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Case Report

Huge multinodular goiter with retrosternal extension: trans-cervical approach in a 39-year-old patient

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ABSTRACT

Large multinodular goiters (MNG) with retrosternal extension present significant surgical challenges, particularly in resource-limited settings like Bangladesh. This case report describes the successful management of a huge MNG in a 39-year-old female using a trans-cervical approach, highlighting the importance of preoperative imaging, postoperative complications, and the healthcare challenges specific to developing countries. A 39-year-old female presented with a large anterior neck mass that had progressively enlarged over several years. Ultrasound and computed tomography (CT) confirmed the presence of a MNG with retrosternal extension. Fine needle aspiration (FNA) cytology revealed a benign follicular nodule. Preoperative biochemical findings showed subclinical hyperthyroidism and hypocalcemia. The patient underwent total thyroidectomy via a trans-cervical approach without the need for sternotomy. Postoperatively, the patient experienced transient hypocalcemia, which was managed with calcium and vitamin D supplementation, and mild transient hoarseness, likely due to recurrent laryngeal nerve (RLN) manipulation. The histopathological examination confirmed a benign MNG. The case demonstrates the feasibility and success of the trans-cervical approach in managing large retrosternal goiters, (RSG) minimizing postoperative morbidity while avoiding sternotomy. Preoperative imaging played a crucial role in surgical planning, and the management of transient complications was effective. This case also highlights the need for improved healthcare infrastructure and public health measures in regions like Bangladesh, where iodine deficiency remains prevalent.

Keywords: MNG, Retrosternal extension, Trans-cervical approach, Hypocalcemia, Iodine deficiency

INTRODUCTION

Thyroid disorders, including goiters, represent a significant public health burden globally, particularly in regions where iodine deficiency remains prevalent. Goiter is one of the most common endocrine disorders worldwide, affecting about 5-10% of the population, with a higher prevalence observed in iodine-deficient regions, such as parts of South Asia, including Bangladesh. Iodine deficiency continues to be the primary contributing factor to the development of goiters, particularly in resource-limited settings, where access to iodized salt and public health interventions may be inconsistent. Studies from South Asia have indicated that the prevalence of thyroid diseases, including goiters, remains high despite efforts to implement iodine supplementation programs. For instance, a study conducted in Pakistan found a palpable goiter prevalence of 28.7%, with a significant association

with iodine deficiency and other thyroid disorders.[1] Similarly, research in Sri Lanka following the global iodization program reported a clinically detectable goiter prevalence of 6.8%, indicating the continued relevance of iodine deficiency in the region.[2] Goiters can manifest in various forms, including diffuse goiters and MNG, with the latter being characterized by the progressive enlargement of the thyroid gland and the development of multiple nodules. MNG may be toxic or non-toxic, with toxic variants associated with hyperthyroidism and non-toxic forms generally presenting without overt thyroid dysfunction. The non-toxic, benign nature of MNG, such as the case presented in this study, is often the result of longstanding thyroid hyperplasia and is more commonly observed in women, with up to 12% prevalence in iodine-deficient regions.[3] The development of MNG is often gradual, with some cases remaining asymptomatic for extended periods until the gland's enlargement leads to the compression of surrounding structures or cosmetic concerns necessitate intervention. A specific subset of goiters, RSG, pose additional clinical challenges due to their extension beyond the thoracic inlet into the mediastinum. Defined as goiters in which more than 50% of the thyroid tissue extends below the thoracic inlet, RSG may compress vital mediastinal structures such as the trachea, esophagus, and large vessels, leading to symptoms like dyspnea, dysphagia, stridor, and, in severe cases, superior vena cava syndrome.[4] While approximately 40-50% of RSG are asymptomatic at initial presentation, their growth over time can necessitate surgical intervention due to airway compromise or significant compression of adjacent structures.[5] Retrosternal extension is observed in about 10-15% of large goiters, with an incidence of 3-20% in patients undergoing thyroid surgery.[6] The management of RSG typically requires surgical excision due to the risks associated with continued growth and compression of mediastinal structures. The primary treatment for symptomatic or large MNGs with retrosternal extension is total thyroidectomy. In most cases, this can be achieved through a cervical incision, which is the preferred approach due to its minimally invasive nature, shorter recovery times, and lower complication rates compared to more invasive approaches like sternotomy or thoracotomy.[7] Studies have shown that approximately 85-90% of RSG can be safely removed via a cervical approach without the need for a sternotomy.[8] The feasibility of this approach even in cases where the goiter extends as far as the aortic arch has been demonstrated, with low complication rates and successful outcomes in the majority of cases.[9] The trans-cervical approach has been favored in surgical practice due to its association with lower morbidity, quicker recovery times, and reduced need for more invasive procedures. A study conducted on the surgical outcomes of substernal goiters found that 90.5% of patients were successfully managed using a cervical approach, with only 9.5% requiring a sternotomy due to the goiter's extension below the aortic arch or other complicating factors.[10] Similar outcomes have been reported in other studies, where the trans-cervical approach was sufficient in the majority of cases, avoiding the need for sternotomy and resulting in fewer complications such as RLN injury or hypoparathyroidism.[11] In cases where sternotomy is required, it is typically reserved for situations where the goiter extends beyond the thoracic inlet or is associated with significant tracheal or vascular compression, making access through a cervical incision challenging.[12] Despite the overall success of the trans-cervical approach, the surgical management of large RSG is not without risks. Potential complications include tracheal compression, postoperative bleeding, RLN injury, and hypocalcemia due to manipulation or inadvertent damage to the parathyroid glands. Hypocalcemia, in particular, remains one of the most common postoperative complications, with studies reporting transient hypocalcemia in up to 20.54% of cases managed through a cervical approach.[13] Advanced imaging techniques such as CT and magnetic resonance imaging (MRI) play a crucial role in preoperative planning by helping to delineate the extent of the goiter and its relationship with surrounding structures, enabling surgeons to better anticipate potential complications and select the optimal surgical approach.[14] In the context of Bangladesh, the surgical management of large RSG presents additional challenges due to healthcare infrastructure limitations and delayed diagnosis of thyroid diseases. Public health efforts to address iodine deficiency, while improving, remain inconsistent, contributing to the persistence of goiters and other thyroid disorders in the population. Moreover, the lack of access to advanced diagnostic tools in many regions can delay the detection and management of large goiters, increasing the risk of complications at the time of surgery.[15] The case presented in this report serves as an illustrative example of the successful management of a large retrosternal goiter through a trans-cervical approach, highlighting both the feasibility of this approach and the importance of early detection and intervention in optimizing patient outcomes.

CASE REPORT

A 39-year-old female, Razia Begum, presented to the outpatient department with complaints of a progressively enlarging neck mass over the past five years. The mass, which was predominantly located in the anterior part of the neck, had become visibly noticeable and was gradually increasing in size. Although she experienced mild discomfort from the enlarging mass, she did not report significant symptoms of dyspnea, dysphagia, stridor, or any compressive symptoms like difficulty breathing or swallowing. The patient did not report any weight loss, palpitations, heat intolerance, or tremors typically associated with hyperthyroidism, and she had no history of prior radiation exposure to the neck.

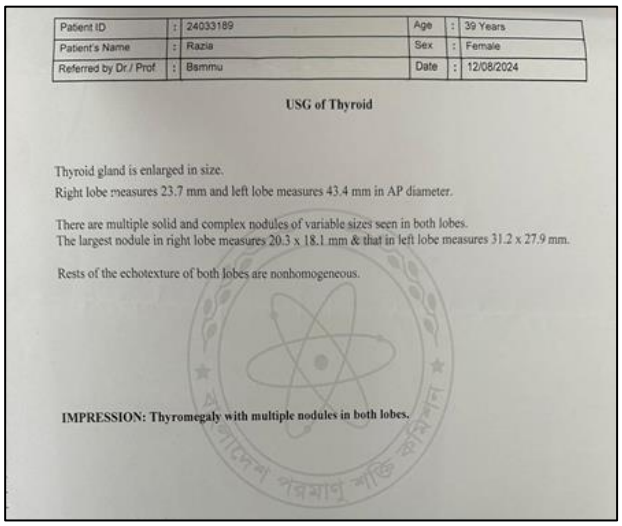
Initial examination and investigations

On physical examination, the patient was found to have an enlarged, palpable thyroid mass, consistent with a

MNG. The mass was firm, non-tender, and extended below the sternal notch, raising concerns about a retrosternal component. No significant cervical lymphadenopathy was observed. The mass was noted to cause mild tracheal deviation but did not appear to cause respiratory distress or compromise airway patency. Auscultation of the lungs was clear, and cardiac examination was normal, with a pulse of 72 beats per minute and blood pressure of 110/70 mmHg.

Given the goiter's size and potential mediastinal involvement, further investigations were initiated.

Ultrasound of the thyroid gland revealed an enlarged thyroid with multiple solid and cystic nodules of varying sizes. The right lobe measured 23.7 mm, while the left lobe was significantly larger, measuring 43.4 mm in anterior-posterior (AP) diameter. The largest nodule in the right lobe was 20.3×18.1 mm, and the largest nodule in the left lobe was 31.2×27.9 mm (Figure 1). These findings were consistent with MNG, and the left lobe exhibited extension beyond the thoracic inlet, confirming the presence of a retrosternal goiter. Additionally, the echotexture of the thyroid gland was heterogeneous, with evidence of colloid degeneration.



Patient ID	:	24033189	Age	:	39 Years
Patient's Name	:	Razia	Sex	:	Female
Referred by Dr./ Prof	:	Bsmmu	Date	:	12/08/2024

USG of Thyroid

Thyroid gland is enlarged in size.
Right lobe measures 23.7 mm and left lobe measures 43.4 mm in AP diameter.

There are multiple solid and complex nodules of variable sizes seen in both lobes.
The largest nodule in right lobe measures 20.3 x 18.1 mm & that in left lobe measures 31.2 x 27.9 mm.

Rests of the echotexture of both lobes are nonhomogeneous.

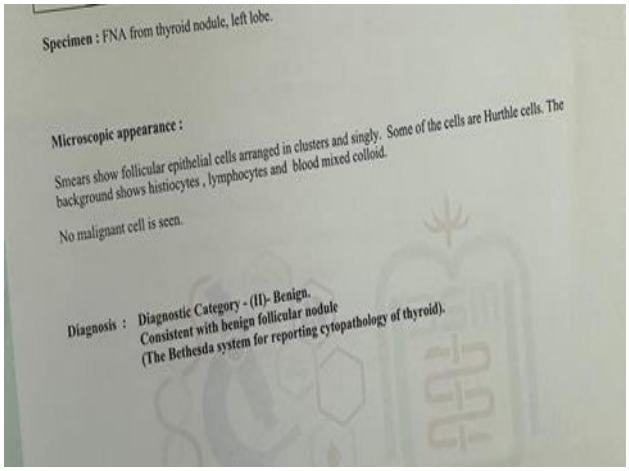
IMPRESSION: Thyromegaly with multiple nodules in both lobes.

Figure 1: The ultrasonogram findings of the patient.

The CT scan of the thyroid gland revealed that both thyroid lobes are enlarged more on the left side which extends downward to about the aortic arch. Multiple solid and cystic areas within. The gland extends retrosternally on the left side. Mild external compression and displacement of the trachea. The largest nodule in the left lobe measures about (13×7 cm), the right lobe (7×4 cm), isthmus (2×1 cm), retrosternal portion (5×3 cm) (Figure 2).

A FNA biopsy was performed on the largest nodule in the left lobe to rule out malignancy. Based on Bethesda System Category II, the cytopathology report confirmed a benign follicular nodule. The microscopic examination showed clusters of follicular epithelial cells arranged singly and in groups, along with some Hurthle cells and blood-mixed colloid. No malignant cells were identified, confirming the benign nature of the thyroid enlargement (Figure 3).

Figure 2: CT of thyroid gland with MNG.



Specimen : FNA from thyroid nodule, left lobe.

Microscopic appearance :

Smears show follicular epithelial cells arranged in clusters and singly. Some of the cells are Hurthle cells. The background shows histiocytes , lymphocytes and blood mixed colloid.

No malignant cell is seen.

Diagnosis : **Diagnostic Category - (II)- Benign.**
Consistent with benign follicular nodule
(The Bethesda system for reporting cytopathology of thyroid).

Figure 3: Cytopathology report of the patient.

Further blood tests showed thyroid function within normal limits, with a thyroid-stimulating hormone (TSH) level of 0.53 mIU/l, indicating subclinical hyperthyroidism. Other thyroid function markers, including FT3 and FT4, were within normal ranges. Additionally, routine laboratory workup revealed a serum calcium level of 6.48 mg/dl, which was significantly below the normal range (8.6-10.3 mg/dl), suggesting pre-existing hypocalcemia. Hemoglobin levels were measured at 12.8 g/dl, with other laboratory values within normal limits, such as fasting blood sugar and electrolytes. A chest X-ray (CXR) showed normal lung

fields without any evidence of tracheal compression or mediastinal widening. The patient's electrocardiogram (ECG) was also normal, ruling out any significant cardiac involvement.

Given the size of the goiter, its retrosternal extension, and the risk of future compressive symptoms, the decision was made to proceed with surgical management in the form of a total thyroidectomy. The surgical team planned for a trans-cervical approach, as imaging and clinical assessment indicated that this approach would be sufficient without the need for more invasive procedures like sternotomy.

Surgical intervention

The patient was prepped for surgery under general anesthesia, and a total thyroidectomy was performed using a trans-cervical approach. Despite the goiter's significant size and its retrosternal extension, the surgery was completed successfully without the need for sternotomy. The intraoperative findings revealed a MNG with retrosternal extension into the superior mediastinum, but the mass did not extend below the aortic arch, thus obviating the need for a more invasive thoracic incision. The thyroid gland was removed intact, with care taken to preserve the RLNs and parathyroid glands.

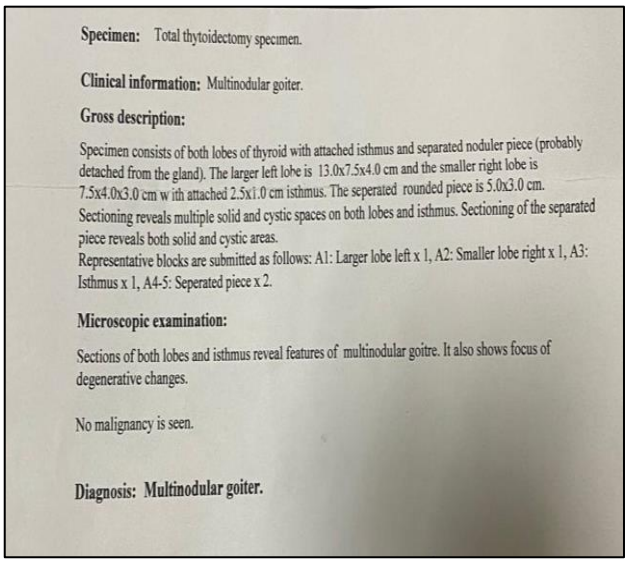
The surgical procedure was uneventful, and the patient was transferred to the post-anesthesia care unit (PACU) for monitoring. Postoperatively, the patient experienced transient hypocalcemia, a common complication following thyroidectomy, which was managed with intravenous calcium gluconate and oral calcium supplements. The patient also experienced mild transient hoarseness, which was attributed to manipulation of the RLN during surgery. However, there were no signs of permanent nerve injury.

Postoperative course

The patient was closely monitored for complications in the immediate postoperative period. Serum calcium levels continued to be low, necessitating ongoing calcium and vitamin D supplementation. The patient's hoarseness improved gradually, and no other significant complications, such as hematoma or airway compromise, were observed.

Histopathological examination of the resected thyroid specimen revealed a MNG with both solid and cystic areas. The largest nodule in the left lobe measured 13.0×7.5×4.0 cm, while the right lobe had a nodule measuring 7.5×4.0×3.0 cm. No signs of malignancy were observed, and the nodules were characterized by colloid degeneration and benign hyperplasia (Figure 4).

The patient's serum calcium levels were rechecked on the second postoperative day, and although they remained below the normal range, her symptoms were controlled with oral supplementation. The patient was discharged on the fifth postoperative day with instructions for follow-up to assess calcium levels and thyroid hormone replacement therapy.



Specimen: Total thytoidectomy specimen.

Clinical information: Multinodular goiter.

Gross description:

Specimen consists of both lobes of thyroid with attached isthmus and separated noduler piece (probably detached from the gland). The larger left lobe is 13.0x7.5x4.0 cm and the smaller right lobe is 7.5x4.0x3.0 cm w ith attached 2.5x1.0 cm isthmus. The seperated rounded piece is 5.0x3.0 cm. Sectioning reveals multiple solid and cystic spaces on both lobes and isthmus. Sectioning of the separated piece reveals both solid and cystic areas.
Representative blocks are submitted as follows: A1: Larger lobe left x 1, A2: Smaller lobe right x 1, A3: Isthmus x 1, A4-5: Seperated piece x 2.

Microscopic examination:

Sections of both lobes and isthmus reveal features of multinodular goitre. It also shows focus of degenerative changes.

No malignancy is seen.

Diagnosis: Multinodular goiter.

Figure 4: Histopathological report of the patient.

Figure 5: Post-total thyroidectomy specimen and the excised gland weighed 460 gm.

This case demonstrates the successful management of a large MNG with retrosternal extension via a trans-cervical approach. The patient's post-operative recovery was uneventful aside from transient hypocalcemia and mild hoarseness, both of which were managed effectively. The case highlights the feasibility of a cervical approach in large goiters with retrosternal extension, avoiding the need for more invasive procedures like sternotomy while minimizing postoperative complications.

Figure 6: Excised MNG with retrosternal extension following total thyroidectomy.

DISCUSSION

The presented case of a 39-year-old female with a large MNG extending retrosternal illustrates the complexities and challenges of managing such cases in a resource-limited setting like Bangladesh. RSG, though not uncommon, pose significant surgical challenges due to their anatomical extension into the mediastinum, potentially compressing critical structures such as the trachea, esophagus, and blood vessels. In this case, the decision to proceed with a total thyroidectomy via a trans-cervical approach was crucial in ensuring minimal invasiveness while effectively managing the patient's condition. The successful outcome in this case aligns with the growing body of evidence supporting the cervical approach for most RSG, as demonstrated in several studies where 85-90% of such goiters were successfully managed without the need for more invasive procedures like sternotomy.[16] Advanced imaging played a pivotal role in preoperative planning, helping assess the size and extent of the goiter, particularly its retrosternal involvement. Ultrasound and CT scans are integral in determining whether a cervical approach is feasible or whether a more invasive approach is necessary. In this case, the CT scan confirmed the retrosternal extension of the goiter, guiding the surgical team in opting for a trans-cervical approach without sternotomy. This approach is well-supported by existing literature, where studies have shown that CT imaging significantly aids in evaluating the mediastinal involvement of thyroid masses and is crucial for surgical planning.[17] Additionally, studies have demonstrated that multidetector CT can offer detailed insights into the anatomical relationships of mediastinal goiters, reducing operative time and morbidity.[18] One of the primary postoperative complications observed in this case was hypocalcemia, which necessitated calcium and vitamin D supplementation. Hypocalcemia remains one of the most frequent complications following total thyroidectomy, with an incidence ranging from 10-30%, depending on the study.[19] The transient nature of hypocalcemia in this case aligns with findings from studies that report transient hypocalcemia in 15-24% of thyroidectomy cases, with most patients requiring temporary calcium supplementation during the recovery period.[20] Moreover, hypoparathyroidism, which is often associated with devascularization of the parathyroid glands during surgery, remains a critical factor in post-thyroidectomy hypocalcemia, as seen in other studies.[21] The transient hoarseness experienced by the patient postoperatively can be attributed to the manipulation of the RLN during surgery, another known complication of thyroidectomy. In the literature, transient RLN palsy occurs in approximately 1-6% of cases, depending on the complexity of the surgery and the surgeon's experience.[16] Fortunately, no permanent nerve injury was observed in this case, which is consistent with other studies that report the reversibility of transient nerve injuries with time and proper care.[5] The case also underscores the healthcare challenges faced in resource-limited settings like Bangladesh, where delayed diagnosis and limited access to advanced diagnostic tools can hinder early intervention. Iodine deficiency, a leading cause of goiters in South Asia, continues to be a significant public health issue, as seen in studies conducted across the region. In Bangladesh, delayed presentation of large goiters is common due to limited healthcare resources, which complicates management and increases the risk of complications.[15] This case further highlights the need for improved public health measures to enhance iodine supplementation and early detection, which could prevent the development of such large thyroid masses.[3] In conclusion, this case demonstrates the effective management of a large retrosternal goiter via a trans-cervical approach, avoiding the need for invasive sternotomy, and highlights the importance of advanced imaging in surgical planning. The successful management of postoperative hypocalcemia and transient RLN injury in this patient further reinforces the importance of careful intraoperative technique and postoperative monitoring. Additionally, the case underscores the healthcare challenges in resource-limited settings like Bangladesh, particularly in managing large goiters that result from iodine deficiency. Addressing these challenges through public health interventions and improved access to healthcare could significantly reduce the burden of thyroid disorders in such regions.

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This case report highlights the successful management of a large MNG with retrosternal extension in a 39-year-old female using a trans-cervical approach. The case emphasizes the importance of advanced preoperative imaging, such as ultrasound and CT scans, in assessing the extent of the goiter and aiding in surgical decision-making. The avoidance of sternotomy underscores the feasibility of the cervical approach for the majority of RSG, reducing postoperative morbidity. Although transient hypocalcemia and hoarseness were observed, these complications were effectively managed, and the patient's recovery was uneventful. This case also brings attention to the challenges faced in resource-limited settings, such as Bangladesh, where iodine deficiency remains a significant cause of goiters. Public health interventions and improved healthcare access are essential for the early detection and treatment of thyroid disorders in such regions.

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REFERENCES

1. Jawa A, Jawad A, Riaz SH, Assir MZK, Chaudhary AW, Zakria M, et al. Turmeric use is associated with reduced goitrogenesis: Thyroid disorder prevalence in Pakistan (THYPAK) study. Indian J Endocrinol Metabol. 2015;19(3):347.
2. Fernando R, Chandrasinghe P, Pathmeswaran A. The prevalence of autoimmune thyroiditis after universal salt iodisation in Sri Lanka. Ceylon Med J. 2012;57(3):116.
3. Kumari R. Goiter Prevalence in Children in North India Region. Asian J Biomed Pharmaceutical Sci. 2016;6(53):39-40.
4. Gostimsky AV, Karpatsky IV, Matveeva ZS, Shudaev IR, Selikhanov BA. Diagnostic And Choice of Surgical Tactics in Patients with Retrosternal Goiter. Tavricheskiy Mediko-Biologicheskiy Vestnik. 2020;23(2):52-8.
5. Wang X, Zhou Y, Li C, Cai Y, He T, Sun R, et al. Surgery for retrosternal goiter: cervical approach. Gland Surg. 2020;9(2):392-400.
6. Cichoń S, Anielski R, Konturek A, Baczyński M, Cichoń W, Orlicki P. Surgical management of mediastinal goiter: risk factors for sternotomy. Langenbecks Arch Surg. 2008;393(5):751-7.
7. Coskun A, Yildirim M, Erkan N. Substernal Goiter: When is a Sternotomy Required? Int Surg. 2014;99(4):419-25.
8. Althbety M. Outcomes of trans-cervical surgical management for massive substernal Thyroid goiters; a community hospital experience. J Rep Thyroid Res. 2021;5:2.
9. Mostafa MA, Mohamed TH, Jamjoom AO, Shadi A, Abdelwahab K, Elmaadawy M. Cervical Approach for Retro-Sternal Goiter Reaching the Arch of the Aorta. Should be Always your First Option. Med J Cairo University. 2021;89(12):2403-9.
10. Nakayama H, Goda M, Kohagura K, Suganuma N, Iwasaki H, Yamazaki H, et al. A Large Substernal Goiter that Extended to Both Sides of the Thorax. Case Rep Surg. 2018;2018(1):6107982.
11. Polistena A, Sanguinetti A, Lucchini R, Galasse S, Monacelli M, Avenia S, et al. Surgical approach to mediastinal goiter: An update based on a retrospective cohort study. Int J Surg. 2016;28(1):S42-6.
12. Tsakiridis K, Visouli AN, Zarogoulidis P, Karapantzos E, Mpakas A, Machairiotis N, et al. Resection of a giant bilateral retrovascular intrathoracic goiter causing severe upper airway obstruction, 2 years after subtotal thyroidectomy: a case report and review of the literature. J Thorac Dis. 2012;4(1):41-8.
13. Anikin V, Welman K, Asadi N, Dalal P, Reshetov I, Beddow E. Retrosternal goiter in thoracic surgical practice. Khirurgiia (Mosk). 2021;(12):20-6.
14. Nankee L, Chen H, Schneider DF, Sippel RS, Elfenbein DM. Substernal goiter: when is a sternotomy required? J Surg Res. 2015;199(1):121-5.
15. Subhan F, Jahangir M, Saira S, Khattak RM, Shahab M, Haq M, et al. Prevalence of goiter and iodine status among 6-12 years school age children in district Kohat, Pakistan. South East Asia J Publ Heal. 2014;4(2):42-6.
16. Soni N, Gedam BS, Akhtar M. Thyroidectomy: post-operative complications and management. Int Surg J. 2019;6(5):1659-63.
17. Grainger J, Saravanappa N, D'souza A, Wilcock D, Wilson PS. The surgical approach to retrosternal goiters: The role of computerized tomography. Otolaryngol Head Neck Surg. 2005;132(6):849-51.
18. Moschetta M, Ianora AAS, Testini M, Vacca M, Scardapane A, Angelelli G. Multidetector computed tomography in the preoperative evaluation of retrosternal goiters: a useful procedure for patients for whom magnetic resonance imaging is contraindicated. Thyroid. 2010;20(2):181-7.
19. Christou N, Mathonnet M. Complications after total thyroidectomy. J Visc Surg. 2013;150(4):249-56.
20. Ambe PC, Brömling S, Knoefel WT, Rehders A. Prolonged duration of surgery is not a risk factor for postoperative complications in patients undergoing total thyroidectomy: a single center experience in 305 patients. Patient Safety Surg. 2014;8(1):45.

21. Atiq MT, Joarder AH, Alam MM, Hossain MA, Biswas SS. Analysis of post operative complications following total thyroidectomy. Mymensingh Med J. 2011;20(2):238-44.

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