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Delayed Post-Traumatic Left Main Bronchial Transection Causing Complete Lung Collapse: A Case Report of Successful Surgical Reconstruction

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ABSTRACT: After a car accident six weeks earlier, a 22-year-old man complained of ongoing chest pain, coughing, and dyspnea. Initial injuries included multiple left-sided rib fractures, associated skeletal injury, and a left-sided pneumothorax, which was managed with tube thoracostomy. The patient's respiratory symptoms persisted, though. Left lung collapse was caused by left main bronchus stenosis, which was discovered by imaging and bronchoscopy. Following surgical resection and end-to-end anastomosis of the stenosed bronchus, the patient recovered and experienced lung re-expansion. In order to prevent irreversible lung damage, this case emphasizes the significance of early diagnosis and surgical intervention in traumatic bronchial injuries.

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Key Clinical Message

Delayed bronchial stenosis after blunt chest trauma can be missed despite initial treatment. Persistent respiratory symptoms and non-resolving lung collapse should prompt early bronchoscopy. Surgical resection and end-to-end anastomosis can successfully restore airway continuity and preserve lung function.

Keywords: *Post-traumatic bronchial stenosis, bronchial injury, lung collapse, thoracic trauma, case report*

Introduction

Traumatic bronchial injuries manifest with clinical signs including tachypnea, tachycardia, dyspnea, pneumothorax, pneumomediastinum, and subcutaneous emphysema. Blunt thoracic trauma is frequently linked with multiple rib fractures, pulmonary parenchymal contusion, or laceration, all of which produce comparable symptoms and indications [1]. The trachea's location relative to the sternum, mandible, and vertebral column protects it from injury and explains why severe injuries are uncommon. Additional protection is provided by the trachea's flexibility, motility, and cartilaginous support [2]. Injury to the tracheobronchial tree due to blunt traumatic causes remains uncommon but a serious complication of chest trauma. According to estimates, the incidence of Tracheobronchial injury (TBI) in patients with chest injuries ranges from 0.2% to 5%. Additionally, risk factors include congenital tracheal anomalies, female gender, and age greater than 65 [3]. Different approaches are available for managing TBI, calling for the rapid diagnosis and treatment of these diseases by a skilled, interdisciplinary team to reduce the risk of consequences and avoid lung function loss[4]. Significant morbidity from prolonged atelectasis, infection, or loss of lung function might result from delayed diagnosis. It is crucial to get an early diagnosis utilizing bronchoscopy and imaging, then perform surgical repair. We describe a young adult who was involved in a car accident and developed post-traumatic left main bronchus stenosis.

Case Presentation

A 22-year-old man arrived at the hospital on March 25, 2025, carrying the wounds from an automobile accident that had occurred on February 11, more than a month prior. The patient had no significant past medical or surgical history. He had no known history of

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chronic respiratory disease, pulmonary tuberculosis, or previous thoracic surgery. He was a nonsmoker and was not taking any regular medications before the traumatic event. The patient provided details about the exact mechanism retrospectively, and these were corroborated by available medical records. The patient was the driver and sustained significant blunt trauma to the left anterior chest. A direct steering-wheel impact was suspected. Although the initial presentation was dominated by skeletal injuries and pneumothorax, the mechanism of injury raised the possibility of associated tracheobronchial injury, including a dislocated left shoulder and several rib fractures on the left side. Immediately after the road traffic collision, the patient was conscious and hemodynamically stable. His blood pressure was 118/76 mmHg, heart rate 96 beats/min, respiratory rate 24 breaths/min, temperature 36.8°C, and oxygen saturation 94% on room air. Respiratory examination revealed reduced movement of the left hemithorax and markedly reduced air entry on the left side, with clinical findings suggestive of a left-sided pneumothorax. A left-sided tube thoracostomy was inserted during the initial emergency management for the traumatic pneumothorax. Following the initial trauma and tube thoracostomy, the patient's respiratory symptoms did not completely resolve. Over the subsequent weeks, he continued to experience persistent left-sided chest pain, cough, and progressive shortness of breath. Approximately six weeks after the road traffic collision, these ongoing symptoms prompted re-presentation for further evaluation. No fever, exercise intolerance, hemoptysis, or other systemic symptoms were documented in the available manuscript. The chest X-ray findings immediately after trauma and at later presentation are shown in Figure 1. In these situations, it was the type of intervention that typically made a difference. But his breathing never really came back to normal. A few weeks later, he came back with a trifecta of symptoms that would not go away: chest pain that persisted like a warning sign, a persistent cough, and shortness of breath that prevented him from taking full breaths. On admission, the patient was hemodynamically stable, with a heart rate of 92 beats/min, blood pressure of 118/76 mmHg, respiratory rate of 22 breaths/min, temperature of 36.8°C, and peripheral oxygen saturation of 95% on room air. He was conscious and oriented, with mild respiratory discomfort but no evidence of hemodynamic instability. The physical examination this time revealed a quiet but concerning tale. There was just silence until the stethoscope reached the left side of the chest wall, which hardly moved at all. There are absolutely no breath sounds. At the initial

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trauma admission, the patient presented with clinical features consistent with significant left-sided thoracic injury. Respiratory examination revealed reduced air entry on the left side with findings suggestive of pneumothorax. A left tube thoracostomy was performed as part of emergency management. There was no initial suspicion of complete bronchial disruption because the patient's respiratory condition improved following drainage. An X-ray of the chest revealed a dense, uniform opacity engulfing the entire left lung (Figure 1), making the image more striking. CT imaging demonstrated collapse of the left lung and raised suspicion of left main bronchial injury (Figure 2). The next course of action was obvious because something was preventing the lung from functioning. A concerning suspicion of bronchial damage was raised by the pattern on CT imaging, which showed that the left lung had collapsed. When a bronchoscopy was performed to confirm the cause, stenosis of the left main bronchus, a significant restriction that had essentially blocked airflow to the entire lung, was discovered (Figure 3). There must be a clear solution. To restore continuity to the bronchus, surgeons removed the narrowed segment and performed an end-to-end anastomosis (Figure 4). Intraoperative/postoperative procedural findings are shown in Figure 5. The left lung re-expanded after the procedure, and the recovery was smooth. The quiet chest began to breathe again, marking a turning point in a case that had started with trauma, remained uncertain, and ended with a repaired airway and a revitalized lung. The postoperative chest X-ray and follow-up radiographic appearance are shown in Figure 6.

Discussion

The current patient had clavicular injuries, rib fractures, and pneumothorax around six weeks following a high-energy RTA. The pattern seen in multiple recent accounts, where partial tears or first occult main bronchus injuries scar down over weeks and develop into severe stenosis, is mirrored in the delayed return with cough, chest pain, and exertional dyspnea. Lung function was restored by surgical sleeve resection and end-to-end anastomosis in a 2024 Frontiers case report of delayed partial left main bronchus rupture, which also mentioned that mild or nonspecific early symptoms can lead to missed diagnosis, which later manifests as whole-lung atelectasis and cicatricial bronchial occlusion [5]. Similarly, ur patient's history is equally consistent with that of a study, who described a delayed left main bronchus rupture diagnosed 45 days after a traffic accident,

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resulting in near-complete airway obstruction and a functional left pneumonectomy, which was effectively managed by resection and end-to-end anastomosis [6]. The similar time and involvement of the left main bronchus demonstrate that clinically "quiet" periods following physical trauma do not rule out substantial airway disruption. In this scenario, CT can indicate damage, but bronchoscopy verifies the diagnosis and operability. The 2024 JTD series emphasizes that CT indications can be faint and that bronchoscopy should be performed promptly if clinical suspicion remains [7]. Our bronchoscopy discovery of left main bronchus stenosis fits this pattern, allowing for timely definitive treatment before permanent parenchymal loss. Recent findings strongly support the surgical decision to do both resection and end-to-end anastomosis. One journal expressly states that even delayed major bronchus ruptures can be successfully treated with repair and anastomosis, regaining lung function [8]. In post-traumatic bronchial stenosis, bronchoscopic interventions including balloon dilation and airway stenting may be considered, particularly in patients with short-segment stenosis or those who are poor surgical candidates. In this patient, severe left main bronchial narrowing with associated lung collapse suggested a fibrotic cicatricial process rather than a simple reversible narrowing. Although airway stenting represents an alternative treatment option in selected cases, it was not preferred because of concerns regarding long-term complications, including migration, granulation tissue formation, mucus obstruction, and the need for repeated interventions, particularly in a young patient. Given the patient's age, localized stenotic segment, and potential for anatomical restoration, surgical resection of the stenotic segment with end-to-end anastomosis was chosen as definitive treatment to restore airway continuity and preserve lung function. One study reported effective tracheobronchial anastomosis for delayed right main bronchus stenosis of the carina, with postoperative luminal patency and better spirometry [9]. Clinically, this case reinforces a key message echoed in 2021-2024 studies: any patient with blunt chest trauma who exhibits persistent dyspnea, unilateral absent breath sounds, non-resolving collapse, or failure of lung re-expansion after drainage should be evaluated for tracheobronchial injury with early bronchoscopy. Early detection inhibits the advancement of fibrotic stenosis and saves the need for an unnecessary pneumonectomy.

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Conclusion

This case shows how crucial it is to identify and treat traumatic bronchial injuries as soon as possible. Left main bronchus stenosis was discovered as a result of delayed symptoms including coughing and dyspnea, despite early treatment. Lung function was restored by surgical repair using resection and anastomosis, demonstrating the need of early bronchoscopy and prompt surgical intervention in preventing long-term consequences such as atelectasis and pneumonectomy.

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