CASE REPORT

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Clinical manifestations and surgical approach of retrosternal goiter: A case report

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ABSTRACT

Introduction: Retrosternal goiter is an enlarged thyroid gland that extends into the mediastinum and is often asymptomatic until discovered incidentally on radiological examination. This report aims to describe the clinical manifestations, radiological findings, and surgical considerations in a case of a large retrosternal goiter successfully resected using a combined transcervical approach and a full sternotomy.

Case description: A 66-year-old woman presented with chief complaints of shortness of breath and cough. Physical examination revealed a diffusely enlarged thyroid gland with a nonpalpable lower border and decreased vesicular breath sounds in the right hemithorax. Laboratory results showed a thyroid-stimulating hormone (TSH) level of <0.05 µIU/mL and a free thyroxine (FT4) level of 7.61 pmol/L. A chest radiograph revealed a mass in the right upper lung field, while a chest computed tomography (CT) showed a retrosternal mass associated with the thyroid gland and extending into the mediastinum. The patient underwent a total thyroidectomy using a combined transcervical approach and full sternotomy. The removed tissue measured 9 × 6 × 4 cm, and histopathological examination confirmed the diagnosis of papillary thyroid carcinoma with follicular differentiation.

Conclusion: Most retrosternal goiters can be resected via a transcervical approach, but a full sternotomy is necessary in cases with bilateral thoracic extension, exceeding the thoracic inlet, or associated tracheal narrowing. This approach provides extensive visualization of the mediastinum, facilitates bleeding control, and reduces the risk of surgical complications.

Keywords: Retrosternal goiter, sternotomy, thyroid, thyroidectomy.
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INTRODUCTION

Retrosternal goiter is defined as an enlargement of the thyroid gland that extends beyond the thoracic inlet into the mediastinum by more than 50% of its volume.[1,2] This condition is a special form of goiter that can cause compression of mediastinal structures such as the trachea, esophagus, or great vessels, resulting in respiratory obstruction or dysphagia.[3,4] The incidence of retrosternal goiter is reported to range from 5.1% to 15.7% of all thyroid goiter cases.[5,6] The majority of cases are asymptomatic and discovered incidentally on radiological examination, but in some patients, progressive enlargement may occur, requiring surgical intervention.[7,8] Negative thoracic pressure, gravity, and a relatively wide mediastinal position are thought to contribute to the descent of the thyroid into the thoracic cavity.[2]

Despite various definitions and classifications, there is no consensus regarding the anatomical boundaries or the best surgical approach for retrosternal goiter.[9,10] Most cases can be resected via a cervical approach alone, but approximately 2–8% require a full sternotomy or a combined extracervical approach due to extension of the lesion into the posterior mediastinum or adhesions to vital structures.[6,11,12] The choice of optimal surgical technique depends on the size, location, and direction of growth of the mass, as well as the risk of complications such as bleeding, recurrent laryngeal nerve injury, or postoperative tracheal collapse.[13,14] In this context, reporting cases with atypical clinical manifestations or those requiring a combined cervical approach and sternotomy is valuable, as it enriches the clinical literature and helps clarify the indications for this procedure.

This case report aims to describe the clinical manifestations and surgical strategy in a patient with a large retrosternal goiter extending into the mediastinum, which was successfully resected using a combined cervical approach and full sternotomy.

CASE DESCRIPTION

A 66-year-old woman presented to the hospital with chief complaints of persistent shortness of breath and cough. There was no history of previous trauma. On general physical examination, the patient's level of consciousness was within normal limits, vital signs were stable, and no abnormalities were found on examination of the head, neck, extremities, or abdomen. The chest wall appeared symmetrical during inspiration and expiration without intercostal retractions (Figure 1). On neck palpation, the thyroid gland was palpably enlarged with a soft consistency, the lower border was not palpable, and movement of the gland relative to the surrounding tissue was limited. On lung auscultation with a stethoscope, vesicular breath sounds were decreased in the upper right hemithorax.

Laboratory tests revealed a TSH level of <0.05 μIU/mL and an FT4 level of 7.61 pmol/L, indicating hyperthyroidism. A neck ultrasound revealed a large mass with calcified areas in the right thyroid lobe, accompanied by left lobe enlargement and a collection of fluid around the paratracheal area, without any obvious signs of malignancy. A chest X-ray revealed a mass shadow in the upper to middle right lung field without pleural effusion (Figure 2a). A chest CT scan showed that the mass originated from the thyroid gland and extended into the mediastinum, forming a retrosternal component that was continuous with the cervical thyroid tissue (Figure 2b).

The patient then underwent a total thyroidectomy procedure using a combined transcervical approach and a full sternotomy. Anesthesia was performed via bronchoscope-assisted intubation by an anesthesiologist. The patient was positioned supine with optimal neck extension. An incision was made in the anterior neck skin, followed by a median incision in the sternum, leading to a full sternotomy to gain access to the mediastinal mass (Figure 3a). After total resection, the tumor tissue was successfully removed intact, measuring approximately 9 × 6 × 4 cm (Figure 3b).

The tumor tissue sample was then sent to the anatomical pathology laboratory for microscopic examination. After all the tumor tissue was removed, a histopathology slide was prepared and observed under a microscope. The examination revealed an arrangement of round cells with central nuclei forming a microfollicular structure, accompanied by clusters of oval-shaped nucleated cells with a ground-glass appearance, coffee-bean nuclei, and pseudo-nucleoli (Figure 4a). Furthermore, numerous thyroid follicular structures were visible, containing surrounding colloid masses. Tumor cell infiltration into blood vessels was also clearly visible in other fields of view (Figure 4b). Based on these morphological findings, the diagnosis was made as papillary thyroid carcinoma with follicular differentiation variant.

Figure 1. Clinical picture showing the results of the patient's local neck and chest examination.

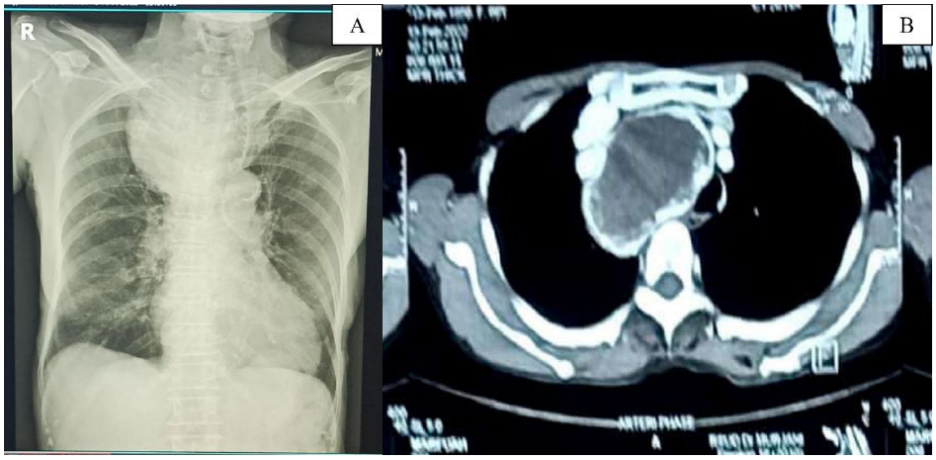

Figure 2. a) The chest X-ray showed a tumor shadow in the upper-middle field of the right lung without pleural effusion; b) Computed tomography (CT) of the chest revealed that the tumor shadows had been caused by a retrosternal goiter connected to the thyroid gland in the mediastinum.

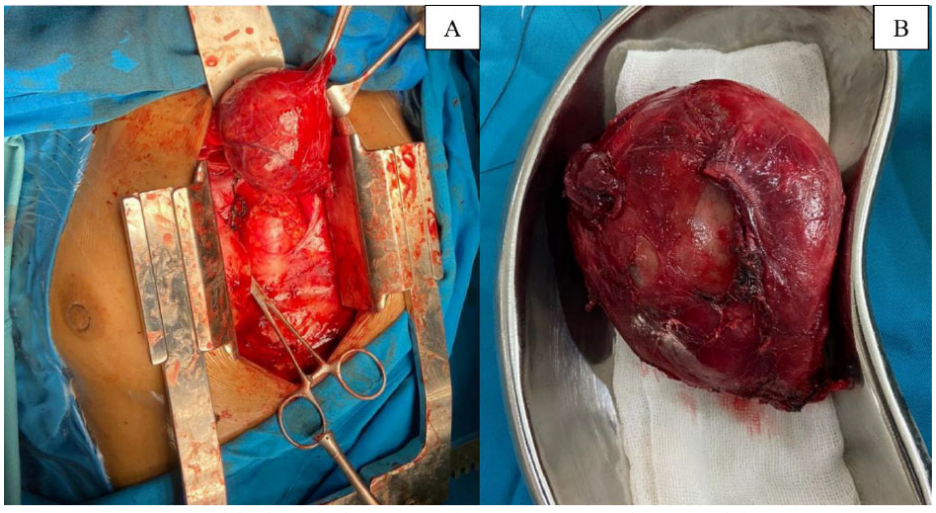

Figure 3. a) Surgical findings before removal; b) Macroscopic findings of the tumor.

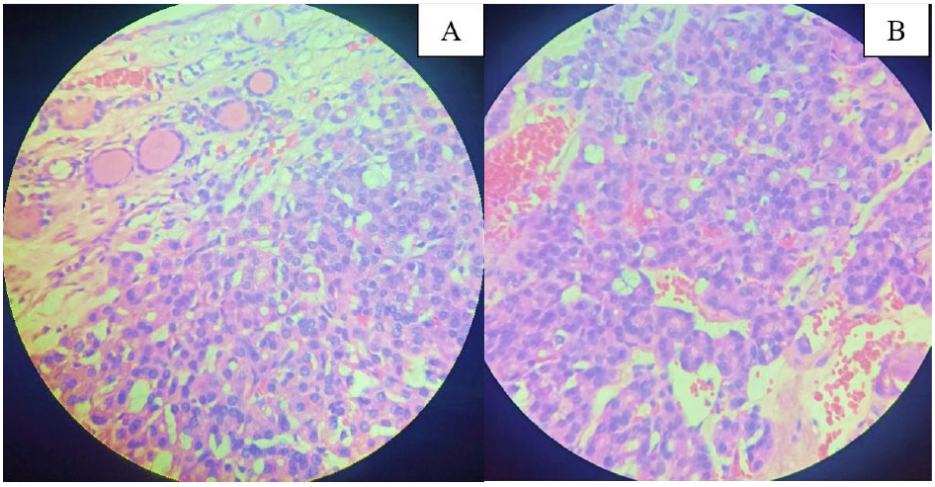

Figure 4. a) Distribution of round core cells and thyroid follicular structures contained colloidal masses; b) The tumor cells infiltrated into the vessels.

DISCUSSION

In this case, a retrosternal goiter was found extending to both sides of the thorax, extending deep enough to reach the tracheal bifurcation, and extending widely into the mediastinum. The large size of the mass and bilateral involvement make this case rare in clinical practice. The thyroidectomy procedure was performed using a combined transcervical approach and full sternotomy without additional thoracotomy. At surgery, extensive adhesions between the thyroid tissue and major blood vessels were found, along with significant bleeding due to the abundant vascularization. Due to the extensive tumor extension and involvement of vital structures, a full sternotomy was considered the safest approach to allow optimal exposure and complete resection in this case.

Most retrosternal goiters are reported to grow slowly and may remain asymptomatic for years before causing clinical symptoms.[4,6] Approximately 20–40% of cases are reported to be discovered incidentally through routine radiological examinations, such as chest radiographs, which show a mediastinal mass shadow without obvious respiratory symptoms.[2,5] The mechanism of growth toward the lower mediastinum is influenced by negative intrathoracic pressure and gravity that pull the thyroid gland into the chest cavity, so that symptoms only appear when the mass compresses the trachea, esophagus, or large blood vessels.[1,3] The most common clinical symptoms include dyspnea, dysphagia, hoarseness due to compression of the recurrent laryngeal nerve, and discomfort during sleep due to upper airway obstruction.[8,15] However, the correlation between mass size and symptom severity is not always linear. Several studies have shown that severe symptoms can occur even when tracheal deviation is minimal or even absent on radiographs.[3,16] This suggests that functional obstruction due to dynamic compression of the trachea may occur before anatomical changes are apparent on conventional imaging.

In this case, the chief complaint of shortness of breath indicated significant airway narrowing. This was confirmed by a chest CT scan, which demonstrated tracheal compression by a large thyroid mass extending into the mediastinum. These findings align with those of Sorouri et al., who stated that severe respiratory symptoms may appear earlier than classic radiological changes, such as tracheal deviation, typically seen on chest radiographs.[15] This phenomenon emphasizes that clinical evaluation alone is not always able to accurately depict the degree of airway obstruction. Therefore, a CT scan is necessary to assess tracheal compression in three dimensions and determine the extent and direction of the retrosternal mass's growth relative to the surrounding mediastinal structures.[1,17] In addition to assessing the degree of tracheal narrowing, chest CT also provides important information regarding the inferior margin of the lesion, posterior mediastinal involvement, and the relationship of the mass to major blood vessels such as the aortic arch and superior vena cava.[9,10] A study by Zuo et al. confirmed that chest CT has high sensitivity in detecting tracheal deviation and stenosis caused by retrosternal goiter, especially when compared with conventional radiographic modalities.[18] This information is crucial in determining the surgical plan because extension of the mass into the posterior mediastinum or below the aortic arch often requires an extracervical approach, such as a full sternotomy, to ensure safe resection.[5,6]

Preoperative CT-based volumetric analysis has been shown to help predict the need for sternotomy by comparing the ratio of mediastinal volume to total thyroid volume.[10,14] This approach provides additional diagnostic value because it not only identifies the anatomical boundaries of the mass but also estimates the surgical difficulty based on the degree of mass penetration into the mediastinum. Studies by Ríos et al. and Yano et al. confirmed that the greater the proportion of mediastinal volume to total thyroid volume, the higher the likelihood of the need for an extracervical approach, including a full sternotomy, to ensure safe resection.[1,17] Furthermore, preoperative CT scans not only serve to confirm the diagnosis of retrosternal goiter but also serve as an important guide in surgical planning by demonstrating the mass's relationship to the trachea, esophagus, aortic arch, and superior vena cava.[9,18] The three-dimensional images produced by CT allow evaluation of the direction of mass growth and the degree of tracheal deviation or compression that may not be detected with conventional radiography. Thus, CT is a crucial tool in determining the urgency of surgery, especially in patients with significant respiratory symptoms or suspected local invasion. Overall, chest CT is considered an essential and irreplaceable imaging modality in the preoperative evaluation of retrosternal goiter. This examination not only aids in establishing the diagnosis and determining surgical indications but also facilitates the selection of the safest and most effective surgical strategy.[19,20] With its ability to provide

detailed anatomical information, chest CT is a key component in the comprehensive management of patients with retrosternal goiter, particularly in efforts to reduce the risk of intraoperative complications and increase the success rate of complete resection.

Definitive therapy for retrosternal goiter is thyroidectomy, which in most cases can be completed through a conventional cervical approach, as most of the mass remains accessible from the neck.[5,7] However, in certain circumstances, the cervical approach alone does not provide adequate access to the mediastinum, particularly when the tumor extends into the posterior or inferior mediastinum, necessitating an enlarged surgical field to achieve safe and complete resection.[6,12] This is particularly true for masses with extensive attachment to mediastinal tissues or major vessels, where dissection through the neck carries a high risk of vascular injury and difficulty in controlling bleeding.[14] Several factors have been identified as predictors of the need for sternotomy, including aortic arch involvement, recurrent goiter, superior vena cava obstruction, suspected malignant infiltration of surrounding tissue, and acute airway obstruction due to tracheal deviation or collapse.[6,16] A study by Ahmed et al. recommended a full sternotomy when the mass diameter exceeds 10 centimeters or is greater than the thoracic inlet width, as in these conditions, the risk of bleeding, dissection difficulty, and vascular injury increases significantly.[21] Furthermore, Rugiu and Piemonte reported that the sternotomy approach provides greater visualization of the mediastinum, allows for better vascular control, and minimizes the risk of damage to vital structures such as the recurrent laryngeal nerve and trachea.[22] These findings are supported by a meta-analysis conducted by Khan et al., which showed that although most retrosternal goiters can be resected through a cervical approach, cases with extensive mediastinal extension and large mass diameters have a higher resection success rate and lower morbidity when performed with a full sternotomy.[23] Therefore, the choice of surgical approach should consider the location, size, and direction of growth of the mass, while maintaining the main principle of complete resection that is safe and minimizes the risk of intraoperative complications.

The thyroid mass in this case showed a diameter significantly exceeding the thoracic inlet and extending bilaterally into the mediastinum, accompanied by significant tracheal narrowing, so a full sternotomy was chosen as the most rational approach. This choice is in line with the findings of Rugiu and Piemonte, who emphasized that sternotomy provides extensive visualization of mediastinal structures, facilitates bleeding control, and reduces the risk of injury to major vessels and the recurrent laryngeal nerve.[22] Furthermore, a recent meta-analysis by Khan et al. also showed that extracervical approaches, including a full sternotomy, are associated with low morbidity and high resection success rates in massive retrosternal goiters.[23] Therefore, the choice of a full sternotomy in this case is considered in accordance with the principles of surgical safety and the effectiveness of total resection in lesions with extensive mediastinal extension.

Compared with previous reports, the main differences in this case lie in the extent of bilateral mediastinal extension, which is extremely rare, and the choice of a full sternotomy as the sole surgical access without additional lateral thoracotomy. In the studies reported by Machado et al. and Koulouris et al., most posterior retrosternal masses required a combination of a transcervical approach with a thoracotomy or partial sternotomy to achieve adequate resection.[19,20] These differences indicate that the reported cases have greater anatomic complexity and a greater degree of vascular adhesions, but can still be safely managed through a single full sternotomy without increasing the risk of postoperative complications. The full sternotomy approach in this case has been shown to provide optimal mediastinal exposure and allow for better vascular control during dissection, especially in masses with extensive attachment to major vessels such as the superior vena cava and aortic arch. Studies by Ahmed et al., Rugiu and Piemonte also emphasized that a full sternotomy can minimize the risk of vascular and recurrent laryngeal nerve injury, while accelerating the resection process in goiters with dimensions larger than the thoracic inlet.[21,22] In contrast to the combined thoracotomy approach, which requires two incisions and a longer operative time, a full sternotomy allows for direct resection of bilaterally expanding masses with low morbidity.[5,14]

The main limitation of this case report is its single-page descriptive nature, which precludes generalizability of the results. Furthermore, no further histopathological analysis of molecular expression or long-term postoperative respiratory function evaluation, which would provide more comprehensive prognostic information, was performed. Nevertheless, this report makes an important clinical contribution by describing the indications and safety of full sternotomy in a case of large bilateral retrosternal goiter rarely reported in the literature.

CONCLUSION

Most retrosternal goiters can be managed through a transcervical approach, but a full sternotomy is necessary if the mass extends to both sides of the thorax, has a diameter larger than the thoracic inlet, or causes significant airway narrowing. A full sternotomy approach provides wide access to the mediastinum, facilitates bleeding control, and reduces the risk of intraoperative complications. Based on the results of this case, the choice of surgical technique should be tailored to the direction of tumor extension and size to ensure complete and safe resection. However, in cases with extensive vascular adhesions or bilateral extension, a full sternotomy remains a rational and effective option.

DISCLOSURE

Ethical Approval

This study has been approved by the Medical and Health Research Ethics Committee in the Faculty of Medicine, University of Palangka Raya. All published data have received informed consent from the patient.

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Conflict of Interest
None declared.

Author Contribution
All authors are involved in concepting, designing, and supervising the manuscript. All authors also prepare the manuscript and agree to this final version of the manuscript to be submitted to this journal.

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REFERENCES

1. Ríos A, Rodríguez JM, Balsalobre MD, Tebar FJ, Parrilla P. The value of various definitions of intrathoracic goiter for predicting intra-operative and postoperative complications. Surgery. 2010 Feb;147(2):233–8. Available from: https://doi.org/10.1016/j.surg.2009.06.018.
2. Huins CT, Georgalas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goitre based on a systematic review of its complications and management. Int J Surg. 2008 Feb;6(1):71–6. Available from: https://doi.org/10.1016/j.ijsu.2007.02.003.
3. Shen WT, Kebebew E, Duh QY, Clark OH. Predictors of airway complications after thyroidectomy for substernal goiter. Arch Surg. 2004 Jun;139(6):656–60. Available from: https://doi.org/10.1001/archsurg.139.6.656.
4. Wong WK, Shetty S, Morton RP, McIvor NP, Zheng T. Management of retrosternal goiter: Retrospective study of 72 patients at two secondary care centers. Auris Nasus Larynx. 2019 Feb;46(1):129–34. Available from: https://doi.org/10.1016/j.anl.2018.06.012.
5. Lin YS, Wu HY, Lee CW, Hsu CC, Chao TC, Yu MC. Surgical management of substernal goitres at a tertiary referral centre: A retrospective cohort study of 2,104 patients. Int J Surg. 2016 Mar;27:46–52. Available from: https://doi.org/10.1016/j.ijsu.2016.01.032.
6. Coskun A, Yildirim M, Erkan N. Substernal goiter: when is a sternotomy required? Int Surg. 2014;99(4):419–25. Available from: https://doi.org/10.9738/intsurg-d-14-00041.1.
7. Raffaelli M, De Crea C, Ronti S, Bellantone R, Lombardi CP. Substernal goiters: incidence, surgical approach, and complications in a tertiary care referral center. Head Neck. 2011 Oct;33(10):1420–5. Available from: https://doi.org/10.1002/hed.21617.
8. Doulaptsi M, Karatzanis A, Prokopakis E, Velegrakis S, Loutsidi A, Trachalaki A, et al. Substernal goiter: Treatment and challenges. Twenty-two years of experience in diagnosis and management of substernal goiters. Auris Nasus Larynx. 2019 Apr;46(2):246–51. Available from: https://doi.org/10.1016/j.anl.2018.07.006.
9. Perincek G, Avci S, Celtikci P. Retrosternal Goiter: A couple of classification methods with computed tomograpy findings. Pakistan J Med Sci. 2018;34(6):1494–7. Available from: https://doi.org/10.12669/pjms.346.15932.
10. Sormaz İC, Uymaz DS, İşcan AY, Özgür İ, Salmaslıoğlu A, Tunca F, et al. The Value of Preoperative Volumetric Analysis by Computerised Tomography of Retrosternal Goiter to Predict the Need for an Extra-Cervical Approach. Balkan Med J. 2018 Jan;35(1):36–42. Available from: https://doi.org/10.4274/balkanmedj.2017.0161.
11. Di Crescenzo V, Vitale M, Valvano L, Napolitano F, Vatrella A, Zeppa P, et al. Surgical management of cervico-mediastinal goiters: Our experience and review of the literature. Int J Surg. 2016 Apr;28 Suppl 1:S47-53. Available from: https://doi.org/10.1016/j.ijsu.2015.12.048.
12. Hanson MA, Shaha AR, Wu JX. Surgical approach to the substernal goiter. Best Pract Res Clin Endocrinol Metab. 2019 Aug;33(4):101312. Available from: https://doi.org/10.1016/j.beem.2019.101312.
13. Tabchouri N, Anil Z, Marques F, Michot N, Dumont P, Arnault V, et al. Morbidity of total thyroidectomy for substernal goiter: A series of 70 patients. J Visc Surg. 2018 Feb;155(1):11–5. Available from: https://doi.org/10.1016/j.jviscsurg.2017.05.006.
14. Uludag M, Kostek M, Unlu MT, Aygun N, Isgor A. Surgical Treatment of Substernal Goiter Part 1: Surgical Indications, Pre-Operative, and Peroperative Preparation. Sisli Etfal Hastan tip Bul. 2022;56(3):303–10. Available from: https://doi.org/10.14744/SEMB.2022.52280.
15. Sorouri S, Akbarianrad S, Naseri M. A case report of massive retrosternal goiter in a 54-year-old woman with symptoms of head and neck swelling and dyspnea. Clin case reports. 2024 Jun;12(6):e8918. Available from: https://doi.org/10.1002/ccr3.8918.
16. Tikka T, Nixon IJ, Harrison-Phipps K, Simo R. Predictors of the need for an extracervical approach to intrathoracic goitre. BJS open. 2019 Apr;3(2):174–9. Available from: https://doi.org/10.1002/bjs5.50123.
17. Yano T, Okada T, Sato H, Tomioka R, Tsukahara K. Preoperative Evaluation of Substernal Goiter by Computed Tomography in the Extended Neck Position. Case Rep Oncol. 2021;14(3):1353–8. Available from: https://doi.org/10.1159/000518532.
18. Zuo T, Gao Z, Chen Z, Wen B, Chen B, Zhang Z. Surgical Management of 48 Patients with Retrosternal Goiter and Tracheal Stenosis: A Retrospective Clinical Study from a Single Surgical Center. Med Sci Monit Int Med J Exp Clin Res. 2022 Aug;28:e936637. Available from: https://doi.org/10.12659/msm.936637.
19. Machado NO, Grant CS, Sharma AK, al Sabti HA, Kolidyan S V. Large posterior mediastinal retrosternal goiter managed by a transcervical and lateral thoracotomy approach. Gen Thorac Cardiovasc Surg. 2011 Jul;59(7):507–11. Available from: https://doi.org/10.1007/s11748-010-0712-x.
20. Koulouris C, Paraschou A, Manaki V, Mantalovas S, Spiridou K, Spiridou A, et al. Cardiopulmonary Arrest Caused by Large Substernal Goiter-Treatment with Combined Cervical Approach and Median Mini-Sternotomy: Report of a Case. Medicina (Kaunas). 2021 Mar;57(4). Available from: https://doi.org/10.3390/medicina57040303.
21. Ahmed ME, Ahmed EO, Mahadi SI. Retrosternal goiter: the need for median sternotomy. World J Surg. 2006 Nov;30(11):1945–8; discussion 1949. Available from: https://doi.org/10.1007/s00268-006-0011-y.
22. Rugiu MG, Piemonte M. Surgical approach to retrosternal goitre: do we still need sternotomy? Acta Otorhinolaryngol Ital organo Uff della Soc Ital di Otorinolaringol e Chir Cerv-facc. 2009 Dec;29(6):331–8. Available from: https://pubmed.ncbi.nlm.nih.gov/20463839/.
23. Khan NS, Zhang Y, Bollig K, Bollig CA. Extracervical Approaches to Substernal Thyroid Goiter Resection: A Systematic Review and Meta-Analysis. OTO open. 2024;8(1):e103. Available from: https://doi.org/10.1002/oto2.103.