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Effective Management of a Total Thyroidectomy Case with Positive Cuff Leak Test: A Case Report

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Abstract

Total thyroidectomy is frequently performed to treat various thyroid conditions, such as malignancies, large goiters, and Graves' disease. One of the possible complications after this surgery is airway obstruction, which can be evaluated intraoperatively using the cuff leak test (CLT). A positive CLT suggests significant airway edema or obstruction, which can lead to postoperative respiratory difficulties. Managing a patient with a positive CLT after thyroidectomy necessitates a multidisciplinary approach, including close monitoring, prompt intervention, and appropriate postoperative care. This case shows the management of a patient who developed a positive cuff leak test following a total thyroidectomy. Key strategies involved administering corticosteroids to mitigate airway edema, ensuring close observation in an intensive care unit (ICU), and considering reintubation or tracheostomy if airway obstruction persisted. The patient was successfully managed through conservative measures, avoiding the need for invasive airway procedures. This case underscores the importance of vigilance and timely intervention in the postoperative period to secure patient safety and achieve favorable outcomes after total thyroidectomy. The discussion highlights the necessity of tailoring care plans to the severity of the airway compromise and the overall clinical condition of the patient. This case adds to the understanding of airway management in thyroidectomy patients and the utility of CLT in guiding clinical decisions.

Keywords: *Anesthesia, Cuff Leak Test, High Risk Airway, Interop Management, Total Thyroidectomy.*

Introduction

Total thyroidectomy, the complete surgical removal of the thyroid gland, is a widely performed procedure for conditions such as thyroid cancer, large goiters, and uncontrollable hyperthyroidism. Despite its routine nature, the surgery is not without risks, particularly in relation to airway management both during and after the procedure. One of the critical concerns post-surgery is airway edema, which can potentially lead to obstruction. The cuff leak test (CLT) is a valuable assessment tool used to evaluate the likelihood of airway obstruction or post-extubation stridor in patients following a total thyroidectomy.

Postoperative airway problems, including stridor, are a concern associated with thyroidectomy, especially for diseases such as multinodular goiter. Predicting these risks requires the use of the Cuff Leak Test (CLT), particularly in cases where airway compromise is suspected. According to research, tracheomalacia, a consequence of thyroidectomy, may require tracheostomy or

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other procedures to keep the airways open [1]. Furthermore, there is a larger chance of post-thyroidectomy stridor in cases with higher body mass index, bilateral thyroidectomy, and repeated intubation attempts [3].

Due to laryngeal edema and recurrent laryngeal nerve palsy following surgery, one patient needed to be re-intubated, which underscored the significance of airway compromise monitoring, as demonstrated by a case study [5]. Although thyroidectomies are generally safe, the risks of postoperative stridor can be greatly reduced by using CLT and exercising caution when managing airways. Our case shows the management of a patient who underwent a total thyroidectomy and had a positive cuff leak test before extubating. The importance of the CLT, and the clinical strategies that ensured a positive outcome.

A positive cuff leak test signals the presence of airway swelling or blockage, posing a significant challenge for both anesthesiologists and surgeons. It indicates that the patient's airway may not be sufficiently clear for safe extubation, increasing the risk of complications such as stridor and respiratory difficulty. As a result, managing a patient with a positive cuff leak test after a total thyroidectomy requires meticulous planning regarding extubation timing, enhanced monitoring, and possible interventions to ensure patient safety [4].

This case report will delve into the challenges associated with managing a total thyroidectomy case when a positive cuff leak test is present. It will explore the underlying causes of a positive CLT, its implications for postoperative care, and the strategies available to minimize risks and achieve the best outcomes. Additionally, the importance of a collaborative approach, involving surgeons, anesthesiologists, and critical care professionals, will be emphasized to effectively manage airway complications in such cases.

Case Presentation

A 51-year-old female patient was scheduled for total thyroidectomy due to a multinodular goitre. With a history of hypothyroidism managed with 12.5 µg of thyroxin daily, she showed no symptoms of compression such as dyspnea or dysphagia during the preoperative examination. However, a palpable 5x4 cm mass on the left side of her neck caused significant tracheal deviation to the right. Her thyroid function tests were normal, and a chest X-ray (CXR) posteroanterior view, as well as a lateral view, confirmed the tracheal deviation without compression. Preoperative video laryngoscopy (VDL) indicated normal findings.

Intraoperative Course

On the day of surgery, induction was achieved using midazolam (1 mg IV), fentanyl (100 µg IV), and propofol (100 mg IV). The patient was paralyzed with suxamethonium (100 mg IV) and intubated with a 7-size endotracheal tube (ETT) without complications. Anesthesia was maintained with oxygen, nitrous oxide (N2O), isoflurane, and vecuronium. The patient was positioned in the rose position, and the surgery lasted three and a half hours. Intraoperatively, she received 8 mg of dexamethasone.

The patient remained stable during surgery with no unexpected findings. Post-surgery, the cuff leak test was performed to assess the risk of post-extubation airway obstruction, yielding a positive result. As a precaution, she was transferred to the Intensive Care Unit (ICU) for elective mechanical ventilation.

In the ICU, she received hydrocortisone (100 mg) intravenously twice daily. A repeated cuff leak test 48 hours later was negative, indicating a lower risk of post-extubation stridor. She was successfully extubated under fiberoptic bronchoscope (FOB) guidance, with both vocal cords mobile and no signs of airway obstruction post-extubation.

Discussion

When predicting post-extubation airway blockage, the cuff leak test (CLT) is an essential

technique, especially for patients having thyroid surgery. Less than 110 milliliters of leakage are considered low volume and is linked to a higher risk of post-extubation stridor. This condition is frequently caused by laryngeal edema, tracheomalacia, or recurrent laryngeal nerve (RLN) palsy. Studies show that even though the conventional CLT has been used, its diagnostic precision varies. For example, research discovered that the typical leak test had a specificity of 74% and a sensitivity of only 36% [3], [4]. On the other hand, different approaches such as laryngeal ultrasonography have demonstrated potential, since they may predict post-extubation stridor with a sensitivity of 72.7% when they employ an air column width ratio cut-off of ≤0.94[5]. Consequently, as the cuff leaks.

After thyroidectomy, there is a considerable risk of postoperative airway problems, including laryngeal edema, especially in instances with large goiters or tracheal deviation. Since its sensitivity and specificity are crucial for patient care, the cuff leak test is an essential tool for determining the likelihood of airway edema and obstruction [6]. Proactive treatments including delayed extubation and corticosteroid administration are recommended in the event of a positive cuff leak test, as they have been demonstrated to lower the incidence of post-extubation stridor (PES) and the requirement for reintubation [7]. According to a study, patients who took corticosteroids had a far lower incidence of PES than those who did not. As a result, the cuff leak test's early risk detection enables prompt treatments, which eventually contribute to positive results in

A number of risk factors, including as extended intubation, patient posture, surgical manipulation in the vicinity of the airway, and pre-existing disorders like enlarged thyroid glands and tracheal deviation, might contribute to post-extubation stridor (PES). According to research, there is a considerable increase in the incidence of PES in newborns with nonelective intubation and extended mechanical breathing (more than 48 hours), with odds ratios of 2.92 and 1.75, respectively [8]. Furthermore, forceful intubation and repeated intubation attempts are linked to increased PES incidence [3]. Higher body mass index (BMI), bilateral thyroidectomies, and concurrent hoarseness all increase the likelihood of stridor in individuals undergoing thyroidectomies. The positive cuff leak test is crucial in identifying patients at risk, guiding perioperative care and extubation decisions. Recognizing these risk factors allows for better planning and management, ultimately reducing the likelihood.

Corticosteroids like dexamethasone reduce airway edema and inflammation. In this case, intraoperative dexamethasone and postoperative hydrocortisone were crucial in mitigating potential airway obstruction. Steroid use in patients with a positive cuff leak test significantly reduces post-extubation stridor and complications.

Anesthetic management should minimize the risk of postoperative stridor. This includes careful selection of induction agents, maintaining optimal anesthesia depth, and strategic use of muscle relaxants for smooth intubation and extubation. Using fiberoptic guidance during extubation, as demonstrated, is critical for managing difficult airways safely.

By enabling customized actions that can reduce the hazards associated with airway compromise, delaying extubation based on the results of a cuff leak test demonstrates a commitment to patient safety. According to research, the findings of positive cuff leak tests might direct clinical judgments, permitting additional measures including the use of mechanical ventilation and steroids, which may lower the prevalence of post-extubation laryngeal edema (PLE) [9]. Even though the available leak tests have poor diagnostic precision in PLE prediction, they are nevertheless useful in determining extubation readiness [9]. Furthermore, it has been shown that the use of standardized extubation protocols, such as the "Extubation Bundle,"

improves interdisciplinary teamwork and results, which can help provide more tailored patient care. Therefore, combining the results of cuff leak tests with clinical judgment is crucial for maximizing.

Further research is needed to refine cuff leak test use and determine optimal thresholds for predicting post-extubation complications in thyroid surgery patients. Prospective studies could help establish standardized protocols for CLT and identify additional influencing factors.

Conclusion

This case underscores the importance of the cuff leak test in predicting post-extubation stridor in thyroid surgery patients. Integrating the Cuff leak test into extubation protocols enables better anticipation and management of potential airway complications, improving patient outcomes.

Summary

The cuff leak test should be a standard part of postoperative assessment in thyroid surgery, particularly in patients with significant airway compromise risk factors. Its use, combined with appropriate interventions like corticosteroid administration and delayed extubation, can significantly reduce post-extubation stridor and airway complications. Timely corticosteroid use and delayed extubation until a negative cuff leak test were crucial in preventing airway obstruction, leading to a successful recovery. The case demonstrates that even with significant airway deviation and a positive cuff leak test, careful intraoperative and postoperative management can yield favorable results. The successful management of this patient illustrates the importance of integrating the cuff leak test into postoperative care for thyroidectomy patients. Using the test to guide extubation decisions helps anticipate and address potential airway issues, improving patient safety and outcomes [10]. A multidisciplinary approach involving surgeons, anesthesiologists, and intensivists is essential for comprehensive care.

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