

# Acute aortic occlusion due to tumor embolism in a patient with lung malignancy

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## Abstract

**Objectives:** Acute lower limb ischemia caused by tumor embolization is rare, despite the fact that cancer is a common cause of hypercoagulability predisposing to venous thrombosis. Arterial embolization is mostly associated with intracardiac tumors while lung malignancies are the second most common cause of tumor embolism.

**Methods:** In this report, we present a male patient who developed acute bilateral lower limb ischemia in the immediate postoperative period after a thoracotomy for attempted left upper lobe resection for lung cancer.

**Results:** The patient was treated with a subclavian-bifemoral bypass, since an initial attempted embolectomy was unsuccessful. Histopathological characteristics of thrombus obtained during embolectomy were consistent with the histopathology of the primary tumor.

**Conclusion:** Acute ischemia is an emergency that should be diagnosed and treated immediately. Interestingly, in this case, the presence of epidural anesthesia masked the initial symptoms and delayed diagnosis. Preoperative assessment with transesophageal echocardiography may reveal patients at high risk for tumor embolism.

## Keywords

Acute limb ischemia, aortic occlusion, tumor embolism

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## Introduction

Hypercoagulable state is a frequent complication of cancer that can cause venous thrombosis and pulmonary embolism.<sup>1</sup> However, acute lower limb ischemia caused by tumor embolization is a rare complication. Generally, tumor embolization is associated with intracardiac tumors, especially atrial myxoma. In cases of lung cancer, the tumors most commonly invade pulmonary veins.<sup>2</sup> We present a case that was complicated by acute bilateral lower limb ischemia due to tumor embolism causing aortic occlusion, after attempted resection of lung adenocarcinoma. This case has the special interests that the presence of epidural anesthesia masked the initial symptoms and apart from invasion of pulmonary veins that is common, in this patient there was invasion of the aorta as well.

## Case report

A 75-year-old male was admitted to the Thoracic Surgery Department in order to undergo an elective left lung upper

lobe resection for a moderately differentiated lung adenocarcinoma. Patient medical history included diabetes mellitus, hypertension and dyslipidemia under medication. Moreover, the patient was a heavy smoker (140 Pack/Years). One year ago, he presented to his general practitioner (GP) suffering from cough, anemia, fatigue and weight loss of 12 kg during

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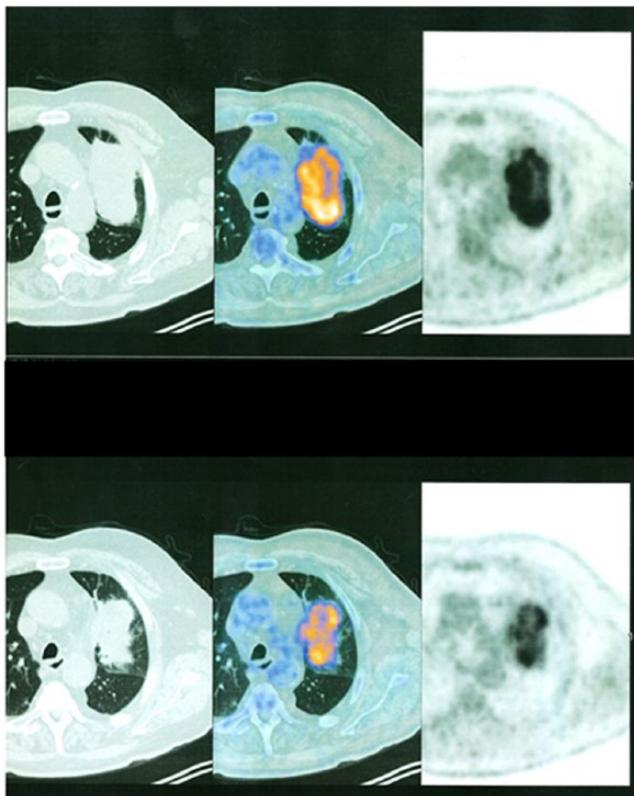
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**Figure 1.** PET-CT scan after chemotherapy and before surgical exploration.

3 months. The patient eventually underwent computed tomography (CT) scan, bronchoscopy and tumor biopsy, and he was diagnosed with a moderately differentiated lung cancer, stage IIIa, T3N2M0 according to seventh edition of the TNM staging system. T3 was attributed to tumor size (maximum diameter 10.8 cm) and N2 to metastasis to inferior mediastinal (subcarinal) lymph node according to the initial CT scan. The patient subsequently underwent six cycles of chemotherapy with pemetrexed and carboplatin. After that, a new CT scan, a fluorodeoxyglucose (FDG) uptake positron emission tomography (PET)-CT scan and a transthoracic echocardiogram were performed in order to evaluate tumor stage following chemotherapy. The tumor at that time was staged T3N1M0. Size was decreased (maximum diameter 9 cm) but remained T3, while only ipsilateral hilar lymph nodal metastases but no mediastinal nodes were found (downgrade to N1). Additionally, there was close proximity of the tumor to the aortic arch, but vessel wall invasion was not evident according to the radiology report (Figure 1). Therefore, the patient was scheduled for left upper lung lobe resection.

Under general and thoracic epidural anesthesia, a left anterolateral thoracotomy was performed. In the left lung apex, the tumor was strongly adhered to the thoracic wall and the aortic arch and it seemed to invade the superior pulmonary vein, although this was not evident on the CT



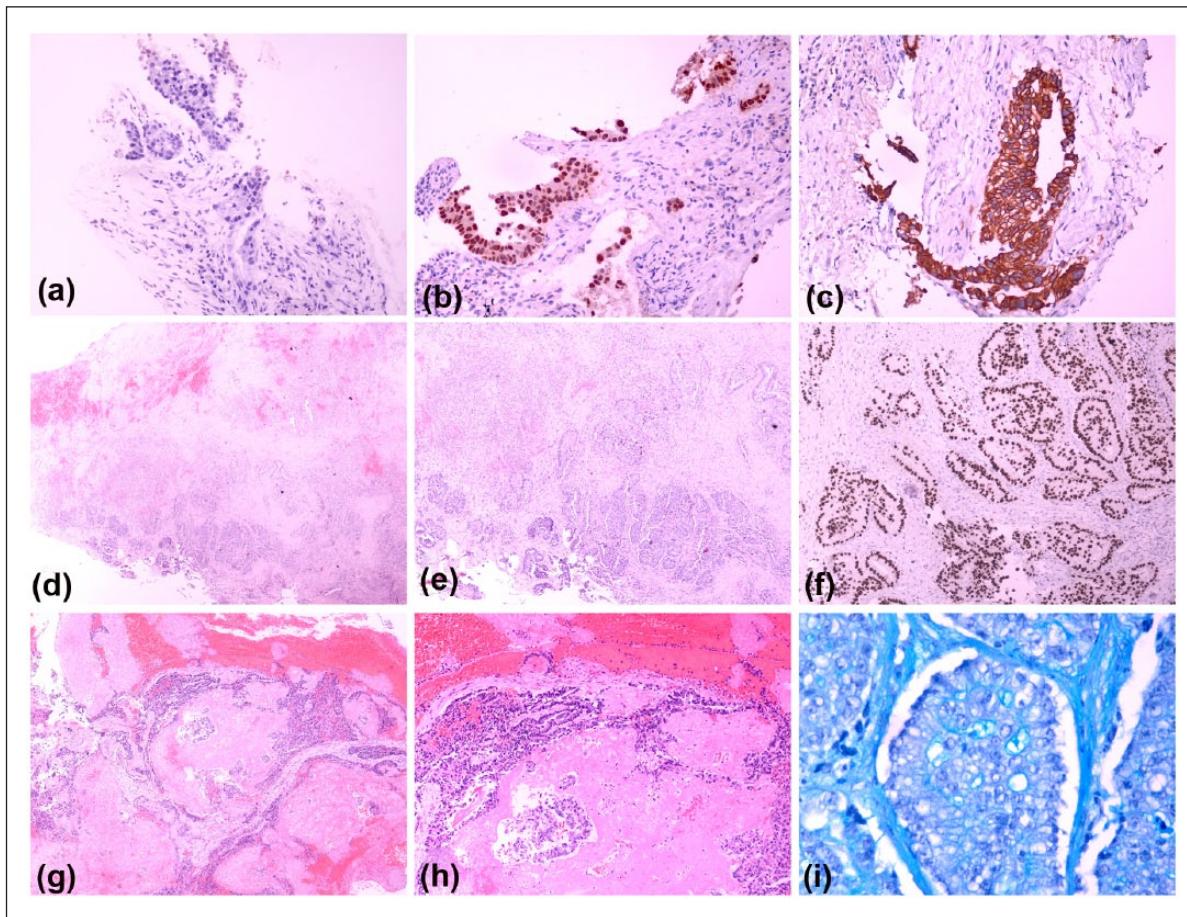
**Figure 2.** CTA revealing the presence of infrarenal aortic occlusion and coexistence of atherosclerotic lesions in iliac arteries.

scan. Ligation of pulmonary vein and complete resection of tumor due to aortic arch invasion were not possible, so the tumor was considered nonresectable and thus resection was not attempted. A specimen of tumor adjacent to aortic arch and lymph nodes were resected for histopathological examination.

While still in recovery, the patient complained of sudden onset of lower back pain and paralysis of the lower limbs. Initially, symptoms were attributed to epidural anesthesia, but subsequently the lower limbs became pale and cold and vascular consultation was requested. On clinical examination, arterial pulses of bilateral femoral, popliteal, dorsalis pedis and posterior tibial arteries were absent and there was no blood flow on handheld Doppler examination at the ankle level. The patient immediately underwent a CT angiography that revealed thrombosis of the infrarenal aorta in the presence of atherosclerotic lesions of the iliac arteries bilaterally (Figure 2).

The patient was emergently taken back to the operating theater where bilateral femoral artery thromboembolectomies were performed. Although thrombus was removed after multiple embolectomies, blood flow was not adequately restored. Since arterial inflow was inadequate while the patient had just undergone a thoracotomy, it was decided to proceed to revascularization of the lower limbs with a subclavian-bifemoral bypass, in order to avoid a second major abdominal procedure. The bypass was performed with a Dacron 8-mm ringed graft. Femoral pulses were restored and postoperative ankle-brachial index was 0.6 on the right side and 0.85 on the left side which were similar to preoperative recordings.

Postoperatively, the patient was transferred to intensive care unit (ICU), hemodynamically unstable with metabolic



**Figure 3.** (a–c) Fine needle biopsy of the primary lung tumor shows moderately differentiated lung adenocarcinoma: (a) hematoxylin and eosin stain  $\times 200$ , (b) TTF-1 positivity  $\times 200$  and (c) CK7 positivity  $\times 200$ . (d–f) Carcinomatous invasion of the aortic wall: (d and e) hematoxylin and eosin stain  $\times 20$  and  $\times 40$ , respectively, and (f) TTF-1 positivity  $\times 100$ . (g–i) Tumoral embolus material that shows tumor aggregates in between fibrin and erythrocytes: (g) hematoxylin and eosin stain  $\times 40$ , (h) hematoxylin and eosin stain  $\times 100$  and (i) Alcian blue stain demonstrates mucin production by the neoplastic cells,  $\times 400$ .

acidosis due to prolonged ischemia. The postoperative course was unfavorable and patient died on the fifth postoperative day due to multi-organ failure caused by reperfusion syndrome.

Histopathological characteristics of thrombus obtained during embolectomy (Figure 3(g)–(i)) were consistent with the histopathology of the biopsy of the primary lung tumor (Figure 3(a)–(c)). The histopathology of the fraction of tumor adjacent to aortic arch revealed invasion of aortic adventitia (Figure 3(d)–(f)).

## Discussion

Although cancer is a frequent cause of coagulation disorders, acute arterial occlusion due to tumor embolization is uncommon.<sup>1,3</sup> When these complications occur, they are mostly associated with intracardiac tumors and especially atrial myxoma that is complicated with embolic phenomena in 30%–40% of cases.<sup>2,4,5</sup> Apart from intracardiac tumors, lung

malignancies are the next more common cause of tumor embolization. In a review, published in 1996, by Zürcher et al.,<sup>6</sup> 38 cases of tumor arterial embolization have been reported. In a more recent review of the literature, Xiromeritis et al. have found 104 reported cases of acute arterial ischemia caused by tumor. In 46 of these cases, patients suffered from primary lung cancer and in 33 cases from metastatic lung cancer.<sup>7</sup> The site of tumor embolization reported most commonly is the aortic bifurcation or femoral arteries (50%) followed by the cerebral arteries (30%).<sup>3,8</sup>

In the majority of cases, tumor gains access to the arterial tree through pulmonary veins.<sup>3</sup> In a review of the literature, pulmonary vein invasion of tumor existed in 24 out of 29 reported cases.<sup>4</sup> In our case, apart from invading left superior pulmonary vein, the tumor was strongly adherent to aortic arch, invading this as well as demonstrated by histopathological examination (Figure 3(d)–(f)). Taking these into consideration, the origin of tumor embolism in this case could be either the pulmonary vein or the aorta.

Transesophageal echocardiography has been recommended by many authors as a method of choice for diagnosing intracardiac tumor invasion.<sup>2</sup> While transthoracic echocardiography is able to visualize only two pulmonary veins in 71% of the patients, transesophageal echocardiography allows visualization of bilateral superior and right inferior pulmonary veins in 100% of the patients and is able to visualize left inferior vein in 87% of the cases.<sup>9</sup> In this case, although our patient had undergone a transthoracic echocardiography preoperatively, it did not reveal the presence of tumor invasion in pulmonary veins, while intraoperatively it seemed that tumor invaded left superior pulmonary vein highlighting the inferiority of transthoracic echocardiogram during preoperative investigation of such cases.

A significant factor that can provoke embolism is the surgical handling during dissection at the time of operation.<sup>10</sup> Most of these cases occur intraoperatively or in the immediate postoperative period.<sup>8,11</sup> Moreover, while in the majority of reported cases, arterial flow is restored with embolectomy, in our case this was unsuccessful and therefore revascularization was achieved with a subclavian-bifemoral bypass.

Thoracotomy is the procedure with the greatest need of analgesia. Inadequate analgesia may have implications on recovery, delaying mobilization and lung physiotherapy and even predisposing in development of chronic chest pain.<sup>12,13</sup> Therefore, the presence of epidural analgesia is very beneficial for the patient. Cywinski et al.<sup>14</sup> have reported that the absence of epidural analgesia is a predictor of delayed extubation after thoracotomy. Although epidural analgesia is in the interest of patient, in our case, it masked the initial presentation of ischemia, delaying diagnosis and treatment. Earlier revascularization may have caused less reperfusion injury and reduced morbidity and mortality.

Occasionally an embolic event, presenting in a patient with no previous history of malignancy, may be due to an underlying cancer.<sup>15</sup> In such circumstances where there is no specific cause for embolization, the treating physician should also investigate and rule out the chance of malignancy.

## Conclusion

Tumor embolism presenting with frank ischemia is a life-and limb-threatening emergency that should be diagnosed promptly and treated aggressively. It usually happens in patients with advanced disease and in this instance evaluation with transesophageal echocardiography or a thorough thin-slice CT scan is likely to detect tumor invasion in pulmonary veins. This may impose the use of anticoagulation and alter patients' management although anticoagulant therapy in this group of patients remains ill defined. The use of epidural anesthesia, although beneficial, may camouflage initial presentation of acute ischemia and delay immediate treatment.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

## Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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## Informed consent

Written informed consent was obtained from a legally authorized representative for anonymized patient information to be published in this article.

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