OPTIMIZING SURGICAL STRATEGIES FOR GIANT AND RETROSTERNAL GOITERS: RESULTS FROM A FIVE-YEAR INSTITUTIONAL STUDY

Ermuminov Iskandar Ziyodullo o‘g‘li
Scientific Advisor: DSc, Associate Professor ***Irisov Ortiqali Tulayevich***
Academician V.V. Vakhidov Republican Specialized Scientific and Practical Medical Center of Surgery, Tashkent, Uzbekistan

Abstract

To systematically evaluate and optimize the surgical management of giant and substernal goiters, a comprehensive clinical analysis of 147 patients (mean age 54.2 years) treated between 2019 and 2024 was conducted. Utilizing Multi-Slice Computed Tomography (MSCT), mediastinal extension was anatomically categorized into Grades I (51.0%), II (35.4%), and III (13.6%). The primary surgical strategy heavily favored a standard cervical approach, allowing for successful total excision via a Kocher collar incision alone in 87.1% (n=128) of the cohort. However, 10.2% (n=15) of patients required conversion to median sternotomy due to complex anatomical anchoring or "hourglass" morphological configurations, and 2.7% (n=4) necessitated lateral thoracotomy for deep posterior descent. Post-operative outcomes demonstrated a high safety profile, with transient hypocalcemia (9.5%), transient recurrent laryngeal nerve palsy (5.4%), and structural tracheomalacia managed effectively via prolonged intubation (2.0%), alongside a 0% operative mortality rate. Ultimately, while the vast majority of substernal masses can be extracted via a cervical incision, maintaining strict criteria for thoracic access escalation is essential for deep extensions to ensure immediate vascular control and safeguard the compromised airway.

Keywords: Substernal goiter, giant goiter, thyroidectomy, sternotomy, tracheomalacia, MSCT.

Introduction

Giant and substernal (retrosternal) goiters represent one of the most formidable challenges in modern endocrine and thoracic surgery. By definition, these are thyroid masses where a significant portion extends caudally beyond the thoracic inlet into the mediastinum. The pathophysiology is driven by the progressive growth of the thyroid tissue within the rigid, unyielding osseous boundaries of the superior chest. This anatomical displacement leads to severe mechanical compression of critical adjacent

structures, primarily the trachea, esophagus, and major brachiocephalic vessels. As the mass expands, patients develop debilitating exertional dyspnea, positional orthopnea, and potentially life-threatening airway narrowing. Furthermore, substernal goiters frequently recruit ectopic parasitic blood vessels directly from the thoracic cavity, significantly elevating the risk of catastrophic intraoperative hemorrhage. Consequently, optimizing surgical tactics is paramount.

Aim of the Study

To systematically evaluate and optimize the tactical selection of surgical access routes and procedural techniques in the management of giant and substernal goiters, with the ultimate goal of minimizing severe intraoperative complications, securing the airway, and improving long-term physiological outcomes.

Materials and Methods

A comprehensive clinical analysis was conducted on a cohort of 147 patients surgically treated at our institution between 2019 and 2024. The demographic profile revealed a mean age of 54.2 ± 12.6 years, with a pronounced female predominance (76.2%, n=112 females; 23.8%, n=35 males). The cornerstone of our pre-operative diagnostic protocol was Multi-Slice Computed Tomography (MSCT) of the neck and chest with 3D volumetric reconstruction. This advanced imaging allowed for precise anatomical mapping of the mass and measurement of the minimum tracheal diameter. Based on MSCT data, mediastinal extension was categorized into three grades: Grade I (mass extending above the upper border of the aortic arch), Grade II (mass reaching the level of the aortic arch), and Grade III (deep penetration into the anterior or posterior mediastinum below the arch).

Results

Pre-operative MSCT mapping demonstrated Grade I extension in 51.0% (n=75) of patients, Grade II in 35.4% (n=52), and Grade III in 13.6% (n=20). The primary surgical strategy heavily favored a standard cervical approach. Through meticulous digital traction performed strictly within the true avascular surgical capsule, total excision via a standard Kocher cervical collar incision alone was successfully achieved in 87.1% (n=128) of the cohort. However, due to complex anatomical anchoring, "hourglass" morphological configurations, or dense recurrent scarring, 10.2% (n=15) of patients required a planned or intraoperative conversion to a median sternotomy. An additional 2.7% (n=4) necessitated lateral thoracotomy for deep posterior mediastinal descent. Post-operative outcomes demonstrated a high safety profile: transient hypocalcemia was observed in 9.5% of cases, and transient recurrent laryngeal nerve

(RLN) palsy in 5.4%, both resolving completely with conservative care. Notably, 2.0% of patients exhibited structural tracheomalacia, successfully managed via prolonged intubation (48-72 hours) without the need for permanent tracheostomy. The operative mortality rate for the entire cohort was 0%.

Conclusion

The foundation of safe surgical management for giant and substernal goiters relies heavily on high-fidelity MSCT imaging to pre-operatively map mediastinal descent. While the vast majority of these complex masses can be safely extracted via a cervical incision using precise capsular dissection, surgeons must maintain strict, predefined criteria for converting to a median sternotomy. Escalation to thoracic access is absolutely essential for deep Grade III extensions and "hourglass-shaped" masses to ensure immediate vascular control, prevent capsular rupture, and safeguard the compromised airway.

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