An Autopsy Case of Asphyxia Caused by Uncontrolled Hemorrhage Following Transbronchial Lung Biopsy

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Abstract
Bronchoscopy is an important technique and flexible bronchoscopy procedures are considered comparatively safe. Notwithstanding, we here describe a woman who died of asphyxia caused uncontrolled hemorrhage following transbronchial lung biopsy. A medico-legal autopsy disclosed a small wound with clotted blood at the point of the transbronchial lung biopsy. The right lung was filled with a large volume of blood. Other organs showed no significant findings. Thus, this woman died from asphyxia associated with uncontrolled hemorrhage from the site of a transbronchial lung biopsy. We believe that our case is very instructive for safety bronchoscopy procedures.

Keywords: Bronchoscopy; Transbronchial lung biopsy; Haemorrhage; Hemostasis; Autopsy

Abbreviations: CT: Computed Tomography; GGO: Ground Glass Opacities; TBLB: Transbronchial Lung Biopsy

Introduction
Bronchoscopy is an important endoscopic technique of visualizing the inside of the Airways for the diagnosis and therapy. In 1966, Ikeda invented the flexible bronchoscope [1], nowadays flexible bronchoscopy is commonly performed on conscious patients as a local anesthetic or under moderate sedation and used to diagnose and treat many lung and airways diseases worldwide. Flexible scopes can be inserted into the airways through the nose, mouth, or a tracheostomy. Because they usually have diameters of 5–6 mm, curved subsegmental bronchi can be observed. Samples can be obtained by transbronchial biopsy, bronchoalveolar lavage, brushing, transbronchial needle aspiration, and transbronchial lung biopsy (TBLB). Flexible bronchoscopy procedures are considered comparatively safe: one large survey [2] found that in 103,978 diagnostic flexible bronchoscopy procedures performed in Japan in 2010, the complication rate ranged from 0.15% to 2.06%, and the mortality rate was 0.004%.

We here present an unusual autopsy case of asphyxia caused by uncontrolled hemorrhage following TBLB.

Case Report
A 64-year-old woman was brought to the hospital’s Emergency Department with a high fever. Chest radiographs showed ground glass opacities (GGO) in the lower right lung and these were confirmed by a chest CT scan (Figure 1A). Based on her physical examination, laboratory and imaging examinations, she was diagnosed with pneumonia and hospitalized. Her medical history included partial thyroidectomy for cough variant asthma, with no improvement. A second CT scan showed slight worsening of the GGOs (Figure 1B). On day 3 of her hospitalization, she underwent flexible bronchoscopy to determine why her pneumonia was not resolving. TBLB was performed under fluoroscopic guidance. At first, TBLB was performed through the right B2a; however, simple insertion of the bronchoscope caused hemorrhage from this bronchus, which was stopped by wedging the bronchoscope into the B2a. While attempts were being made to complete the bronchoscopy 20 minutes after its commencement, her blood pressure dropped significantly and hemorrhage prevented further visualization of the affected bronchus. The bronchoscope was removed and an unsuccessful attempt made to intubate the trachea. 30 minutes after the start of bronchoscopy, cardiopulmonary arrest occurred and she was given cardiac compression. 90 minutes after the start of bronchoscopy, an airway was finally established by performance of an emergency tracheostomy. 140 minutes after the start of bronchoscopy, she died in spite of receiving intensive care.

At autopsy, a 0.3 cm wound with clotted blood was observed on the wall of the right posterior bronchus (B2b) at the point of TBLB (Figure 2A). Saline infused into the right bronchial artery leaked from the wall of the right B2b without critical problem. After that, the doctor examined the right upper lobe because of diffuse infiltrative shadow throughout the lungs. When TBLB was performed through the right B2b, slight hemorrhage from the biopsy site was observed and the bronchoscope wedged into the hemorrhaging bronchus with cold water until hemostasis had been achieved. An unsuccessful attempt was then made to obtain a sample through the right B2a; however, simple insertion of the bronchoscope caused hemorrhage from this bronchus, which was stopped by wedging the bronchoscope into the B2a. While attempts were being made to complete the bronchoscopy 20 minutes after its commencement, her blood pressure dropped significantly and hemorrhage prevented further visualization of the affected bronchus. The bronchoscope was removed and an unsuccessful attempt made to intubate the trachea. 30 minutes after the start of bronchoscopy, cardiopulmonary arrest occurred and she was given cardiac compression. 90 minutes after the start of bronchoscopy, an airway was finally established by performance of an emergency tracheostomy. 140 minutes after the start of bronchoscopy, she died in spite of receiving intensive care.

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the lung periphery. Because hemorrhage with TBLB cannot be avoided usually performed under fluoroscopic guidance; however, small arteries hemorrhage is a major and unavoidable complication [2]. TBLB is paid to patient selection and the patient's medical history and clinical procedures are considered comparatively safe provided attention is approximately 0.025% [3]. Studies from the 2000s [4,5] have reported complication rates of 1.08–6.6% and mortality rates of 0.02–0.045%. A large survey in Japan [2] found complication rates ranging from 0.15 to 2.06% and a mortality rate of 0.004%. Flexible bronchoscopy cause by uncontrolled hemorrhage following TBLB. An autopsy showed a small wound with clotted blood on the wall of the right posterior bronchus (B2b) and adjacent bronchial artery, which was the point of transbronchial lung biopsy. The lungs were filled with a large volume of blood. Other organs showed no significant findings.

Soon after the introduction of flexible bronchoscopy, Suratt et al. reported a complication rate of about 0.3% and mortality rate of approximately 0.025% [3]. Studies from the 2000s [4,5] have reported complication rates of 1.08–6.6% and mortality rates of 0.02–0.045%. A large survey in Japan [2] found complication rates ranging from 0.15 to 2.06% and a mortality rate of 0.004%. Flexible bronchoscopy procedures are considered comparatively safe provided attention is paid to patient selection and the patient's medical history and clinical examination findings reviewed. Risk factors include medication (especially antiplatelet and anticoagulant agents), clinical history such as cancer, site of lung lesion, and nature of the procedure [2]. Hemorrhage is a major and unavoidable complication [2]. TBLB is usually performed under fluoroscopic guidance; however, small arteries cannot be directly visualized and the biopsy forceps must be pushed to the lung periphery. Because hemorrhage with TBLB cannot be avoided completely, being familiar with its management is crucial. Techniques for managing hemorrhage during bronchoscopy [6] include (i) wedging a rigid bronchoscope into the hemorrhaging bronchus and using a hemostatic agent; (ii) tamponading the bleeding site with a balloon-tipped catheter; (iii) performing one-lung ventilation to prevent blood flowing into the other lung; and (iv) appropriately timed bronchial arterial embolization. The most important goal is to maintain adequate SpO2 by ventilating the intact lung or performing circothyroidotomy and tracheostomy.

Only a few cases of diagnostic bronchoscopy-associated deaths have been reported in Japan [2]. In one case, it was caused by brushing of a solitary lesion in a patient with suppurative pneumonia, other deaths were attributed to cerebral infarction caused by air emboli following forceps biopsy of a solitary lesion, aortic dissection following simple bronchoscopy for diffuse lesions, and acute exacerbation of interstitial pneumonia after endobronchial ultrasonography transbronchial needle aspiration of hilar lymph node. Since hemostasis techniques have been improving based on a great deal of experience, fatal case of hemorrhage due to TBLB have not been reported in recent years [2,4,5].

To our knowledge, there have been no detailed reports of deaths caused by direct arterial injury during TBLB, such as occurred in our case. Failure to rapidly establish an airway for oxygenation and ventilation was the key factor in our patient's death: early performance of circothyroidotomy and tracheotomy and urgent transfer to another hospital may have prevented our patient's oxygen desaturation and death. Not maintaining hemostasis technique at effective level, hemorrhage can be a cause of death following TBLB even today.

Discussion

We here present an unusual autopsy case of a woman who died from asphyxia cause by uncontrolled hemorrhage following TBLB. An autopsy showed a small wound with clotted blood on the wall of the right posterior bronchus (B2b) and adjacent bronchial artery, which was the point of transbronchial lung biopsy. The lungs were filled with a large volume of blood. Other organs showed no significant findings.

![Figure 2](image)

**Figure 2**: Macroscopic appearance of the right lung. (A) A wound with clotted blood was observed on the wall of right posterior bronchi (B2b), which was the point of TBLB. (B) Enlarged view. Infusion of saline from right bronchial artery resulted in leakage of saline from the mucosal wound and adjacent bronchial artery.

References