

## Case Report

# Lung metastasis induced chronic compartment syndrome of the lower leg

Miodrag Vranješ<sup>1\*</sup>, Tanja Lakić<sup>2</sup>

<sup>1</sup>Faculty of Medicine, University of Novi Sad, Clinic for Orthopedic Surgery and Traumatology, Clinical Center of Vojvodina, Novi Sad, Serbia

<sup>2</sup>Faculty of Medicine, University of Novi Sad, Center for Pathology and Histology, Clinical Center of Vojvodina, Novi Sad, Serbia

**Received:** 09 February 2021

**Accepted:** 12 March 2021

### \*Correspondence:

Dr. Miodrag Vranješ,

E-mail: [miodragvranjes@gmail.com](mailto:miodragvranjes@gmail.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

Compartment syndrome occurs when the pressure within a defined compartmental space increases above a critical pressure threshold. Lung cancer is one of the world's most frequently diagnosed cancer whose metastases are rare cause of compartment syndrome. We present a 50 year old male patient who was admitted to our emergency department due to painful left lower leg, swelling and paresthesia of the medial side of the foot that lasted about 2 months back. The diagnosis of metastatic lung adenocarcinoma was set 9 months earlier. Physical examination revealed an ill-defined, tense, and tender swelling left calf and X-ray images confirmed periosteal reaction on all four cortices of both bones without osteolytic lesions. After an adequate laboratory analyses and preoperative preparation, debridement with biopsy and fasciotomy was performed. Histopathological evaluation showed necrotic tumor tissue that morphologically and immunohistochemically corresponds to lung cancer. We performed an above knee amputation and the next day, the patient was discharged home, due to his personal request.

**Keywords:** Compartment syndrome, Metastasis, Lung cancer, Pulmonary adenocarcinoma

## INTRODUCTION

Compartment syndrome is a complication caused by fracture, ischemic reperfusion injury, soft tissue trauma, external compression, burn, or even bleeding disorders.<sup>1</sup> The syndrome occurs when the pressure within a defined compartmental space increases over a critical pressure threshold, thereby decreasing the perfusion pressure to that compartment. Pain that is out of proportion to the injury and aggravating pain with passive stretching of the muscles are the earliest and most reliable indicators of acute compartment syndrome.<sup>2</sup> Lung cancer is one of the most frequently diagnosed major cancer in the world and the most common cause of cancer mortality worldwide whose incidence continues to rise. Most lung cancers are associated with a well-known carcinogen-cigarette smoke, in addition with other genetic and environmental

factors. Lung cancer most commonly metastasizes to regional lymph nodes, liver, brain, distant lymph nodes, adrenals and bone, while metastasis to the lower leg is very rare.<sup>3,4</sup> We present a unique case of a patient with acute atraumatic compartment syndrome of the lower leg due to a pulmonic carcinoma metastasis.

## CASE REPORT

A 50 year old male with a 9 months earlier known diagnosis of metastatic lung adenocarcinoma was admitted to our emergency department with a two month history of increasingly painful left lower leg, swelling and paresthesia of the medial side of the foot. Physical examination revealed an ill-defined, tense, and tender swelling left calf. Dorsalis pedis artery and posterior tibial artery pulsations were intact, but there was

numbness over the medial sole and medial tree toes. The patient complained of a foot drop 7 days ago and extreme pain developed the previous day. The patient was treated for deep vein thrombosis before admission. X-ray images of the left lower leg revealed periosteal reaction on all four cortices of both bones (Figure 1). No osteolytic lesions were noted. Pulmonary X-ray images revealed complete atelectasis of the right lung (Figure 2). The white blood cell count was  $17 \times 10^9$  l and the C-reactive protein level was also elevated (209 mg/L). Anaemia was present (Hgb 102 g/l) with blood clotting in normal limits. Preoperative liver and renal function were within normal limits. Under the tentative diagnosis of compartment syndrome with associated compressive neuropathy, urgent operation with debridement, biopsy and fasciotomy was performed.

In the operating room two incisions and all three compartment decompression procedure was performed. Upon dissection into the compartments of the lower leg, abnormal solid tissue was evacuated. The tibia and the fibula bone surface was extremely rough. The samples for microbiology and pathology analysis were taken. The incisions were left open in order to monitor wound condition.

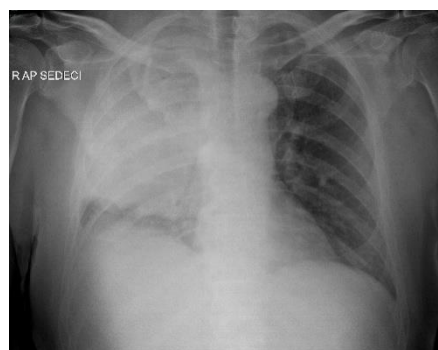
For the first 24 hour the patient stated of having no pain. The patient remained afebrile. Repeated laboratory workup revealed postoperative anaemia which was corrected with two units of blood transfusions. Microbiologic examinations were all negative. On hospital day 13, the pathologic examination confirmed the diagnosis of metastatic pulmonary cancer. Tumor tissue was consisted of large, atypical cells with hyperchromatic nuclei and increased mitotic index with numerous pathological mitoses (Figure 3a).

Tumor cells were arranged into sheets, solid and abortive adenoid structures with extensively areas of necrosis. Immunohistochemical analyses (IHC) showed immunopositivity for cytokeratin 7 (Figure 3b), High molecular weight cytokeratin (Figure 3c) and TTF-1 (Figure 3d) and the diagnosis of metastatic poorly differentiated pulmonary adenocarcinoma was set.

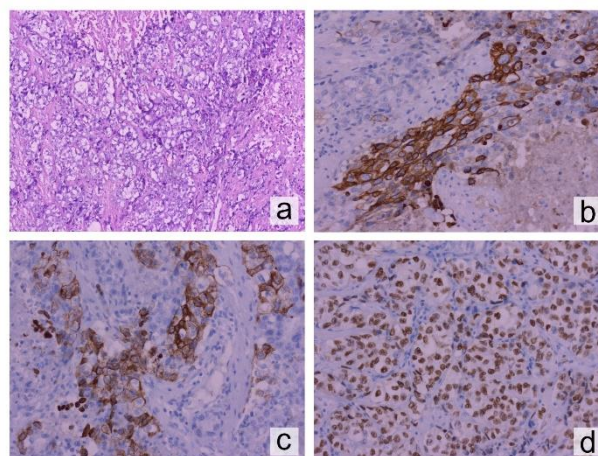
Pulmologists were immediately consulted for confirmation of palliative treatment. During wet dressing management of the fasciotomies, abnormal tissue was noted rising above the fascia (Figure 4). The second procedure, above knee amputation, was performed on the 16-th hospital day. Drainage was removed on the second postoperative day. There were no postoperative wound healing complications. At his personal request, the patient was discharged home on the 17-th hospital day. On control visits he remained pain free.



**Figure 1: Lower leg X-ray; periosteal reaction on all four cortices.**



**Figure 2: Pulmonary X-ray; complete atelectasis of the right lung.**



**Figure 3: Microscopic view of intraoperative soft tissue specimen; (a) HE staining, 100x, (b) IHC antibody CK7, 200x, (c) IHC antibody HMWCK, 200x, (d) IHC antibody TTF-1, 200x.**



**Figure 4: Left lower leg; medial fasciotomy site with abnormal tissue.**

## DISCUSSION

Lung cancer is a highly aggressive disease with an overall 5 year survival rate of less than 15% and the third most common form of cancer to spread to bone. It is considered to be a fast progressing disease with a short latency period after clinical diagnosis. About 30–40% of patients with lung cancer develop bone metastases during the course of their disease.<sup>5</sup> Cancer cells are capable of infiltrating and colonizing remote organs including bone, contralateral lungs and the brain simultaneously.<sup>6</sup> In a retrospective study of 259 nonsmall cell lung cancer patients, the most common site of skeletal metastases was the spine in 50% of patients, followed by the ribs (27.1%), ilium (10%), sacrum (7.1%), femur (5.7%) and humerus, scapula and sternum (2.9%). No lower leg skeletal metastases were noted.<sup>7</sup> The lower leg is the least affected by bone metastases with a rate under 0.1%.<sup>8</sup> In the literature available to us, there were only three case reports of tibial bone metastasis due to lung cancer.<sup>9-11</sup> Two of them were poorly differentiated adenocarcinomas, as in our case, and one was a small cell carcinoma.

In regard to the compartment syndrome, traumatic causes are very rare.<sup>12</sup> There are only 7 documented cases of compartment syndrome caused by hematologic diseases in the skeletal muscle, but in only two cases it was leg compartment.<sup>13</sup> Furthermore, there are only two documented solid tumor metastasis complicated with compartment syndrome. One melanoma and one breast cancer with upper arm and forearm compartment syndromes.<sup>14,15</sup> To our knowledge, there are no documented pulmonal bone metastases complicated with lower leg compartment. The reason may be because many patients with metastatic lung carcinoma have a very short survival period. The mean survival of patients with metastatic lung cancer is about 8-10 months.<sup>16</sup>

One limitation of the case report is lack of intracompartmental pressure measurement. As the surgical treatment was urgent and there was rapid reduction of postoperative pain, we do not think that these measurements would alter our treatment.

## CONCLUSION

Although very rare, lower leg compartment syndrome can be caused by metastatic deposits of diverse tumors as well as pulmonary adenocarcinoma. It is likely that this complication will be seen more often with the worldwide increased incidence of lung cancer. Great caution is necessary in the treatment of disseminated malignancies when hard swelling of the extremities occurs.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not required*

## REFERENCES

1. Cohen E, Truntzer J, Truntzer J, Klinge S, Schwartz K, Schiller J. Acute pediatric leg compartment syndrome in chronic myeloid leukemia. *Orthopedics.* 2014;37(11):1036-9.
2. Donaldson J, Haddad B, Khan WS. The Pathophysiology, Diagnosis and Current Management of Acute Compartment Syndrome. *Open Orthop J.* 2014;8(1):185-93.
3. Lortet-Tieulent J, Soerjomataram I, Ferlay J, Rutherford M, Weiderpass E, Bray F. International trends in lung cancer incidence by histological subtype: adenocarcinoma stabilizing in men but still increasing in women. *Lung Cancer.* 2014;84(1):13-22.
4. Sugiura H, Yamada K, Sugiura T, Hida T, Mitsudomi T. Predictors of survival in patients with bone metastasis of lung cancer. *Clin Orthop Relat Res.* 2008;466(3):729-36.
5. Coleman RE. Metastatic bone disease: clinical features, pathophysiology and treatment strategies. *Cancer Treat Rev.* 2001;27(3):165-76.
6. Nguyen DX, Bos PD, Massagué J. Metastasis: from dissemination to organ-specific colonization. *Nat Rev Cancer.* 2009;9(4):274-84.
7. Tsuya A, Kurata T, Tamura K, Fukuoka M. Skeletal metastases in non-small cell lung cancer: A retrospective study. *Lung Cancer.* 2007;57(2):229-32.
8. Hage WD, Aboulaflia AJ, Aboulaflia DM. Incidence, location, and diagnostic evaluation of metastatic bone disease. *Orthop Clin North Am.* 2000;31(4):515-28.
9. Kurishima K, Kagohashi K, Mammoto T, Satoh H. Tibia Metastasis from Small Cell Lung Cancer. 2014;62(1):89-90.
10. Gurrieri L, Longhi A, Braghetti A. Lung cancer presenting as a metastasis to the tibial bones: a case report. *Tumori Journal.* 2015;101(1):18-20.
11. Shih WJ, Magoun S, Lahar B, Stipp V, Gross K. An unusual case of a tibial metastasis as the clinical presentation of bronchogenic adenocarcinoma. *J Nucl Med Technol.* 1998 ;26(2):91-3.

12. Cone J, Inaba K. Lower extremity compartment syndrome. *Trauma Surg Acute Care Open*. 2017;2(1):e000094.
13. Li JY, Li CL, Lu CK. Skeletal Muscle Lymphoma Presenting with Chronic Compartment Syndrome of Leg after Trauma. *Case Rep Oncol Med*. 2018;2018:1-4.
14. Simmons DJ, Wharton SM, Waters R. Compartment syndrome complicating metastatic malignant melanoma. *Br J Plast Surg*. 2000;53(3):255-7.
15. Hazeltine M, Duranceau L, Gariepy G. Presentation of breast carcinoma as Volkmann's contracture due to skeletal muscle metastases. *J Rheumatol*. 1990;17:1097-9.
16. Fossella F, Pereira JR, von Pawel J, Pluzanska A, Gorbounova V, Kaukel E, et al. Randomized, multinational, phase III study of docetaxel plus platinum combinations versus vinorelbine plus cisplatin for advanced non-small-cell lung cancer: the TAX 326 study group. *J Clin Oncol*. 2003;21(16):3016-24.

**Cite this article as:** Vranješ M, Lakić T. Lung metastasis induced chronic compartment syndrome of the lower leg. *Int J Res Orthop* 2021;7:663-6.