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## Case Report

# A case report of life-threatening hemothorax after percutaneous lung biopsy successfully managed with embolization <sup>☆</sup>

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## ARTICLE INFO

## Article history:

Received 2 May 2023

Accepted 7 May 2023

## Keywords:

Lung biopsy

CT lung biopsy

Hemothorax

Pulmonary artery injury

Pulmonary artery embolization

Pulmonary hypertension

## ABSTRACT

CT-guided lung biopsy is a widely used procedure for tissue identification. The complications are divided into minor and major with the latter being described as low rate. Hemothorax is reported at a rate of 0.092% and predominantly results from the injury of intercostals or internal mammary arteries. We present the case of 81-year old woman with a right upper lobe mass referred for a CT-guided biopsy. Four hours after the procedure, rapid deterioration of patient's status was observed. A massive hemothorax was reported due to the transection of an intratumoral pulmonary branch. The following management involved successful emergent embolization of the injured branch of the pulmonary artery using a combination of coils and gel foam. One of the theories possibly explaining this extremely rare complication involves the possibility of underlying pulmonary hypertension.

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## Introduction

CT-guided lung biopsy is a widely used procedure for tissue sampling required for scheduling the appropriate therapy plan. Careful approach to the procedure is of high importance. The majority of patients being referred to an interventional radiologist have already undergone a cross-sectional study and review of the previous imaging examinations is an essential step while planning on the patient's positioning,

access route, needle types and trajectory. At the end of the procedure, the final CT-scan of the chest is performed to exclude possible immediate complications. Close observation of the patient and monitoring of vital signs are required for up to 6 hours, especially in procedures carrying a higher risk of bleeding [1].

According to the reporting standards of the Society of Interventional Radiology the complications of the transthoracic lung node biopsy are divided into minor and major, with the latter being described as low rate [2,3].

<sup>☆</sup> Competing Interests: The authors have declared that no competing interests exist.

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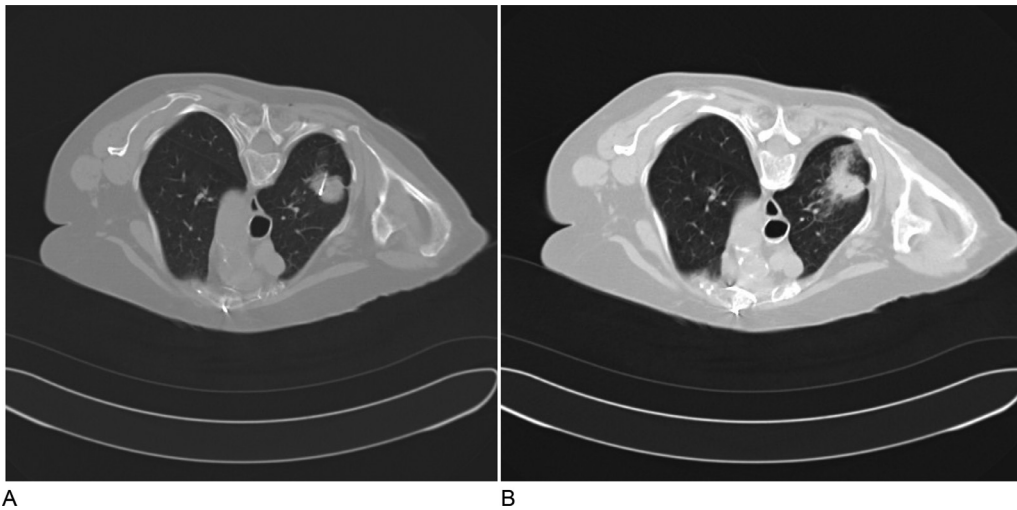
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<https://doi.org/10.1016/j.radcr.2023.05.026>

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**Table 1 – (A) Absolute contraindications for percutaneous biopsy. (B) relative contraindications for percutaneous biopsy.**

Absolute contraindications for percutaneous biopsy	Relative contraindications for percutaneous biopsy
<ul style="list-style-type: none"> <li>• Lack of a safe access</li> <li>• Noncorrectable coagulopathy</li> <li>• Refusal of consent</li> </ul>	<ul style="list-style-type: none"> <li>• Noncooperative patient</li> <li>• Existence of significant comorbidities</li> <li>• Coagulopathies</li> <li>• Pregnancy</li> </ul>



**Fig. 1 – (A) Axial CT image shows proper placement of cutting edge of biopsy pistol at the center of left upper lobe mass. (B) Axial CT image shows ground glass opacity in the periphery of the mass but no other complication.**

Minor complications such as small pneumothorax, local ground glass opacity and transient hemoptysis are commonly encountered while major complications including pneumothorax requiring intervention, hemothorax, air embolism, needle tract seeding and death occur in 5.7% [2]. Hemothorax is reported at a rate of 0.092% and predominantly results from the injury of intercostals or internal mammary arteries [4].

The contraindications for percutaneous biopsy are listed in Table 1 [1].

We therefore, present the case of massive hemothorax occurring as an uncommon complication of a lung core biopsy due to the puncture of an intratumoral branch of the pulmonary artery (PA) and its subsequent embolization conducted in the Interventional Radiology (IR) department of our hospital.

## Case report

A 81-year old woman with a right upper lobe mass was referred to the IR department for a CT-guided transthoracic biopsy. After positioning the patient in a prone position and applying local anesthesia, a 18-gauge coaxial needle was inserted via the intercostal space between the posterior arch of the right 3rd and 4th rib. Three tissue samples were

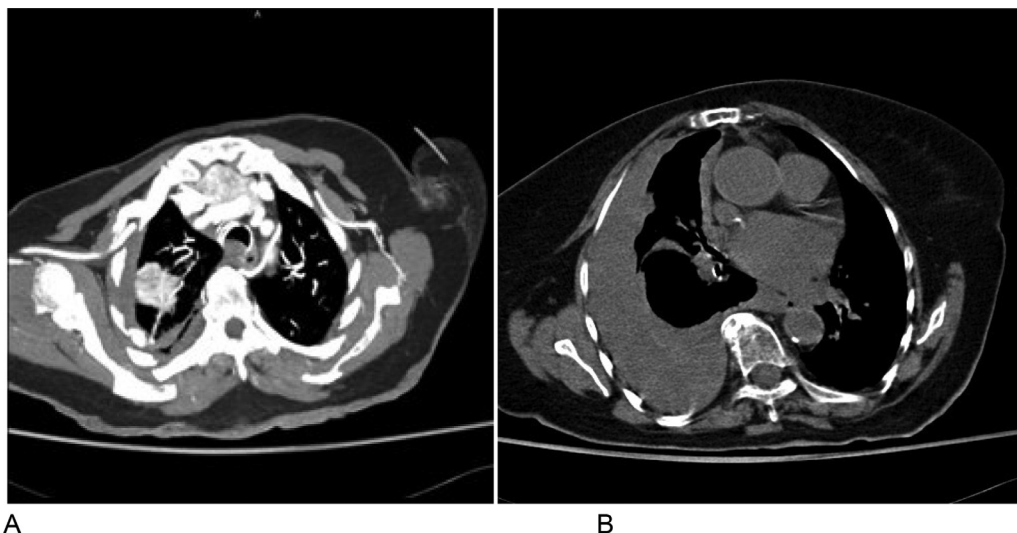
collected. Postbiopsy CT scan revealed ground glass opacity in the periphery of the mass but no other complication (Fig. 1).

The patient was transferred to the pulmonology department with the standard instruction for regular monitoring of vital signs. Four hours after the procedure, rapid deterioration of patient's status was observed. An episode of vomiting was followed by a sudden decrease of blood pressure, syncope and a significant drop of hematocrit value (from initial 34 % to 26.6 %). Intensive fluid resuscitation and blood transfusion were started immediately and the patient was intubated. A following CT-pulmonary angiography revealed large hemothorax and active contrast extravasation into the needle tract and pleural cavity (Fig. 2).

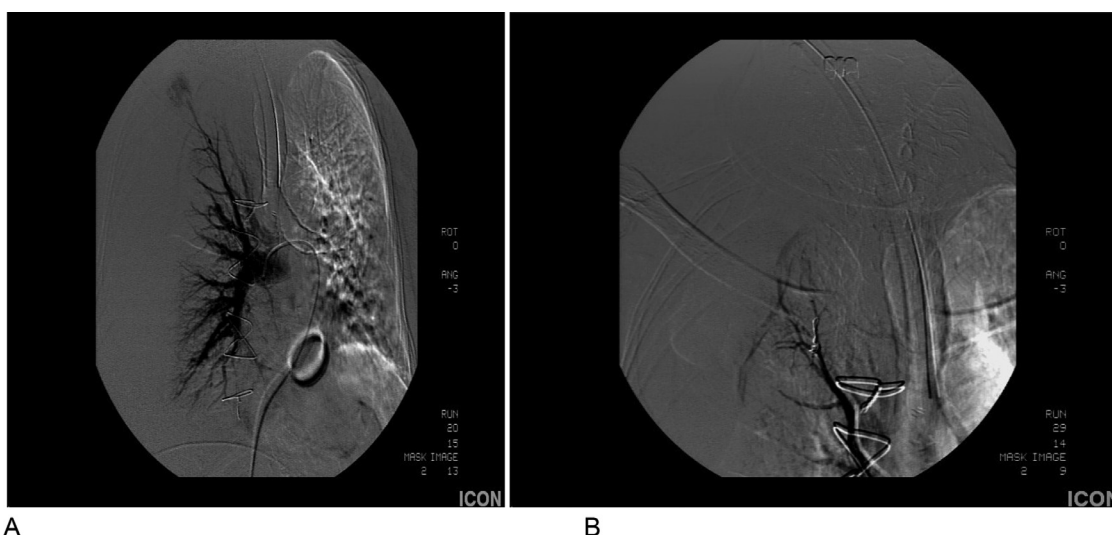
The embolization of the bleeding vessel was performed emergently using 18'' metal coils (4-6 mm) and gel foam. After accessing the right femoral vein, a 5-Fr Cobra 2 diagnostic catheter was used to approach the branch for the superior segment of the right PA. Then a 2,4 Fr microcatheter was inserted co-axially for a selective embolization of the bleeding branches (Fig. 3).

Following successful vessel occlusion, the patient was admitted to the intensive care unit.

Surgical removal of blood residues was performed when the patient's clinical status improved. The final pathological report identified lung adenocarcinoma and the patient was planned for a right upper lobe lobectomy.



**Fig. 2 – (A) following CT-pulmonary angiography active contrast extravasation into the needle tract and pleural cavity. (B) Axial CT image revealed large hemothorax.**



**Fig. 3 – (A) a 5-Fr Cobra 2 diagnostic catheter was used to perform diagnostic angiography that showed pathological extravasation of a the branch for the superior segment of the right PA. (B) 2,4 Fr microcatheter was inserted co-axially for a selective successful embolization of the bleeding branches.**

## Discussion

Traumatic injury of pulmonary artery is a rare and usually fatal clinical entity further classified as iatrogenic and noniatrogenic. Iatrogenic injury of PA is predominantly caused by Swan-Ganz catheters, but it also occurs as a consequence of intraoperative surgical procedures, chest tube insertion, central venous catheters and pacemaker implantation [5].

Clinical signs include cardiac arrest and hemodynamic instability that usually coexist with a sudden onset of dyspnea due to massive hemorrhage, hemothorax and/or hemoptysis [5]. Pulmonary circulation is characterized by low pressure,

low resistance and the fragile nature of the vessel's wall [6,7]. Cautious approach is crucial since transection or rupture of even a small branch of PA may lead to extravasation and death [7]. No definitive guidelines for management of traumatic PA injuries exist and depending on the patient, severity of injury and the experience of the institution - surgery, endovascular therapy or even conservative management are all possible approaches [5].

In our case, after consulting with the thoracic surgeons, open surgery was ruled out due to her poor clinical status. Embolization of the injured PA branch was a life-saving procedure, allowing the patient to survive and have a planned surgery performed at a later time.

Puncture of the peripheral branch of PA caused blood extravasation into the needle tract and massive hemothorax, which under normal conditions is not expected to occur [4].

One of the theories possibly explaining this complication involves the underlying pulmonary hypertension. Our patient had a history of surgical replacement of a mitral valve, which is a significant predisposing factor for increased pressure within PA and constitutes a finding strongly supporting this theory.

Pulmonary hypertension (pHTN) often results from longstanding left-sided valvular heart disease and affects 15%-32% of patients undergoing mitral valve surgery for mitral regurgitation [8].

In pulmonary hypertension, the right ventricular load increases due to an increase in pulmonary vascular resistance and decrease in pulmonary vascular compliance, ultimately leading to right ventricular failure. In recent years it has become clear that in pulmonary hypertension not only the contribution of resistance is of importance but that the decrease in arterial compliance plays an equally important role. In addition, in pulmonary hypertension the changes in resistance and compliance are fundamentally and quantitatively different from those in systemic hypertension. Therefore, changes in the pulmonary arterial tree and in pressure are considerably larger (~8-10 times more) than in the systemic arterial tree [9].

Chronic venous hypertension in the pulmonary circulation may cause submucosal vessel dilation, and elevation of pulmonary capillary pressure which then can lead to the recruitment of prominent intrapulmonary bronchopulmonary anastomoses (IBA) connecting pulmonary arteries and bronchial arteries that bypass the alveoli [10].

Also recruitment of IBAs in PAH may contribute to intrapulmonary right-to-left shunt, give rise to plexiform lesions, and increase the risk for pulmonary hemorrhage or hemoptysis [11].

To our best knowledge, this is the first reported case of a segmental PA branch injury resulting in massive hemothorax after the transthoracic needle-core biopsy and its following successful management by embolization. At the time of presenting this case the patient has survived 21 months with no postprocedural sequelae. According to CIRSE Quality Assurance Document and Standards for Classification of complications the case we present is classified as grade 3, meaning that additional post-procedure therapy or prolonged hospital stay (> 48 hours) was required with no postprocedure sequelae [3].

been given by my organization/institution, its legal representative and an ethics committee, and in accordance with local legislation.

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## Patient consent

Informed consent for publication of their case was obtained from the patient(s). Approval to publish by the patients has