

ACQUIRED BRONCHOMALACIA DUE TO A MEDIASTINAL BRONCHOGENIC CYST MANAGED WITH BRONCHIAL STENTING AND CYST EXCISION: A CASE REPORT

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ABSTRACT:

Background: Bronchogenic cysts are uncommon congenital foregut malformations that may remain occult until adulthood, but enlarging mediastinal lesions can compress central airways and rarely produce acquired bronchomalacia.

Case presentation: A 53-year-old woman presented with six months of cough with white mucopurulent sputum, exertional dyspnea, chest tightness, and weight loss. Radiography showed a left mediastinal opacity; contrast-enhanced computed tomography demonstrated a 5.0 x 5.3 x 4.4 cm multiloculated left para-esophageal middle-mediastinal cyst compressing the left main bronchus and adjacent vascular structures. Bronchoscopy confirmed severe left main bronchial narrowing. After surgical excision, persistent dynamic collapse indicated compression-related acquired bronchomalacia. Rigid bronchoscopy with silicone bronchial stent deployment restored airway patency. Histopathology confirmed a bronchogenic cyst.

Conclusion: Bronchogenic cyst-related bronchomalacia is rare. Patients with major airway compression require preoperative and postoperative bronchoscopic assessment; cyst excision combined with silicone stenting can provide effective airway stabilization.

KEYWORDS: bronchogenic cyst; bronchomalacia; silicone stent; rigid bronchoscopy; mediastinal cyst.

INTRODUCTION

Bronchogenic cysts are rare congenital cystic malformations produced by abnormal budding of the primitive foregut and tracheobronchial tree during early lung development [1-3]. They are usually mediastinal or intrapulmonary, with middle-mediastinal, subcarinal, paratracheal, and para-esophageal locations classically described [1,4,5]. Many lesions are discovered incidentally, but adult patients may develop cough, dyspnea, recurrent infection, dysphagia, chest discomfort, or vascular and airway compression when cysts enlarge or become infected [1,4-7]. Contrast-enhanced computed tomography helps define lesion density, cyst wall features, and the relationship to the tracheobronchial tree and mediastinal vessels, whereas histopathology confirms respiratory epithelial lining and bronchial-type elements [1,2,4]. Symptomatic mediastinal bronchogenic cysts are generally treated by complete excision, increasingly by video-assisted or robotic thoracic approaches when feasible, because observation carries risks of infection, fistulization, recurrence, and rare malignant transformation [4-9]. Acquired bronchomalacia from chronic extrinsic compression is unusual, but prolonged narrowing may impair cartilaginous support and leave persistent dynamic collapse after decompression, requiring bronchoscopic airway stabilization [10-14].

Case Presentation

A 53-year-old housewife presented with a six-month history of cough productive of white mucopurulent sputum, progressive exertional dyspnea corresponding to Modified Medical Research Council grade 3, persistent chest tightness, and unintentional weight loss. On examination she was tachycardic and tachypneic, but oxygen saturation was preserved at rest. Initial chest radiography revealed a left-sided mediastinal opacity with apparent compression of the left main bronchus (Figure 1), prompting cross-sectional imaging.

Contrast-enhanced computed tomography of the thorax demonstrated a well-circumscribed, mediastinal-based, spherical, thin-walled multiloculated cystic mass in the visceral compartment, located in the left para-esophageal region of the middle mediastinum. The lesion measured 5.0 x 5.3 x 4.4 cm, had an estimated volume of 58 cc, and showed homogeneous central attenuation of approximately 35 Hounsfield units. Superiorly, it abutted the aortic arch without radiological invasion (Figure 2). Anteriorly, it displaced and narrowed the left main bronchus, left main pulmonary artery, and left superior pulmonary vein through extrinsic compression (Figures 3 and 4). Additional CT images

highlighted the relationship of the cyst to the left hilar airway and vascular structures (Figure 4). The imaging pattern favored a benign foregut cyst, with bronchogenic cyst considered the leading diagnosis [1,4,5].

Preoperative flexible bronchoscopy demonstrated marked narrowing of the left main bronchus with an externally compressed lumen (Figure 5). Because the patient was symptomatic and had significant central airway compromise, surgical excision of the mediastinal cyst was performed. Intraoperative bronchoscopy after cyst removal showed persistent deformation and dynamic collapse of the left main bronchus rather than complete recovery of caliber, consistent with acquired bronchomalacia due to chronic extrinsic compression. Histopathological examination confirmed a bronchogenic cyst lined by respiratory-type epithelium.

To maintain airway patency, rigid bronchoscopy was undertaken and a silicone bronchial stent was deployed across the affected segment of the left main bronchus. Post-deployment bronchoscopic inspection demonstrated adequate expansion and luminal stabilization (Figure 6), and follow-up imaging demonstrated improved patency of the left main bronchial lumen (Figure 7). The patient improved clinically after the combined surgical and bronchoscopic intervention, with relief of dyspnea and persistent bronchial patency. The final diagnosis was acquired left main bronchomalacia secondary to a mediastinal bronchogenic cyst, successfully managed with cyst excision and silicone bronchial stenting.

DISCUSSION

Bronchogenic cysts are uncommon congenital foregut malformations that most frequently occur in the mediastinum and may remain asymptomatic until adulthood. Clinical manifestations depend largely on cyst size and anatomical location. Symptomatic lesions can cause cough, dyspnea, chest discomfort, recurrent respiratory infections, dysphagia, or compression of adjacent mediastinal structures [1,4-7]. In the present case, a para-esophageal middle mediastinal bronchogenic cyst produced significant extrinsic compression of the left main bronchus, resulting in progressive respiratory symptoms and ultimately acquired bronchomalacia.

Airway compression by bronchogenic cysts is well recognized; however, persistent bronchomalacia following surgical excision is uncommon. Chronic extrinsic pressure may weaken bronchial cartilaginous support and alter airway mechanics, leading to dynamic expiratory collapse that persists even after the compressing lesion has been removed [10-14]. This mechanism explains the persistent left main bronchial collapse observed intraoperatively in our patient despite successful cyst excision. The case therefore highlights that relief of external compression does not necessarily result in immediate restoration of airway integrity.

Computed tomography and bronchoscopy were complementary in establishing the diagnosis and guiding management. CT accurately demonstrated the cystic mediastinal lesion and its relationship to the left main bronchus and adjacent vascular structures, findings consistent with previous reports emphasizing the value of cross-sectional imaging in evaluating mediastinal bronchogenic cysts [1,4,5]. Bronchoscopy provided direct assessment of airway compromise and subsequently confirmed persistent dynamic collapse after surgery. Dynamic bronchoscopic evaluation remains the gold standard for diagnosing bronchomalacia and expiratory central airway collapse [10,11].

Complete surgical excision is generally recommended for symptomatic bronchogenic cysts because it relieves symptoms and prevents complications such as infection, fistulization, recurrence, and rare malignant transformation [4,6-9]. However, this case demonstrates that postoperative reassessment of airway patency is essential when substantial preoperative bronchial compression is present. Failure to recognize residual bronchomalacia may result in persistent symptoms despite technically successful surgical treatment.

Silicone airway stents have an established role in selected cases of benign central airway obstruction and bronchomalacia. Their advantages include removability, avoidance of tissue ingrowth, and favorable long-term safety profiles compared with metallic stents [11,14-17]. Consistent with current recommendations, silicone stent placement in our patient restored airway patency and resulted in significant symptomatic improvement. Nevertheless, long-term surveillance remains important because complications such as mucus retention, migration, and granulation tissue formation may occur [15-18].

This case emphasizes the importance of considering acquired bronchomalacia in patients with prolonged airway compression from mediastinal bronchogenic cysts. Combined surgical excision and bronchoscopic airway stabilization can provide excellent functional outcomes when persistent airway collapse is identified.

CONCLUSION

Acquired bronchomalacia secondary to a mediastinal bronchogenic cyst is uncommon. When imaging shows central airway compression, bronchoscopy before and after cyst excision is essential. Persistent collapse after decompression should prompt airway stabilization. Combined cyst excision and silicone bronchial stenting achieved clinical improvement and maintained left main bronchial patency in this patient.

REFERENCES

1. Gross DJ, Briski LM, Wherley EM, Nguyen DM. Bronchogenic cysts: a narrative review. *Mediastinum*. 2023 Apr 20;7:26.
2. Sharma S, Limaïem F, Collier SA, Mlika M. Bronchogenic cyst. In: *StatPearls* [Internet]. 2024 Nov 9. StatPearls Publishing.
3. Doktor F, Antounians L, Lacher M, Zani A. Congenital lung malformations: dysregulated lung developmental processes and altered signaling pathways. In: *Seminars in pediatric surgery* 2022 Dec 1 (Vol. 31, No. 6, p. 151228). WB Saunders.

4. Kabiri EH, El Hammoumi M, Griguihi M, Bhairis M, Boubia S, Ridai M, Kabiri M. Mediastinal bronchogenic cysts resection in adults: Results of VATS and thoracotomy procedures. *Portuguese Journal of Cardiac Thoracic and Vascular Surgery*. 2022 Oct 5;29(3):35-9.
5. Willemse C, Vermeersch G, Hollering P. Differential diagnosis of mediastinal cysts: a case series. *Acta Cardiologica*. 2024 Nov 25;79(10):1087-93.
6. Moita CP, Figueiredo C, Cruz Z, Maciel J, Costa AR, Silva JS, Reis JE, Calvino P. Surgical management of congenital thoracic disorders: a 15-year center experience. *Portuguese Journal of Cardiac Thoracic and Vascular Surgery*. 2024 Jul 7;31(2):23-9.
7. Pederiva F, Dalena P, Pasqua N, Bresesti I, Testa V, Zirpoli S, Gentilino V. Risk of malignant transformation and infections in congenital lung malformations in adults: a systematic review. *European Respiratory Review*. 2025 Apr 2;34(176).
8. Bouassida I, Dahmane MH, Zribi H, Bessrou H, Hachicha S, Marghli A. A poor prognosis of a mediastinal bronchogenic cyst with malignant transformation: a case report. *International Journal of Surgery Case Reports*. 2023 May 1;106:108246.
9. Topaloglu ES, Topaloglu O. Spontaneous Tracheal Fistulization of a Progressive Bronchogenic Cyst: A Four-Year Conservative Follow-Up Case Report. *Archivos de Bronconeumología*. 2026 Feb 1;62:139-40.
10. Pu CY, Keyes C, Majid A. Expiratory central airway collapse: a comprehensive narrative review. *Clinics in Chest Medicine*. 2025 Jun 1;46(2):339-48.
11. Majid A, Ospina-Delgado D, Ayala A, Gangadharan SP, Alape D, Buitrago D, Parikh MS, Wilson JL, Chee AC, Fernandez-Bussy S, Herth FJ. Stent evaluation for expiratory central airway collapse: does the type of stent really matter?. *Journal of Bronchology & Interventional Pulmonology*. 2023 Jan 1;30(1):37-46.
12. Pu CY, Ospina-Delgado D, Kheir F, Avendano CA, Parikh M, Beattie J, Swenson KE, Wilson J, Gangadharan SP, Majid A. Airway stents for excessive central airway collapse: a randomized controlled open-label trial. *Journal of Bronchology & Interventional Pulmonology*. 2024 Oct 1;31(4):e0980.
13. Vidyasagar BP, Gonuguntla H, Radia SB, Dhulipala S. A novel technique of airway silicon stent deployment under vision—Dr. Vidyasagar's technique. *Respirology Case Reports*. 2024 Oct;12(10):e70042.
14. Sabath BF, Casal RF. Airway stenting for central airway obstruction: a review. *Mediastinum*. 2023 Apr 4;7:18.
15. Chaddha U, Agrawal A, Murgu S, Ghoru U, Trias-Sabria P, Ortiz-Comino R, Dutau H, Freitag L, Gasparini S, Lee P, Doms C. World Association for Bronchology and Interventional Pulmonology (WABIP) guidelines on airway stenting for benign central airway obstruction. *Respirology*. 2025 Jul;30(7):587-604.
16. Aravena C, Gildea TR. Advancements in airway stents: a comprehensive update. *Current opinion in pulmonary medicine*. 2024 Jan 1;30(1):75-83.
17. Wang Q, Wang R, Ye Z, Chen J, Xu Y, Ye W, Li S, Chen Y. Fenestrated vs. Conventional Silicone Stents in Benign Central Airway Stenosis: Clinical Outcomes and Biomechanical Validation. *Respirology*. 2025 Aug;30(8):751-9.
18. Akan EG, Aktaş Z, Öztürk AM, Yılmaz A. Complications of silicone airway stents in malignant and benign central airway stenosis: timing of complications and survival outcomes. *Annals of Saudi Medicine*. 2026 Mar;46(2):104-10.

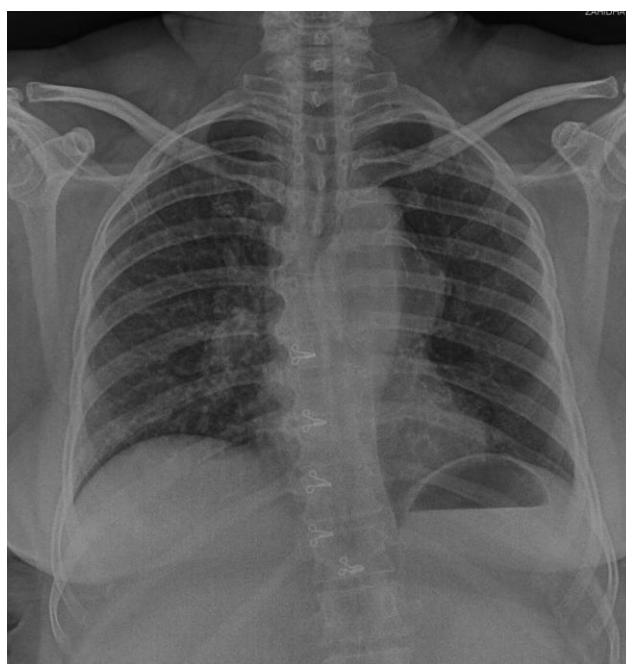


Figure 1. Chest radiograph showing a left-sided mediastinal opacity with suspected compression of the left main bronchus.



Figure 2. Axial contrast-enhanced CT showing the left para-esophageal middle-mediastinal cystic lesion.

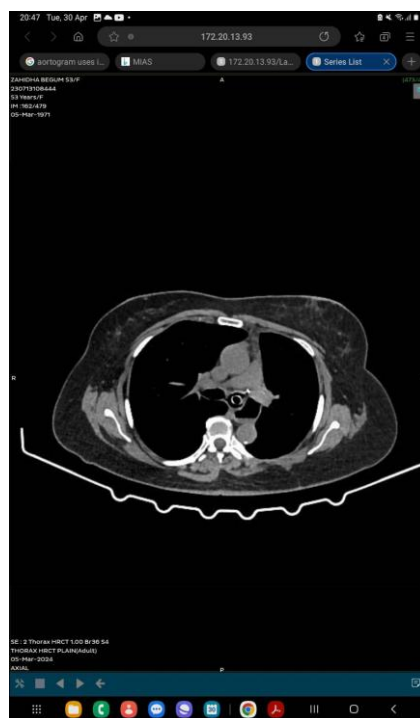


Figure 3. Contrast-enhanced CT demonstrating extrinsic compression near the left hilar airway and adjacent mediastinal structures.

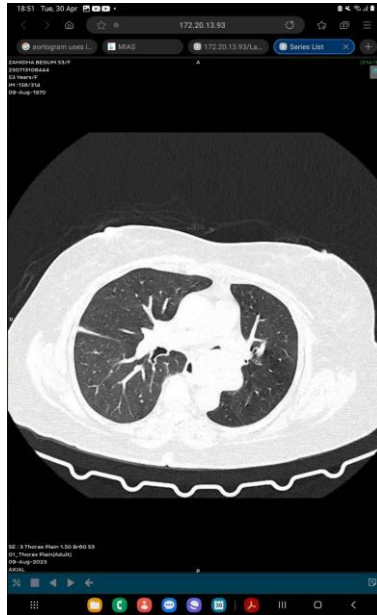


Figure 4. Lung-window CT image showing airway narrowing related to the mediastinal cyst.

left main bronchus narrowing noted



Figure 5. Preoperative bronchoscopy demonstrating marked narrowing of the left main bronchus.



Figure 6. Bronchoscopic view during airway intervention after cyst excision and stent deployment.



Figure 7. Post-intervention CT image demonstrating improved patency of the left main bronchial lumen.