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Perioperative Challenges in Previously Unrecognized and Established Hypothyroidism: Two Case Reports

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Case Report

Keywords: Hypothyroidism, perioperative management, anesthesia, postoperative hypoxemia, coronary artery disease, case report

Posted Date: October 14th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11342596/v1

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Additional Declarations: The authors declare no competing interests.

Abstract

Background

Hypothyroidism may remain undiagnosed during preoperative assessment because of its nonspecific symptoms. Thyroid hormone deficiency can impair cardiovascular and respiratory function, increasing perioperative risks. We report two cases illustrating distinct challenges associated with previously unrecognized and established hypothyroidism.

Case presentation:

A 62-year-old woman with previously unrecognized severe primary hypothyroidism developed persistent hypoxemia and marked hypokalemia following hysteroscopic surgery. Retrospective review revealed low-voltage QRS complexes and first-degree atrioventricular block, suggesting potential diagnostic clues. A 58-year-old man with longstanding hypothyroidism, coronary artery disease, and impaired left ventricular function was scheduled for coronary artery bypass grafting, highlighting the need to balance thyroid hormone replacement against the risk of myocardial ischemia.

Conclusions

These cases emphasize the importance of considering thyroid dysfunction in patients with unexplained electrocardiographic abnormalities or perioperative respiratory complications. Management should be individualized according to hypothyroidism severity, surgical urgency, and cardiovascular comorbidities. Early recognition, careful thyroid hormone replacement, and appropriate perioperative monitoring may help minimize complications.

Background

Hypothyroidism is a systemic hypometabolic disorder resulting from insufficient thyroid hormone production or action [1]. Overt hypothyroidism is characterized by elevated thyroid-stimulating hormone (TSH) and reduced free thyroxine (FT4), whereas subclinical hypothyroidism presents with elevated TSH and normal FT4 levels. Because symptoms such as fatigue, cold intolerance, somnolence, and bradycardia are often nonspecific, hypothyroidism may remain undiagnosed [2, 3]. Severe cases can progress to life-threatening complications, including myxedema coma [4].

Recognition of hypothyroidism is particularly challenging in older patients and those with multiple comorbidities, as its manifestations may be attributed to other condition [5]. Consequently, thyroid dysfunction may remain undetected until anesthesia or surgical stress reveals impaired physiological reserve. Perioperative management should be individualized according to disease severity, surgical urgency, and comorbidities [6]. Although patients with mild-to-moderate hypothyroidism may generally

undergo necessary surgery with appropriate monitoring, elective procedures should usually be deferred in those with severe hypothyroidism until their clinical condition has been optimized [7].

Here, we report two cases illustrating distinct perioperative challenges: previously unrecognized severe hypothyroidism associated with persistent postoperative hypoxemia and longstanding hypothyroidism complicated by coronary artery disease and impaired cardiac function. These cases highlight the importance of early recognition, careful risk assessment, and individualized perioperative management.

Case Presentations

Case-1. Persistent postoperative hypoxemia after hysteroscopic surgery in a patient with previously unrecognized hypothyroidism

A 62-year-old woman was admitted with postmenopausal bleeding and masses at the urethral meatus. She underwent hysteroscopic surgery and excision of a urethral meatal mass under general anesthesia with endotracheal intubation. Hypothyroidism had not been diagnosed preoperatively, and she had not received thyroid hormone replacement therapy.

Retrospective review of the preoperative electrocardiogram revealed first-degree atrioventricular block (PR interval, approximately 218 ms), low-voltage QRS complexes in the limb leads, and right-axis deviation (Fig. 1). Her serum potassium concentration was mildly reduced (3.42 mmol/L; Table 1). These findings were considered nonspecific, and thyroid function was not assessed before surgery.

Table 1

Key perioperative laboratory findings and diagnostic clues in Case 1.

Time point	Oxygenation / clinical status	Electrolyte findings	Thyroid function	Perioperative significance
Preoperative assessment	No obvious hypoxemia; ECG showed low-voltage QRS complexes, prolonged PR interval (approximately 218 ms), and right-axis deviation.	K^+ approximately 3.42 mmol/L.	Not assessed.	ECG abnormalities combined with electrolyte disturbance suggested the need for further endocrine/metabolic evaluation.
PACU after hypoxemia	Persistent hypoxemia requiring oxygen support; poor response to lung recruitment and fluid resuscitation.	K^+ decreased to approximately 2.7 mmol/L.	Not assessed.	Hypoxemia could not be fully explained by atelectasis, hypovolemia, or residual anesthesia alone.
AICU evaluation	Continued monitoring and supportive treatment.	Dynamic electrolyte reassessment.	TSH > 65.5 mIU/L; FT3 < 0.3 pmol/L; FT4 2.18 pmol/L.	Confirmed severe primary hypothyroidism and explained reduced respiratory and cardiovascular reserve.

The procedure was completed without major intraoperative complications. Following extubation, the patient developed persistent hypoxemia requiring prolonged supplemental oxygen in the post-anesthesia care unit (PACU), accompanied by dizziness, nausea, and chest discomfort. Point-of-care ultrasonography suggested atelectasis and reduced cardiac filling. However, oxygenation improved minimally following lung recruitment maneuvers and fluid administration. Repeat laboratory testing revealed marked hypokalemia (2.7 mmol/L; Table 1). The persistent hypoxemia could not be fully explained by atelectasis, relative hypovolemia, or residual anesthetic effects.

After 190 minutes in the PACU, the patient was transferred to the anesthesiology intensive care unit (AICU) for further management. Thyroid function testing revealed markedly elevated thyroid-stimulating hormone (TSH; >65.5 mIU/L), reduced free triiodothyronine (FT3; <0.3 pmol/L), and reduced free thyroxine (FT4; 2.18 pmol/L), confirming severe primary hypothyroidism (Table 1).

In retrospect, the preoperative electrocardiographic abnormalities may have provided important clues to previously unrecognized thyroid dysfunction. Severe hypothyroidism can impair cardiac output and ventilatory responsiveness, potentially contributing to postoperative respiratory compromise [8–10]. This case highlights the importance of considering thyroid dysfunction in patients with unexplained electrocardiographic abnormalities and persistent postoperative hypoxemia (Fig. 2).

Case-2. Established hypothyroidism complicated by coronary artery disease requiring coronary artery bypass grafting

A 58-year-old man presented with a 6-year history of exertional chest pain that had progressively worsened over the preceding 6 months. The pain radiated to the shoulders, left arm, neck, and jaw and was relieved by rest or sublingual medication. Because of worsening symptoms, he was admitted for evaluation and scheduled for coronary artery bypass grafting. His medical history included hypertension and hypothyroidism diagnosed approximately 7 years earlier.

Preoperative electrocardiography revealed sinus rhythm, Q waves in leads V1–V3, first-degree atrioventricular block, and multiple ST–T abnormalities. Echocardiography demonstrated regional left ventricular wall-motion abnormalities, left atrial enlargement, valvular regurgitation, interventricular septal hypertrophy, and impaired left ventricular systolic and diastolic function, with an ejection fraction of approximately 45%. Laboratory testing showed elevated high-sensitivity cardiac troponin I and markedly increased N-terminal pro-B-type natriuretic peptide concentrations (Table 2).

Table 2. Perioperative cardiovascular risk-related findings and management implications in Case 2.

Assessment	Key findings	Perioperative implications
Electrocardiography	Sinus rhythm; Q waves in leads V1–V3; first-degree atrioventricular block; ST–T abnormalities in multiple leads.	Indicated previous myocardial injury, conduction abnormalities, and potential ischemic risk; ECG changes should be interpreted together with hypothyroidism-related cardiovascular effects.
Echocardiography	Regional left ventricular wall-motion abnormalities; left atrial enlargement; valvular regurgitation; interventricular septal hypertrophy; impaired left ventricular systolic and diastolic function; EF approximately 45%.	Suggested reduced cardiac reserve and increased risk during anesthesia induction, cardiopulmonary bypass, and postoperative recovery.
Cardiac biomarkers	Elevated high-sensitivity cardiac troponin I; markedly elevated NT-proBNP.	Suggested myocardial injury and heart failure risk; dynamic monitoring of cardiac function was required.
Medical history	Hypertension; hypothyroidism diagnosed approximately 7 years earlier.	Long-term hypothyroidism may increase cardiovascular vulnerability; thyroid hormone replacement should follow a low-dose and gradual titration strategy.
Perioperative strategy	Multidisciplinary assessment involving cardiology, cardiac surgery, endocrinology, and anesthesiology.	Individualized management was required to balance thyroid optimization and cardiovascular stability.

The coexistence of longstanding hypothyroidism, coronary artery disease, and impaired cardiac function presented substantial perioperative management challenges [11]. Hypothyroidism may further compromise cardiovascular function through reduced myocardial contractility, impaired diastolic relaxation, and conduction abnormalities [12, 13]. In contrast, rapid thyroid hormone replacement can increase myocardial oxygen demand and potentially precipitate ischemia in patients with significant coronary artery disease [14].

Therefore, perioperative management requires balancing the cardiovascular risks of persistent hypothyroidism against those associated with overly rapid thyroid hormone replacement. Untreated hypothyroidism may increase susceptibility to low cardiac output, hypoventilation, hypothermia, and hemodynamic instability [7, 15]. When thyroid hormone replacement is indicated, cautious initiation and gradual dose titration are generally recommended in patients with coronary artery disease [16]. Individualized management should consider thyroid function, cardiac reserve, surgical urgency, and associated comorbidities through multidisciplinary assessment.

Discussion

Physiological effects of hypothyroidism and perioperative implications

Hypothyroidism affects multiple organ systems, potentially increasing susceptibility to anesthetic and surgical stress. Its major cardiovascular, respiratory, neurological, and metabolic consequences are summarized in Fig. 3.

Cardiovascular effects

Thyroid hormones regulate heart rate, myocardial contractility, diastolic function, and vascular tone [8]. Hypothyroidism may therefore cause bradycardia, reduced cardiac output, impaired ventricular relaxation, and increased systemic vascular resistance, increasing the risk of perioperative hemodynamic instability [7, 13] [17]. In patients with coronary artery disease, rapid thyroid hormone replacement may increase myocardial oxygen demand and precipitate ischemia [14].

In Case 1, low-voltage QRS complexes and first-degree atrioventricular block were potential clues to previously unrecognized hypothyroidism. In Case 2, coronary artery disease, reduced left ventricular ejection fraction, and elevated N-terminal pro-B-type natriuretic peptide (NT-proBNP) indicated impaired cardiovascular reserve. These observations emphasize the importance of integrating electrocardiographic findings, cardiac function, and thyroid status into perioperative risk assessment [18, 19].

Respiratory and neurological effects

Hypothyroidism may impair respiratory function through reduced central ventilatory drive, diminished responses to hypoxemia and hypercapnia, and respiratory muscle weakness [9]. Associated conditions, including obesity, macroglossia, and obstructive sleep apnea, may further increase airway and respiratory risks [20]. Anesthetics, opioids, and residual neuromuscular blockade can exacerbate respiratory depression, potentially contributing to postoperative hypoventilation and hypoxemia [7, 21–24].

Severe hypothyroidism may also cause somnolence and reduced central nervous system activity, potentially increasing susceptibility to sedative effects and delayed emergence from anesthesia [2] [7] [6]. Accordingly, careful anesthetic titration and confirmation of adequate ventilation, oxygenation, consciousness, and neuromuscular recovery before extubation are essential [23] [24, 25]. In Case 1, impaired ventilatory responsiveness associated with severe hypothyroidism may have contributed to persistent postoperative hypoxemia, although other perioperative causes could not be excluded.

Metabolic and thermoregulatory effects

Reduced metabolic activity in hypothyroidism increases susceptibility to perioperative hypothermia, which may prolong anesthetic effects, promote coagulopathy and arrhythmias, and delay recovery [26] [27]. Active warming and core temperature monitoring are therefore important, particularly in patients with severe hypothyroidism [28].

Hypothyroidism may also cause hyponatremia through impaired free-water excretion [29]. However, hypokalemia is not a typical manifestation and should prompt investigation of alternative causes [30]. Thus, the marked postoperative hypokalemia observed in Case 1 should be considered a concurrent metabolic abnormality rather than a direct consequence of thyroid hormone deficiency.

Perioperative anesthetic management

Preoperative assessment and optimization

Routine thyroid function screening is unnecessary in all surgical patients; however, TSH and FT4 should be measured when thyroid dysfunction is suspected [3]. Clinical clues include unexplained fatigue, somnolence, bradycardia, low-voltage QRS complexes, atrioventricular conduction abnormalities, heart failure, and electrolyte disturbances [2] [12] [29].

Perioperative management should be guided by hypothyroidism severity, surgical urgency, and cardiopulmonary comorbidities. Patients with mild-to-moderate hypothyroidism may generally undergo necessary surgery with appropriate monitoring, whereas elective procedures should usually be deferred in those with severe hypothyroidism until clinical stabilization [6, 7].

In patients receiving levothyroxine, treatment adherence and recent thyroid function should be assessed. Levothyroxine can generally be continued perioperatively, and brief interruptions are usually tolerated because of its long half-life [31, 32]. In patients with coronary artery disease, replacement therapy requires cautious dose adjustment to avoid increasing myocardial oxygen demand and precipitating ischemia [33].

Intraoperative management

Hypothyroidism may increase sensitivity to anesthetic, sedative, and analgesic agents, potentially prolonging their effects [7]. Careful dose titration and monitoring of cardiovascular function, ventilation, and body temperature are therefore important [31]. Quantitative neuromuscular monitoring should be used when neuromuscular blocking agents are administered, with adequate recovery confirmed before extubation [23] [24].

Hemodynamic management should consider ventricular function and intravascular volume, avoiding excessive fluid administration in patients with impaired cardiac function [19]. In patients with coronary artery disease, particularly those undergoing coronary artery bypass grafting, maintaining myocardial oxygen supply–demand balance is essential, with careful avoidance of significant tachycardia, bradycardia, hypotension, hypoxemia, and hypothermia [46].

Postoperative complications and monitoring

Patients with severe hypothyroidism may be vulnerable to postoperative hypotension, bradycardia, hypothermia, delayed emergence, and respiratory depression [7]. Persistent hypoxemia warrants systematic evaluation of ventilation, residual neuromuscular blockade, pulmonary and cardiac function, arterial blood gases, and metabolic abnormalities rather than assuming a single cause [34, 35].

If myxedema crisis is suspected, immediate intensive care is required, including respiratory and circulatory support, correction of metabolic disturbances, treatment of precipitating factors, and glucocorticoid coverage before or together with thyroid hormone replacement [36].

Postoperative monitoring should focus on respiratory and hemodynamic stability, consciousness, temperature, and electrolyte balance, with particular attention to atelectasis, upper airway obstruction, pulmonary edema, and residual neuromuscular blockade [20, 27, 35]. Levothyroxine should be resumed when clinically feasible, with alternative replacement strategies considered when oral administration is not possible for prolonged periods or in severe decompensated hypothyroidism [31, 37]. In patients with coronary artery disease, thyroid hormone replacement should be initiated or adjusted cautiously, with gradual titration and monitoring for ischemia, arrhythmias, and heart failure [33, 38].

Conclusion

These two cases illustrate distinct perioperative challenges associated with hypothyroidism. In Case 1, previously unrecognized severe hypothyroidism was associated with persistent postoperative

hypoxemia and hypokalemia, while preoperative electrocardiographic abnormalities provided potential diagnostic clues. In Case 2, longstanding hypothyroidism complicated by coronary artery disease and impaired cardiac function highlighted the importance of balancing thyroid hormone replacement against the risk of myocardial ischemia.

These cases underscore the importance of early recognition, appropriate risk stratification, individualized anesthetic management, and close postoperative monitoring. Thyroid dysfunction should be considered in patients with unexplained electrocardiographic abnormalities, respiratory compromise, or perioperative hemodynamic instability. Careful preoperative assessment and optimization of thyroid function, particularly in patients with cardiovascular comorbidities, may help minimize perioperative complications.

Declarations

Ethics declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Written informed consent for publication was obtained from these two patients.

Competing interests

The authors declare no conflict of interest related to this study.

Funding

This work was supported by the Shandong Provincial Medical and Health Science and Technology Guidance Project, China (to GL, 202318000951), and the Shandong Province Pain Medicine Society 2025 Annual Dayi Innovation Research Project, China (to GL, 2025B03).

Acknowledgements

ChatGPT (OpenAI) was used to improve the readability and clarity of the manuscript. All authors reviewed and approved the final version.

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Figures

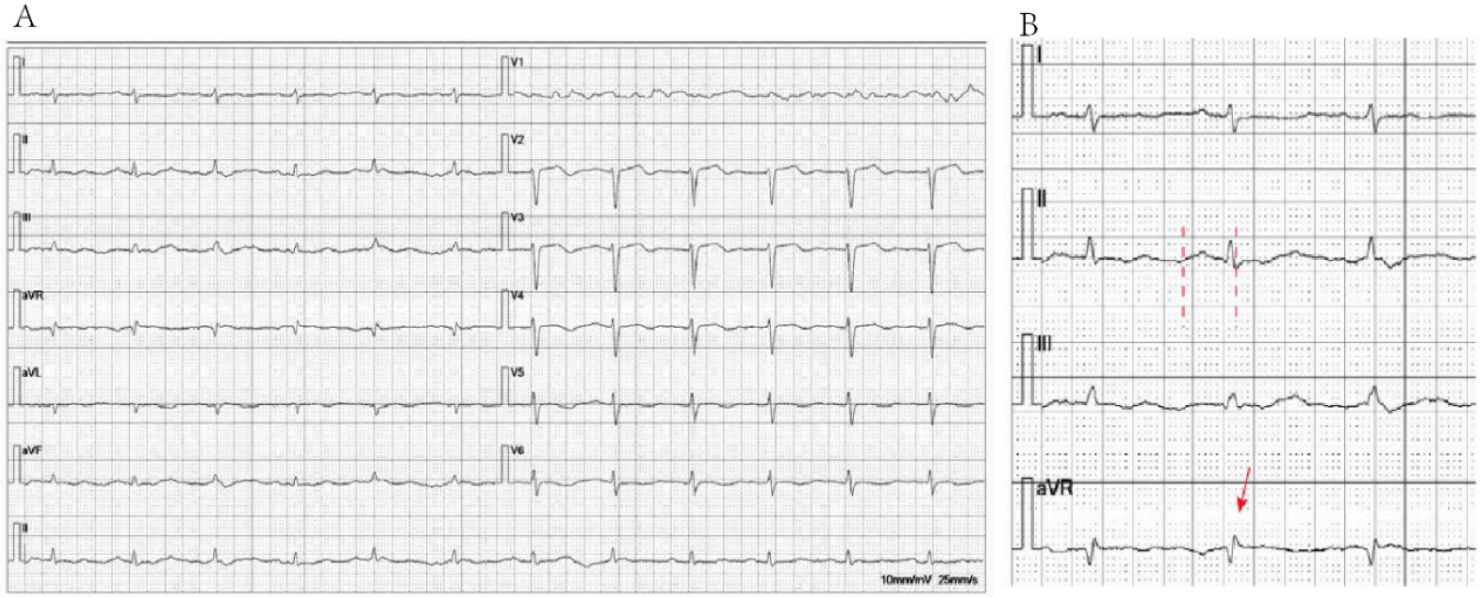


Figure 1

Preoperative electrocardiographic findings in Case 1

(A) Preoperative 12-lead electrocardiogram (10 mm/mV, 25 mm/s). (B) Magnified view showing low-voltage QRS complexes in the limb leads (arrows) and first-degree atrioventricular block with a PR interval of approximately 218 ms (dashed lines).

Figure 2. Perioperative diagnostic and management timeline in Case 1.

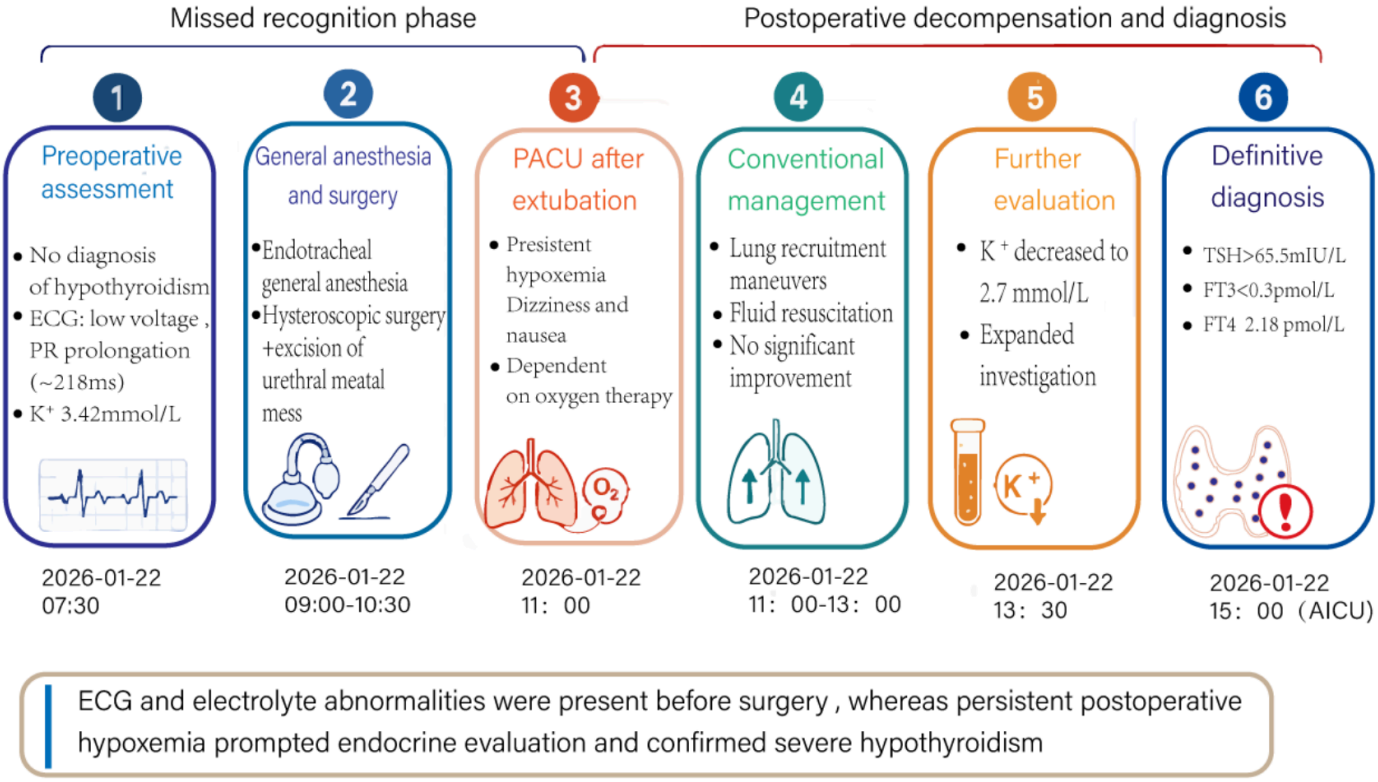


Figure 2

See image above for figure legend

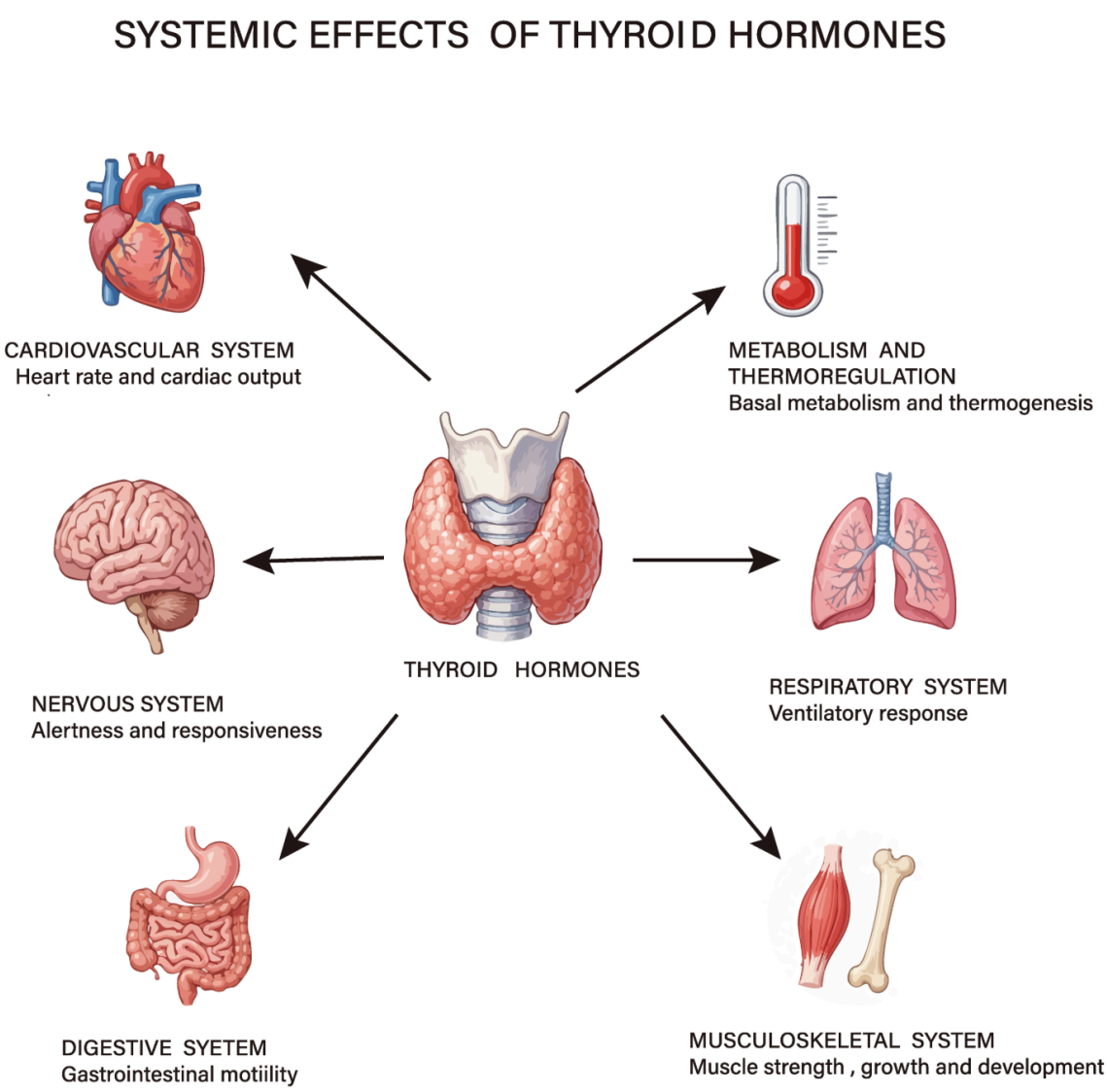


Figure 3

Systemic effects of hypothyroidism and their perioperative implications