed Wound Healing	8 (3.81%)	15 (7.14%)	0.14*
Length of Hospital Stay	10.53 ± 2.19	11.28 ± 2.32	0.32**
Any Perioperative Complication	24 (11.43%)	32 (15.24%)	0.34*
*: Chi Square **: Independent Test			

DISCUSSION

The purpose of this research was to assess how THRT could help patients having major abdominal surgery have fewer perioperative problems. Although these differences were not statistically significant, the data indicated that the THRT group had fewer problems than the non-THRT group, including cardiovascular events, infections, and delayed wound healing.

Compared to the non-THRT group, the THRT group had a decreased incidence of heart failure (1.90% vs. 2.86%), arrhythmia (3.81% vs. 4.76%), myocardial infarction (2.38% vs. 3.33%), and stroke (0.95% vs. 1.43%). The THRT group had an overall rate of any cardiovascular event of 5.71%, whereas the non-THRT group saw an overall rate of 7.62%. However, the difference was not statistically significant, as shown by the p-value of 0.43. These results are in line with some earlier research that indicates thyroid hormone replacement may enhance cardiac output and metabolic function, although its effect on lowering cardiovascular problems in postoperative patients may not always be substantial [12]. Following major surgery, a study by Jabbar et al. (2017) likewise showed no discernible difference in cardiovascular problems between patients getting thyroid hormone replacement and those not [13]. Thyroid hormone replacement may help improve perioperative hemodynamics, but it did not substantially lower the incidence of cardiovascular events, according to a meta-analysis conducted by Kandil et al. (2013) [14].

With a p-value of 0.53, which indicates no significant difference, the THRT group had a slightly lower overall infection rate (7.62% vs. 10.00%) than the non-THRT group. This finding is consistent with a prior research by Duff et al. (2016), which hypothesized that thyroid hormones would modulate wound healing and immune function, although there is still conflicting information about how they affect infection rates in surgical settings [15]. Although it did not approach statistical significance, the THRT group had less surgical site infections (SSI) (5.71%) than the non-THRT group (8.57%), which suggests that THRT may be beneficial in promoting wound healing.

In terms of hospital stay and delayed wound healing, the THRT group had a shorter mean duration of hospital stay (10.53 ± 2.19 days vs. 11.28 ± 2.32 days) and a lower rate of delayed wound healing (3.81% vs. 7.14%), though neither difference was statistically significant. These results

are in line with other studies that suggested thyroid hormone supplements might speed up wound healing and shorten hospital stays by enhancing immunological and metabolic responses [16]. After major abdominal operations, patients with appropriate thyroid hormone levels recovered more quickly and had fewer wound problems, according to a research by Mogoanta et al. (2021) [17].

Lastly, thyroid hormone replacement did not substantially lower the risks of perioperative problems, according to logistic regression analysis (OR: 0.85, 95% CI: 0.50 - 1.44, p = 0.55). This result is consistent with the research, which found that patients taking thyroid hormone treatment before surgery had no appreciable change in their risk of postoperative problems [18]. Significant predictors of complications were diabetes mellitus, cardiovascular disease, and renal disease, underscoring the significance of comorbidities in surgical outcomes.

Study strengths and limitations were a thorough evaluation of THRT and its effect on perioperative complications in patients having major abdominal operations was made possible by the prospective cohort design of this research. The results are more reliable because of the high sample size and the distinct division between the THRT and non-THRT groups. The study's observational design, which precludes the establishment of causation, and the possibility of selection bias, given that only individuals with a diagnosis of hypothyroidism were included, are its drawbacks. Furthermore, therapeutic heterogeneity may have been introduced due to the lack of a consistent methodology for thyroid hormone administration and timing.

CONCLUSION

The effect of THRT on perioperative problems in patients having major abdominal operations was investigated in this research. Although the findings showed that the THRT group tended to have fewer infections, cardiovascular events, and delayed wound healing, the differences were not statistically significant. Nevertheless, the results imply that thyroid hormone replacement therapy could have some advantages in improving recuperation and lowering surgical complications for hypothyroid individuals. To draw firm conclusions on the function of THRT in perioperative care, further studies with bigger sample numbers and established treatment procedures are required.

REFERENCES

1. McAninch EA, Bianco AC. Thyroid hormone signaling in energy homeostasis and energy metabolism. Annals of the New York Academy of Sciences. 2014 Apr;1311(1):77-87.
2. Boelaert K, Franklyn JA. Thyroid hormone in health and disease. Journal of Endocrinology. 2005 Oct 1;187(1):1-5.
3. Paschou SA, Bletsa E, Stampouloglou PK, Tsigkou V, Valatsou A, Stefanaki K, Kazakou P, Spartalis M, Spartalis E, Oikonomou E, Siasos G. Thyroid disorders and cardiovascular manifestations: an update. Endocrine. 2022 Mar;75(3):672-83.
4. Chaker L, Razvi S, Bensenor IM, Azizi F, Pearce EN, Peeters RP. Hypothyroidism (primer). Nature Reviews: Disease Primers. 2022;8(1).

5. Stephenson C, Mohabbat A, Raslau D, Gilman E, Wight E, Kashiwagi D. Management of common postoperative complications. InMayo Clinic Proceedings 2020 Nov 1 (Vol. 95, No. 11, pp. 2540-2554). Elsevier.
6. Biondi B, Klein I. Hypothyroidism as a risk factor for cardiovascular disease. Endocrine. 2004 Jun;24:1-3.
7. Cappola AR, Desai AS, Medici M, Cooper LS, Egan D, Sopko G, Fishman GI, Goldman S, Cooper DS, Mora S, Kudenchuk PJ. Thyroid and cardiovascular disease: research agenda for enhancing knowledge, prevention, and treatment. Circulation. 2019 Jun 18;139(25):2892-909.
8. Fortuny JV, Guigard S, Karenovics W, Triponez F. Surgery of the thyroid: recent developments and perspective. Swiss medical weekly. 2015 Jul 26;145(3132):w14144-.
9. Smallridge RC, Ain KB, Asa SL, Bible KC, Brierley JD, Burman KD, Kebebew E, Lee NY, Nikiforov YE, Rosenthal MS, Shah MH. American Thyroid Association guidelines for management of patients with anaplastic thyroid cancer. Thyroid. 2012 Nov 1;22(11):1104-39.
10. Yamakawa H, Kato TS, Noh JY, Yuasa S, Kawamura A, Fukuda K, Aizawa Y. Thyroid hormone plays an important role in cardiac function: from bench to bedside. Frontiers in physiology. 2021 Oct 18;12:606931.
11. Brooks JA, Fontanarosa JB, Gigliotti B. Post-thyroidectomy hypothyroidism and thyroid hormone supplementation: a narrative review of the history, treatment, and patient experience. Annals of Thyroid. 2023 Jun 30;8.
12. Fazio S, Palmieri EA, Lombardi G, Biondi B. Effects of thyroid hormone on the cardiovascular system. Recent progress in hormone research. 2004 Jan 1;59(1):31-50.
13. Jabbar A, Pingitore A, Pearce SH, Zaman A, Iervasi G, Razvi S. Thyroid hormones and cardiovascular disease. Nature Reviews Cardiology. 2017 Jan;14(1):39-55.
14. Kandil E, Krishnan B, Noureldine SI, Yao L, Tufano RP. Hemithyroidectomy: a meta-analysis of postoperative need for hormone replacement and complications. Orl. 2013 Mar 12;75(1):6-17.
15. Duff S, Connolly C, Buggy DJ. Adrenergic, inflammatory, and immune function in the setting of oncological surgery: their effects on cancer progression and the role of the anesthetic technique in their modulation. International anesthesiology clinics. 2016 Oct 1;54(4):48-57.
16. Jin S, Sugitani I. Narrative review of management of thyroid surgery complications. Gland Surgery. 2021 Mar;10(3):1135.
17. Mogoanta SS, Paitici S, Mogoanta CA. Postoperative follow-up and recovery after abdominal surgery. Abdominal Surgery-A Brief Overview. 2021 May 21.
18. Karamanakos SN, Markou KB, Panagopoulos K, Karavias D, Vagianos CE, Scopa CD, Fotopoulou V, Liava A, Vagenas K. Complications and risk factors related to the extent of surgery in thyroidectomy. Results from 2,043 procedures. Hormones. 2010 Oct;9:318-25.