INSIGHTS-JOURNAL OF
HEALTH AND REHABILITATION

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

SURGICAL MANAGEMENT OF A LARGE RETROSTERNAL GOITER: WHEN IS STERNOTOMY NECESSARY?

Case Report

Ahmad Farooq[1], Hamza Fawad[1], Adnan Tahir[1], Haroon Javaid Majid[1], Saqlain Ghazanfar[1]*, Khunsha Javed[2], Muhammad Saad Khan[2], Shafique Ur Rehman[1]
[1]Department of General Surgery & Surgical Oncology, Shaikh Zayed Hospital Lahore, Punjab, Pakistan
[2]Graduate of Rawalpindi Medical University, Rawalpindi, Punjab, Pakistan.
Corresponding Author: Saqlain Ghazanfar, Department of General Surgery & Surgical Oncology, Shaikh Zayed Hospital Lahore, Punjab, Pakistan.
saqlain.ghazanfar1996@gmail.com
Acknowledgement: The authors express gratitude to the surgical and anesthetic teams for their valuable contributions.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Retrosternal goiters, though uncommon, pose significant surgical challenges due to their potential to compress vital mediastinal structures, leading to respiratory distress and dysphagia. While most cases can be managed through a cervical incision, a subset requires sternotomy for complete resection. The decision to extend the surgical approach depends on factors such as tracheal compression, vascular involvement, and mediastinal extension. This case highlights the indications for sternotomy and emphasizes the importance of preoperative imaging, airway assessment, and multidisciplinary management for optimal surgical outcomes.

Case Presentation: A 52-year-old woman with a history of hypertension and diabetes presented with progressive anterior neck swelling, dyspnea on exertion, and sleep disturbances. Clinical examination revealed a large, firm, mobile neck mass with retrosternal extension. Imaging confirmed a multinodular goiter extending into the mediastinum, compressing the trachea. Bronchoscopy demonstrated significant airway narrowing. Given the extent of mediastinal involvement, a combined cervical incision and median sternotomy approach was performed. The goiter was excised completely while preserving the recurrent laryngeal nerves and parathyroid glands. The patient tolerated the procedure well, with no postoperative complications, and was discharged in stable condition.

Conclusion: This case underscores the need for early diagnosis, meticulous preoperative planning, and a multidisciplinary surgical approach in managing large retrosternal goiters. While most cases can be treated through a cervical incision, sternotomy remains crucial in selected cases with deep intrathoracic extension. A comprehensive strategy incorporating imaging, airway evaluation, and intraoperative nerve preservation plays a pivotal role in ensuring favorable outcomes.

Keywords: Airway management, Goiter, Mediastinum, Multinodular goiter, Sternotomy, Surgical outcomes, Thyroidectomy

INTRODUCTION

Retrosternal goiter, also known as substernal or intrathoracic goiter, occurs when thyroid tissue extends into the mediastinum, often leading to significant clinical challenges. Although relatively uncommon, accounting for 1–15% of all thyroid surgeries, its potential to compress vital structures such as the trachea, esophagus, and major blood vessels necessitates careful evaluation and management (1). The concept of retrosternal goiter dates back to the 18th century, and surgical approaches have evolved significantly with advancements in imaging and operative techniques (2). These goiters typically originate from the cervical thyroid gland and progressively extend into the thoracic cavity, often crossing the thoracic inlet. While many cases remain asymptomatic, a substantial proportion of patients—approximately 20–40%—develop compressive symptoms, including dyspnea, dysphagia, and, in severe cases, superior vena cava syndrome, warranting surgical intervention (3-5).

A key concern in the management of retrosternal goiters is the potential for malignancy, with reported incidence rates varying between 3% and 21% (6). Furthermore, acute airway obstruction, hemorrhage, and cardiovascular complications reinforce the importance of early diagnosis and appropriate surgical planning (7). Imaging modalities, particularly computed tomography (CT), play a pivotal role in assessing the extent of the goiter, differentiating benign from malignant lesions, and determining the need for a sternotomy (8). While the majority of retrosternal goiters can be safely removed through a transcervical approach, a subset of cases requires sternotomy due to extensive mediastinal involvement, adherence to surrounding structures, or suspicion of malignancy. Despite the complexities of surgical management, outcomes are generally favorable, with low morbidity and mortality rates when performed by experienced surgical teams (9). Given the multidisciplinary nature of treatment, collaboration between endocrinologists, radiologists, anesthesiologists, and thoracic surgeons is crucial to optimizing patient outcomes. This study aims to assess the indications for sternotomy in the surgical management of large retrosternal goiters, identifying key factors that necessitate an extended surgical approach while evaluating patient outcomes to guide clinical decision-making.

CASE PRESENTATION

Clinical Presentation

A 52-year-old woman with a history of hypertension and diabetes mellitus presented with a progressively enlarging anterior neck swelling over five years. She reported increasing fatigue, exertional dyspnea, and sleep disturbances, with significant worsening of symptoms in the five months preceding admission. Additionally, she had been on antithyroid medications and had a history of multiple previous surgical procedures, including cesarean sections, cataract surgery, and hemorrhoidectomy.

Clinical Examination and Initial Assessment

Physical examination revealed a large, firm, mobile neck mass with retrosternal extension. The swelling was associated with a positive Pemberton's sign, indicating compression of major vascular structures. A chest X-ray demonstrated a superior mediastinal mass displacing and compressing the trachea. Further evaluation with ultrasound and contrast-enhanced computed tomography (CT) confirmed a large multinodular goiter extending into the mediastinum with significant tracheal compression (Figure 1).

Preoperative Assessment

Given the risk of airway compromise, bronchoscopy was performed, revealing external compression of the trachea due to the goiter. In anticipation of potential intraoperative airway challenges, meticulous surgical planning was undertaken, involving a multidisciplinary team comprising endocrinologists, anesthesiologists, and thoracic surgeons.

Surgical Intervention

The patient underwent a total thyroidectomy through a combined collar incision and median sternotomy, extending to the fifth intercostal cartilage. Intraoperatively, a large multinodular goiter with extensive retrosternal extension was identified, reaching the lung base and causing significant tracheal and right bronchial compression. The thyroid gland was surrounded by multiple engorged veins, which complicated the dissection process (Figures 2–4). To ensure preservation of vital structures, the recurrent laryngeal nerves and

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

parathyroid glands were carefully identified and safeguarded. The goiter was successfully excised with effective intraoperative hemostasis. The patient tolerated the procedure well, and there were no immediate postoperative complications.

Postoperative Course

Postoperatively, the patient was closely monitored in the Surgical Intensive Care Unit (SICU) for airway stability and hemodynamic management. She remained stable and was subsequently transferred to the surgical ward. The recovery was uneventful, with no observed complications. She was discharged in a stable condition with instructions for regular follow-up, including monitoring of serum calcium levels and thyroid function tests.

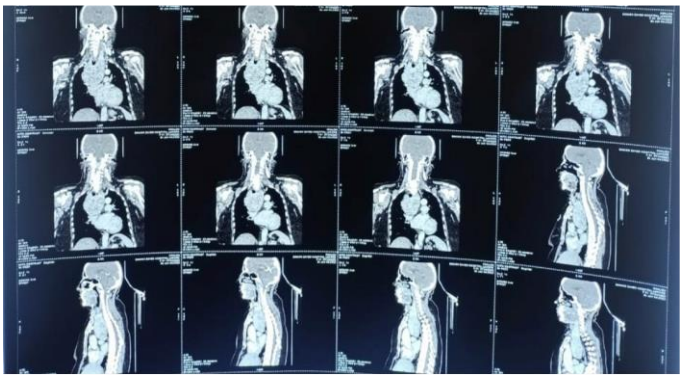

Figure 1: CT scan of the chest and neck with IV contrast showing both enlarged lobes of the thyroid with scattered hypodense nodules. The thyroid extends into the mediastinum up to the subcarinal level, compressing and displacing the trachea and major vessels, especially the superior vena cava (SVC).

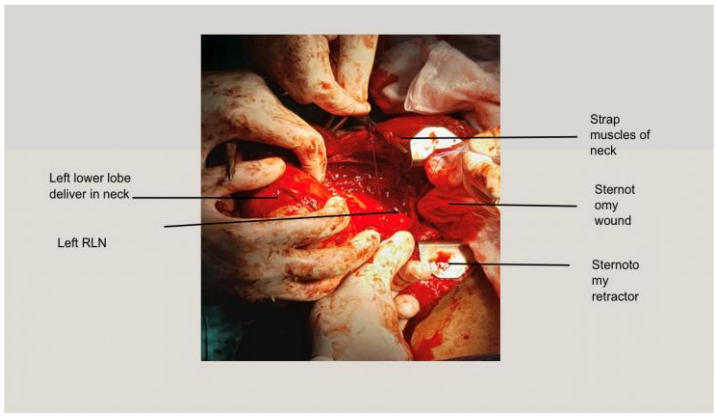

Figure 2: Intraoperative image demonstrating the lower lobe of the thyroid gland being mobilized into the cervical incision during dissection. The retrosternal extension required careful handling to avoid vascular injury.

Figure 3: Surgical view showing the inferior pedicle of the thyroid gland with its blood supply, highlighting the meticulous dissection performed to preserve the recurrent laryngeal nerve and parathyroid glands.

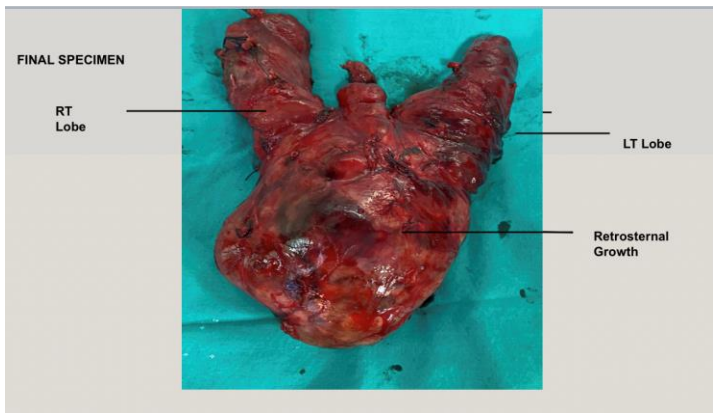

Figure 4: Final excised thyroid specimen following total thyroidectomy. The large multinodular goiter with extensive mediastinal extension is evident, confirming the necessity of sternotomy for complete removal.

DISCUSSION

Retrosternal goiters pose significant surgical challenges due to their potential to compress vital mediastinal structures, including the trachea, esophagus, and major blood vessels, leading to symptoms such as respiratory distress, dysphagia, and superior vena cava syndrome (10). Although most retrosternal goiters are benign, their progressive enlargement necessitates timely intervention to prevent life-threatening complications (3,4). In the present case, the patient exhibited progressive dyspnea on exertion and sleep disturbances, which are well-documented compressive manifestations of retrosternal goiters in existing literature. The successful surgical management of such cases relies on careful preoperative assessment and individualized selection of the surgical approach. The extent of retrosternal extension, tracheal compression, and vascular involvement are key determinants in planning surgical intervention (11). Preoperative computed tomography (CT) imaging plays a critical role in surgical decision-making, as it allows for precise evaluation of goiter dimensions, mediastinal involvement, and potential malignancy risk (12). In this case, CT imaging confirmed significant tracheal compression and extension of the goiter to the lung base, necessitating a combined cervical and median sternotomy approach to ensure

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

complete and safe excision (Figure 1). While up to 90% of retrosternal goiters can be resected via a transcervical approach, certain anatomical considerations, including extension beyond the aortic arch, tracheal deviation, and extensive vascular involvement, necessitate sternotomy for adequate exposure and safe dissection (13). In this patient, the need for sternotomy extending to the fifth intercostal cartilage was justified by the goiter's deep intrathoracic extension, allowing for controlled resection while preserving vital structures, including the recurrent laryngeal nerves and parathyroid glands. This meticulous approach reduced the risk of complications such as vocal cord paralysis and postoperative hypocalcemia, both of which are critical considerations in thyroid surgery (14).

The potential for malignancy in retrosternal goiters remains an important concern, with reported incidence rates ranging from 3% to 21% (15). Factors such as rapid growth, tracheal invasion, and nodal involvement may indicate malignant transformation, warranting histopathological evaluation and, in some cases, the need for a more extensive surgical approach. In the present case, histopathological assessment confirmed a benign multinodular goiter, aligning with the majority of retrosternal goiters that are amenable to complete surgical excision without evidence of malignancy (6,7). However, given the variability in reported malignancy rates, further studies are needed to refine preoperative risk stratification and optimize the surgical approach for retrosternal goiters with suspected malignancy (15). Despite the complexities associated with surgical management, outcomes following retrosternal goiter excision are generally favorable, with low morbidity and mortality rates reported in the literature (9). In this case, the patient experienced an uneventful postoperative recovery, with no evidence of airway compromise, hemorrhage, or recurrent laryngeal nerve injury, further reinforcing the importance of meticulous surgical planning and intraoperative nerve preservation. This aligns with previous studies emphasizing that a multidisciplinary approach involving endocrinologists, radiologists, anesthesiologists, and thoracic surgeons significantly reduces perioperative complications and improves patient outcomes (16,17). The present case highlights the critical role of preoperative imaging, individualized surgical decision-making, and a multidisciplinary approach in optimizing outcomes for patients with large retrosternal goiters. Although the need for sternotomy remains relatively infrequent, its role in ensuring complete and safe resection in cases with extensive mediastinal involvement is well-established. The study is limited by its single-case nature, and larger studies are required to further delineate optimal management strategies, particularly in cases where malignancy risk is uncertain. Future research should focus on refining preoperative risk assessment criteria and exploring minimally invasive alternatives to sternotomy in select cases.

CONCLUSION

The successful management of retrosternal goiters requires early diagnosis, thorough preoperative evaluation, and a well-coordinated multidisciplinary approach to minimize surgical risks and optimize patient outcomes. While most cases can be managed through a cervical incision, sternotomy remains essential in select cases with extensive mediastinal extension, ensuring complete resection and preventing complications. This case underscores the importance of meticulous surgical planning, including airway assessment, intraoperative nerve preservation, and vigilant postoperative monitoring, all of which contribute to favorable outcomes. By integrating advanced imaging, individualized surgical strategies, and collaborative expertise, optimal management of complex retrosternal goiters can be achieved, reinforcing the significance of tailored surgical decision-making in ensuring patient safety and long-term well-being.

AUTHOR CONTRIBUTIONS

Author	Contribution
Ahmad Farooq	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Hamza Fawad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Adnan Tahir	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Haroon Javaid Majid	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

Author	Contribution
Saqlain Ghazanfar*	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Khunsha Javed	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Muhammad Saad Khan	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Shafique Ur Rehman	Writing - Review & Editing, Assistance with Data Curation

REFERENCES

1. Abdelrahman, H., & Elsayed, A. (2020). Clinical presentation and surgical treatment of retrosternal goiter: a case series study. Journal of Thoracic Disease, 12(6), 167-173.

2. Avgoustou C. Challenges in the Management of Secondary Substernal Goiters: A Mini-Review. Ameri J Clin Med Re: AJCMR. 2024;144.

3. Ghaloo SK, Afzal SS, Abbas SA, Ansari S, De M, Iftikhar H. Tracheomalacia in patients undergoing thyroid surgery—What is the true estimate: A systematic review and meta-analysis. World Journal of Otorhinolaryngology-Head and Neck Surgery. 2024.

4. Bento SD, Bezerra GR, Nascimento IP, Brocca KV, Capelli FD. Preoperative predictive criteria for sternotomy necessity in the surgical treatment of intrathoracic goiters. einstein (Sao Paulo). 2024 Jun 25;22(Suppl 1).

5. Fang J, Wang S, Liu J. Gasless transoral endoscopic thyroidectomy in a primary substernal goitre patient: First case. Journal of Minimal Access Surgery. 2024 Jul 1;20(3):349-52.

6. Alemayehu F, Geletu Z, Birhanu W, Berhe LZ, Ayalew Z, Azibte G. Recurrent Laryngeal Nerve Injury After Thyroid Surgery at St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. Journal of Surgery. 2024 Jul;12(4):92-8.

7. Rozenko DA, Engibaryan MA, Kharagezov DA, Zhenilo MV, Popova NN, Bauzhadze MV, Marykov EA. Characteristics of anesthetic and surgical tactics in treatment of a patient with a giant thyroid mass in a cancer center (clinical case). Южно-российский онкологический журнал. 2024;5(1 (eng)):42-51.

8. Bastien AJ, Ho AS. Surgical Management of Substernal Thyroid Goiters. Otolaryngol Clin North Am. 2024;57(1):39-52.

9. Battistella E, Pomba L, Sidoti G, Vignotto C, Toniato A. Retrosternal Goitre: Anatomical Aspects and Technical Notes. Medicina (Kaunas). 2022;58(3).

10. Essig GF, Jr., Niermeyer WL, Essandoh M, Dewhirst E, Gerlach RM, Gonzalez LS, et al. Averting Risk of Airway Loss During Surgical Management of Retrosternal Goiters. J Cardiothorac Vasc Anesth. 2020;34(8):2260-8.

11. Figueiredo AA, Simões-Pereira J. Giant retrosternal goitre causing lung atelectasis. Endokrynol Pol. 2022;73(4):794-5.

12. Knobel M. An overview of retrosternal goiter. J Endocrinol Invest. 2021;44(4):679-91.

13. Linhares SM, Scola WH, Remer LF, Khan ZF, Nguyen DM, Lew JI. Depth of mediastinal extension can predict sternotomy need for substernal thyroid goiters. Surgery. 2022;172(5):1373-8.

14. Mutlu V, Aydın Y, Ogul H. Substernal Goiter with Carinal Involvement Presenting as Mediastinal Mass. Arch Bronconeumol (Engl Ed). 2020;56(5):322.

15. Phillips A, Calcott S, Rahmani MJ. Out of sight, out of mind: retrosternal goitre as a rare cause of breathlessness. Br J Hosp Med (Lond). 2022;83(7):1.

16. Piccioni G, Siciliani A, Messa F, Mercantini P, D'Andrilli A, Tiracorrendo M, et al. Combined Cervicotomy and Robot-Assisted Surgical Approach for Intrathoracic Thyroid Goiter: A Case Series. Innovations (Phila). 2024;19(3):311-4.

17. Rich J, Mehra B, Ghoshal S, Dubhashi SP. Challenges in the management of a secondary retrosternal goitre with superior vena cava syndrome. BMJ Case Rep. 2024;17(12).