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Mini review

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Thyroid dysfunction after cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC)

Abstract

Background: Cytoreductive surgery (CRS) and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) are complex procedures associated with significant morbidity and mortality. Thyroid dysfunction is increasingly recognized as a potential factor influencing postoperative outcomes.

Objective: This study aimed to evaluate the effect of CRS and HIPEC on thyroid hormone and cortisol levels, and their association with surgical outcomes.

Methods: Four hundred patients undergoing CRS and HIPEC for peritoneal metastases were included. Patients with thyroid or endocrine disorders were excluded. Serum levels of TSH, Free T3, Total T3, Free T4, Total T4, cortisol, and albumin were measured preoperatively, intraoperatively, and on postoperative days 3, 6, and 10. Statistical significance was assessed using the paired Student's t-test.

Results: Free T3 and Total T3 levels were significantly decreased on the first and sixth postoperative days ($p < 0.05$). Cortisol levels increased significantly on postoperative days 4, 6, and 10 ($p < 0.05$), with the highest levels observed in patients with adverse events. TSH levels decreased initially but normalized progressively. Albumin levels dropped significantly during the first week. Free T4 and Total T4 showed no significant changes.

Conclusion: Thyroid dysfunction and cortisol response are common after CRS and HIPEC, with Free T3 levels correlating with shorter ICU and hospital stays, and TSH changes associated with prolonged recovery. Preoperative and perioperative thyroid assessment may optimize surgical outcomes.

Volume 16 Issue 5 - 2025

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Received: November 29, 2025 | **Published:** December 18, 2025

Introduction

Cytoreductive surgery and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) are among the most complex and high-risk cancer surgeries, associated with significant morbidity and mortality.[1,2]

Although surgical techniques and perioperative management have advanced significantly, the incidence of adverse events remains a significant concern. One factor gaining increasing attention is thyroid dysfunction. Thyroid hormones play a crucial role in regulating various physiological processes, including metabolism, homeostasis, and cardiovascular function.[3,5]

This importance is especially interesting for cancer patients who have multiple treatment-related problems and frequently compromised performance status. Many researchers have highlighted the significant concern of perioperative thyroid function assessment as a predictor of surgical risk.

Serum thyroid hormone concentrations may be affected during the course of non-thyroidal illnesses such as starvation, sepsis, or major surgeries.[6,7] This condition is defined as "sick euthyroid syndrome." Surgical trauma is one of the factors that can affect the entire thyroid hormone profile. There are no available reports about the effect of CRS + HIPEC on thyroid hormone serum levels.

The aim of this retrospective study was to evaluate the effect of this aggressive surgery on thyroid function.

Patients and methods

Four hundred patients from a total of 1,650 who underwent CRS + HIPEC for peritoneal metastases were included in this study. Patients with thyroid diseases or endocrine disorders were excluded from the trial. All included patients were euthyroid with normal preoperative values of thyroid function. Venous blood samples were taken during the operation (at the end), on 3rd, 6th and on the 10th postoperative day for measurement of thyroid hormone levels: TSH, Free T3, Total T3, Free T4, Total T4, cortisol, and albumin were evaluated. Statistical significance was assessed using the paired Student's t-test.

Results

Free T3 and Total T3 levels were significantly decreased on the first and sixth postoperative days compared to the preoperative period ($p< 0.05$).

Serum cortisol levels were significantly increased on the 4th, 6th, and 10th postoperative days compared to preoperative values ($p< 0.05$). The highest cortisol levels on the 10th postoperative day were observed in patients who experienced postoperative adverse events, such as pulmonary infections or abdominal sepsis.

TSH levels only decreased in the first three postoperative days and then normalized progressively. Albumin levels were significantly decreased during the first seven postoperative days, which is attributed to the extensive surgical procedures, including peritonectomies

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and splanchic resections, resulting in the loss of splanchic proteins. (mesenterium of abdominal organs)

Free T4 and Total T4 values showed a tendency to decrease, but the changes were not statistically significant.

Discussion

This study highlights the potential impact of thyroid hormone and cortisol levels on postoperative outcomes after cytoreductive surgery and HIPEC.

The results demonstrate postoperative changes in TSH levels, which associated with ICU stay (1-2 days) and with longer hospital stays. In contrast, higher postoperative Free T_3 levels correlated with shorter hospital and ICU stays.

These findings are similar to those observed in other major surgeries, such as cardiovascular or pancreatic surgery.[6,7]

Further analysis confirmed a significant correlation between preoperative TSH levels and major postoperative outcomes.

These findings emphasize the importance of monitoring and managing thyroid function both pre- and postoperatively to optimize patient recovery. It has been demonstrated that there is a relationship between serum TSH and cortisol levels. In our study, serum TSH levels significantly decreased, while cortisol levels increased significantly in the early postoperative days due to extensive surgical trauma as result of cytoreductive surgery and remains high in the cases of adverse effect.[8-10]

It has been suggested that increased cortisol concentration has a suppressive effect on serum thyroid-stimulating hormone (TSH) levels.[11]

In our study, preoperative and postoperative total and free T4 levels did not change significantly. This result has also been demonstrated by other investigators in laparoscopic surgery.[12,13]

Conclusion

thyroid dysfunction may impact outcomes in patients undergoing cytoreductive surgery and HIPEC. These findings highlight the potential value of preoperative thyroid assessment and management strategies for each individual patient in order to optimize surgical recovery.

Acknowledgement

None.

Conflict of interest

None declared.

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