

**Case Report**

# A Pulmonary Artery Pseudoaneurysm from a Locally Advanced Lung Cancer: A Case Report

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**Abstract**

**Background:** Pseudoaneurysms or false arterial aneurysms are infrequent complications that result from direct injury to the vascular wall leading to a single-layer hematoma. The formation of a pulmonary artery pseudoaneurysm secondary to an adjacent lung neoplasm is a rare occurrence.

**Presentation of Case:** We report a patient who developed a pseudoaneurysm of his left pulmonary artery from an infiltrating squamous cell carcinoma of the lung.

**Conclusion:** Despite the relative infrequency, the presence of a pulmonary pseudoaneurysm secondary to a lung cancer continues to have a high mortality. The aneurysm was managed with an endovascular stent with the goal of hemorrhage control. Unfortunately, the presence of the pseudoaneurysm in the context of his rapidly growing squamous cell carcinoma made the patient no longer a candidate for curative surgery, chemotherapy or radiation. After a long discussion on the patient's wishes and goals of care, he decided for palliative care measures. He was sent home with home oxygen and community supports in order to spend the remaining days with his family.

**Keywords:** Non-small cell lung cancer; Squamous cell carcinoma; Pseudoaneurysm; False aneurysm; Pulmonary artery

**List of Abbreviations:** PAP – pulmonary artery pseudoaneurysm; PAA – pulmonary artery aneurysm; CT-PA - CT pulmonary angiography

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**Competing Interests:** The authors have declared that no competing interests exist.

**Consent:** We the authors confirm that our patient and his family have given informed assent/consent for the publication of this case report.

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## Introduction

Pseudo or false arterial aneurysms are infrequent vascular complications that typically result from damage to the complete vessel wall leading to an enlarging single-layer hematoma that is encapsulated by the adjacent tissue. Most frequently in our clinical practice we see pseudoaneurysms in the femoral artery as a complication of 1% of diagnostic and 8% of therapeutic endovascular procedures [1]. In contrast to a pseudoaneurysm, a true arterial aneurysm involves the dilation of all layers arterial wall - the intima, media and the adventitia - and are most commonly secondary to atherosclerosis or congenital defects.

Pulmonary artery aneurysms or PAA were first reported in 1947 and are a rare anomaly occurring in about 1 out of 13,969 autopsies [2]. Unfortunately, most are diagnosed post-mortem given their high mortality.

The etiologies of PAPs can be categorized as idiopathic, congenital or acquired. The acquired etiologies of PAPs are probably the largest category. Accidental thoracic trauma has been associated with formation of PAPs. There are currently about twenty case reports in the literature of trauma-associated PAPs [3]. The majority of these were high impact blunt chest trauma from motor vehicle collisions or penetrating thoracic injuries [4-6]. More familiar to the medical profession are iatrogenic etiologies as previously stated. With respect to the pulmonary vasculature, there are some case reports of PAPs secondary to right heart and pulmonary artery catheterization [7-9]. There have also been a few reports of small and large vessel vasculitides, such as Behçet's disease, that have been associated with the formation of PAPs [10]. Infectious causes for PAPs, such as tuberculosis, syphilis and endocarditis, were historically more common etiologies. However, with adequate screening and treatment for

these aforementioned conditions have become less common.

With regards to our case report, there have been various reports of neoplasms causing PAPs. Thus far there have been around seven case reports of intimal leiomyosarcoma of the pulmonary artery causing PAPs [11, 12] and seven case reports of non-small cell lung carcinoma [13-18]. For this case report, we present a rare case of a pulmonary artery pseudoaneurysm (PAP) secondary to a squamous cell carcinoma of the lung.

## Case Presentation

A 63-year-old man presented to our institution with new-onset hemoptysis. He had a history of chronic obstructive pulmonary disease, alcohol abuse and an 80-pack year history of smoking. He had no history of connective tissue disorders and has not had any previous cardiac or endovascular procedures. He was not on any current medications. A CT scan of his chest without contrast showed a heterogeneous cavitory mass, approximately 4.5 cm x 3.3 cm, within the infrahilar portion of the left upper lobe. The mass encased the proximal left upper lobe bronchus and left superior pulmonary vein and artery. There was also some moderate ipsilateral hilar lymphadenopathy. A follow-up bronchoscopy with washings revealed malignant cells consistent with non-small cell lung cancer. Bronchial washings were negative for tuberculosis. An endobronchial ultrasound with transbronchial needle aspirate of the left upper lobe pathologically confirmed the diagnosis of a poorly differentiated squamous cell carcinoma. The patient was diagnosed with Stage IIA lung cancer.

While awaiting a discussion of treatment options with both the medical and surgical oncologists his condition further declined. He presented to the hospital with a post-obstructive pneumonia and was treated with intravenous antibiotics. Unfortunately, he

left the hospital against medical advice. He returned shortly thereafter with increasing dyspnea, hemoptysis, pleuritic chest pain and increasing oxygen requirements. He was admitted to the Medicine service for query pulmonary embolism and underwent CT chest with pulmonary angiography. The study was negative for a pulmonary embolism. However,

his primary lung cancer had increased in size and there was a new proximal branch pulmonary artery pseudoaneurysm of the left upper lob measuring 3cm x 3cm x 3cm (Figures 1 and 2). Ultimately, since the cancer was now complicated by the formation of a PAP he was upstaged to Stage IIIA.



**Figure 1** CT chest with pulmonary arterial contrast. An axial view of a left sided pseudoaneurysm, 3 cm x 3cm x 3cm in size (arrow)



**Figure 2** CT chest with pulmonary arterial contrast. A coronal view of a left upper lobe pseudoaneurysm (arrow)

A tumor board meeting took place with the medical and surgical oncologists regarding the rapid decline in function and upstaging of his lung neoplasm. It was decided that the patient would not likely survive a surgical resection at this time given the high risk of large volume blood loss with the PAP. Chemotherapy was not recommended at this time given the large neck of the pseudoaneurysm. The concern for the medical oncologists was the high risk of exsanguinating into his chest as the tumor regresses with chemotherapy. Therefore, it was decided that he should undergo an urgent interventional radiological procedure. An

endovascular stent was deployed across the origin of the left pulmonary artery aneurysm (Figure 3 and 4). Unfortunately, a complete seal could not be obtained. Percutaneous thrombin injection also did not succeed in occlusion of the aneurysm. After the procedure, a goals of care discussion occurred with the patient and his family. He decided that he wanted no more medical interventions, including surgery or chemotherapy. He wanted to be discharged home. We arranged community palliative care support, home oxygen and other community supports for him to be comfortable at home.



**Figure 3** CT chest with pulmonary arterial contrast. An axial view of a left sided pseudoaneurysm post endovascular stent placement



**Figure 4** CT chest with pulmonary arterial contrast. A coronal view of a left upper lobe pseudoaneurysm post endovascular stent placement

In follow-up, the patient had survived at home for around two months with the various community and social supports. During his last days, he was transferred to a community palliative care bed where he passed on alongside his family and loved ones.

## Discussion

A pseudoaneurysm of the pulmonary artery secondary to an adjacent primary lung

neoplasm is a rare phenomenon with a high mortality. At the present time there have only been seven other case reports. Table 1 lists the other five cases of PAPs secondary to primary lung neoplasms and their corresponding patient and cancer characteristics. All of the cases have been in middle-aged men with known adjacent squamous cell lung carcinoma. The formation of PAPs is a consequence of the highly aggressiveness of squamous cell lung cancers.

Table 1 the other case reports of primary lung neoplasms associated with pulmonary artery pseudoaneurysms and a breakdown of patient and lung cancer characteristics

Reference	Sex	Age (y)	Location	Histology
[13]	Male	56	Right PA	Squamous Cell Carcinoma
[14]	Male	65	Right PA	Squamous Cell Carcinoma
[15]	Male	55	Right PA	Squamous Cell Carcinoma
[16]	Male	48	Right PA	Squamous Cell Carcinoma
[17]	Male	54	Right PA	Squamous Cell Carcinoma
[18]	Male	71	Central	Squamous Cell Carcinoma
[18]	Male	66	Central	Squamous Cell Carcinoma
Present Case Report	Male	63	Left PA	Squamous Cell Carcinoma

Of the PAPs in the current literature, the typical patient presentation is quite varied, ranging from being found incidentally in an asymptomatic patient to acute hemoptysis, dyspnea and hypoxemia. A contrast-enhanced CT pulmonary angiography or CT-PA remains the first line method of localizing the site of the pseudoaneurysm rather than simple angiography. A recent study has demonstrated it has a sensitivity and specificity of 95.1% and 98.7% respectively in detecting pseudoaneurysms [19]. The CT-PA also has the potential to localize an actively bleeding artery with new onset hemoptysis and is exceptional at looking at the vascular anatomy to differentiate a PAP from a PAA. A PAP will appear as a clearly demarcated, rounded

structure with a connecting tributary from where the parent pulmonary artery was damaged (Figure 1), whereas a PAA will be a fusiform dilation of the parent vessel [1].

For all the various arterial pseudoaneurysms the treatment can be varied based on the location, size and type of pseudoaneurysms. Options include medical management (such as antibiotics or chemotherapeutic agents), vascular surgery, localized ultrasound compression, transcatheter embolization or endovascular stenting. For large, wide-necked PAPs, as our case report, the treatment of choice is endovascular stent insertion [1]. Transcatheter arterial embolization with thrombin injection



or coils is a second option or can be used in combination with stenting to best occlude the pseudoaneurysm and prevent the patient from exsanguinating.

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