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## Case Report

# Deciphering the enigmatic symptoms of Pancoast tumors: Navigating the complex landscape of pain management—A case report <sup>☆,☆☆</sup>

Ladislav Kočan, MD, PhD<sup>a</sup>, Róbert Rapčan, MD, PhD<sup>b</sup>, Martin Griger, MD, PhD<sup>b</sup>,  
 Simona Rapčanová, MD<sup>b</sup>, Daniela Kantárová, MD, PhD<sup>c</sup>, Pavol Török, MD, PhD<sup>a</sup>,  
 Janka Vašková, PhD<sup>d,\*</sup>

<sup>a</sup> Clinic of Anaesthesiology and Intensive Care Medicine, East Slovak Institute of Cardiovascular Disease, Ondavská 8, 040 11 Košice, Slovak Republic

<sup>b</sup> Europainclinics, Kominárska 21/5, 831 04 Bratislava, Slovak Republic

<sup>c</sup> Outpatient clinic for adults, Immunology centre in Martin, Mudroňova 12, 036 01 Martin, Slovak Republic

<sup>d</sup> Department of Medical and Clinical Biochemistry, Faculty of Medicine, Pavol Jozef Šafárik University in Košice, Trieda SNP 1, Košice, Slovak Republic

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## ABSTRACT

Pancoast tumors, also known as superior sulcus tumors, encompass a diverse spectrum of neoplasms that infiltrate the apex of the chest wall, yielding distinctive clinical presentations. One of the earliest signs of tumor growth is pain radiating to the upper limb, stemming from peripheral nerve involvement, which can mimic joint pain or spinal radicular irritation. In this case report, we present the clinical history of a 64-year-old female smoker who had previously been recommended for orthopedic elbow surgery due to epicondylitis. Subsequent to the development of additional symptoms and rigorous investigation, a Pancoast tumor was diagnosed. Furthermore, we discuss the characteristic treatment modalities available for Pancoast tumors, including pharmacological pain management and interventional strategies such as spinal cordotomy and spinal alcoholysis. This case underscores the significance of recognizing atypical presentations and emphasizes the importance of comprehensive evaluation in the diagnosis and management of Pancoast tumors.

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\* Corresponding author.

E-mail address: [janka.vaskova@upjs.sk](mailto:janka.vaskova@upjs.sk) (J. Vašková).

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## Introduction

Pain radiating to the upper limb is a common manifestation of vertebral cervical diseases, whether it is the diagnosis of cervical spinal nerve compression and radicular pain or cervical facet joint syndrome. In pain localized predominantly in the brachial plexus of the upper limb or elbow joint, an orthopedic or rheumatological etiology is assumed [1,2].

However, pain radiating to the shoulder and limb can be an indicator of serious medical conditions, including myocardial infarction, hepatobiliary disease, and lung tumors apically located lung tumors, also referred to as Pancoast tumors (superior sulcus tumors). Its typical symptom is upper limb pain caused by infiltration of the brachial plexus on the affected side or pain caused by local osteolysis of the first and second ribs.

The tumor infiltrates the periosteum or skeleton of the ribs or vertebral body, further affecting the inferior branch of the brachial plexus, subclavian vein, artery, sympathetic trunk including the stellate ganglion as the tumor grows and becomes more invasive [3,4].

When the cervical sympathetic trunk is affected, a picture of Horner's triad develops in the ipsilateral eye, namely miosis, ptosis and anhidrosis. This tumor is often accompanied by paraneoplastic manifestations. Early diagnosis of the tumor and determination of the tumor type are essential for the initiation of adequate targeted treatment and prognosis of the patient. Misleading symptoms in the diagnosis of Pancoast tumor of the lung have long been known. The first presenting symptoms are musculoskeletal discomfort or distal neurological findings in the upper limb, which may lead the physician to a misdiagnosis. Delays in diagnosis can adversely affect adequate treatment and the patient's prognosis [5,6].

In the following case report, we describe the central problem in determining the main oncologic diagnosis in the presence of upper extremity pain, emphasizing the importance of carrying out examinations confirming the diagnosis, as well as the appropriate choice of pain management.

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## Case report

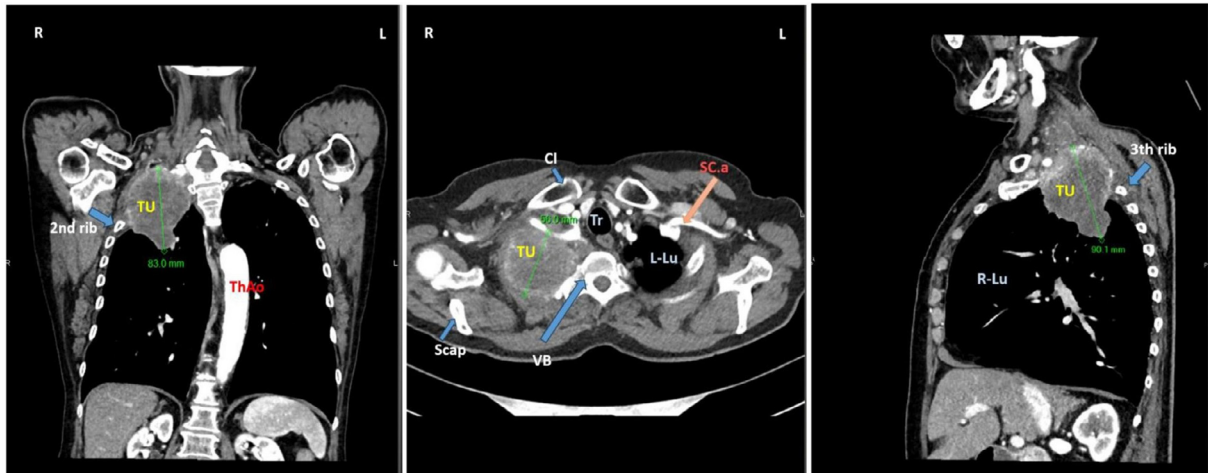
A 65-year-old polymorbid female patient with a history of ischemic heart disease, arterial hypertension, and diabetes mellitus type II, was coming to a pain management clinic with a newly diagnosed lateral epicondylitis. The patient had been a smoker for the past 30 years with a daily consumption of 10–20 cigarettes. The patient reported intense pain in their right elbow with an increasing intensity for the past 2 months and a visual analog scale (VAS) score of 8/10.

The primary purpose of the visit to the pain management clinic was to examine the painful elbow symptoms and potential local injection of the affected elbow with the aim of temporary pain relief until her planned orthopedic surgery for lateral epicondylitis. The patient's current analgesic treatment was Tramadol/Paracetamol combination 37.5/325 mg/ 8 h per os (p. o.) and ibuprofen 400 mg/12 h p. o., the upper limb fixed with a brace.

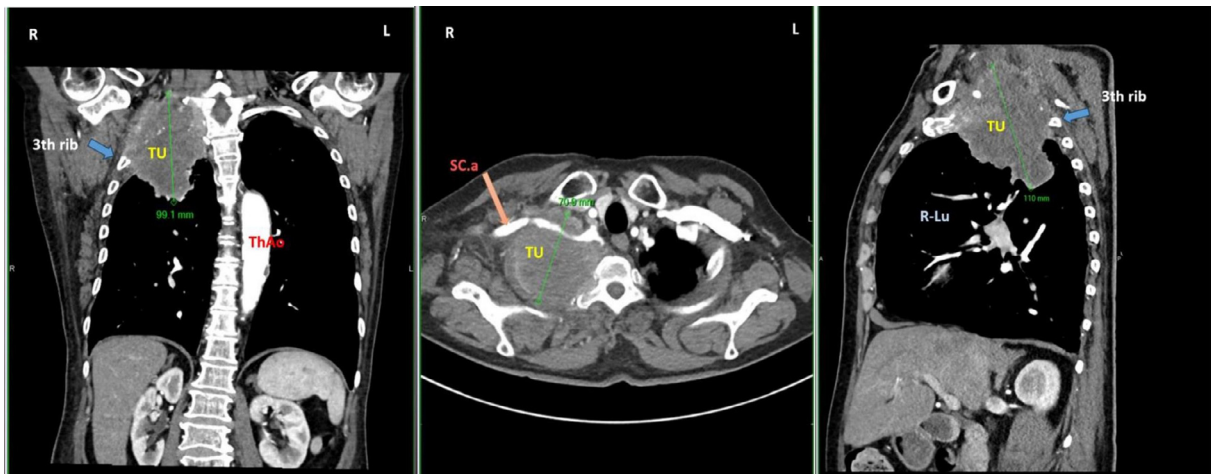
Objective examination revealed pain in the right elbow joint area without palpation tenderness, the quality of the pain was sharp and without limitations to the range of movement. As an incidental finding, there was mild soft tissue asymmetry of the neck and discrete swelling over the right clavicle without palpation tenderness. Outpatient elbow joint infiltration was performed with local anesthetic Mesocain 0.5% 5 mL and corticosteroid Dexamethasone 4 mg. After 10 days, the patient reported worsening discomfort and rated the injection as ineffective. She identified the pain in the thoracic spine on the right side in addition to the elbow, and intermittent spread of pain in the C7 dermatome on the upper extremity extending into the fourth and fifth fingers on the right hand. Due to pain progression, Tapentadol 100 mg/12h p. o., Lornoxicam 4 mg/12 h p. o., Metamizol 500 mg 3-times per day p. o. were added to the treatment. Subsequently, the patient was acutely referred for a chest CT scan (Fig. 1), which revealed the following findings: Pancoast tumor in the right lung apex with osteolytic destruction of the right first and second ribs and propagation cranially to the posterior cervical space. CT findings showed evidence of cervical lymphadenopathy and metastatic dissemination to the middle lobe of the lung ipsilaterally.

The patient was referred to a thoracic surgeon and an oncologist for comprehensive diagnostic and therapeutic management. Consultations were sought from 2 independent specialists in thoracic surgery, each affiliated with different medical centers. As the primary approach, minimally invasive diagnostic methods, such as aspiration biopsy or bronchoscopy, were proposed to obtain a biopsy sample of the tumor. However, both specialists, upon evaluating the clinical findings, advised against open surgery due to the heightened risk of perioperative mortality. Unfortunately, the patient declined the recommended examinations, choosing to undergo only palliative treatment. This decision resulted in a rapid deterioration of her condition.

Both specialists reiterated their reluctance to recommend surgery due to the elevated perioperative mortality risk based on the clinical findings. The patient refused bronchoscopic sampling, and the oncologist faced challenges in initiating targeted cancer treatment. This was primarily due to the patient reporting a significant relief effect during the period of the symptomatic analgesic treatment. The second month after diagnosis, the pain recurred, Citalopram 10 mg p. o., Tapentadol 100 mg/12h p.o., Lornoxicam 4 mg/12h p. o., Metamizole 500 mg 3 times daily p. o. were added to the treatment. The patient tolerated the treatment well, describing the treatment as effective. In the third month after diagnosis, the patient's condition deteriorated again, there was a progression of pain, due to the prognosis of the patient, cervical spinal lysis was indicated, and the patient consented to the procedure. Tapentadol dose was increased to 200 mg/12h p. o. The day before the planned procedure, the patient reassessed her consent to the interventional procedure for current pain improvement, and the lysis was subsequently abandoned. The patient's further therapy was focused on palliative treatment only, which was conducted by a pain management specialist. The patient was negative for further examinations. Follow-up chest CT scan after 4 months (Fig. 2) showed progression of the lesion.



**Fig. 1 – CT examination: coronal, transversal, and sagittal section. Cl- clavicle, L-Lu – left lung, R-Lu – Right lung, SC.a – subclavian artery, Sca – scapula, ThAo- Thoracic aorta, Tr – trachea, TU – tumor, VB – vertebral body.**



**Fig. 2 – CT examination after 4 months: coronal, transversal, and sagittal section. Cl- clavicle, L-Lu – left lung, R-Lu – Right lung, SC.a – subclavian artery, Sca – scapula, ThAo- Thoracic aorta, Tr – trachea, TU – tumor, VB – vertebral body.**

Over the next 2 weeks, there is again a worsening of the patient's clinical condition. The patient described severe pain throughout the upper limb with dominance in the shoulder and elbow. Required opioid change to Buprenorphine 52.5 µg/h transdermal patch, Citalopram 10 mg p. o. Naproxen film-coated tablets 550 mg/12h p. o., Pregabalin 75 mg/12h p. o., Metamizole 500 mg 3x p. o. and morphine 10 mg p. o. for breakthrough pain. Patient reports nausea after taking Naproxen, further prescribed non-steroidal anti-inflammatory drugs in the form of Indomethacin 100 mg per rectum.

Five months after being diagnosed, the patient is already significantly cachectic (weight 42 kg), and very weak, despite current treatment she describes severe pain, has frequent attacks of nausea, central antiemetics are added to her treatment. Analgesic treatment was re-corrected to Fentanyl 75 µg/h, Effentora 200 µg were patches applied, Citalopram 20 mg p. o., Pregabalin 75 mg/12h p. o. The pain was reduced to VAS

4-5/10. The patient passed away 5 months after the first examination.

## Discussion

Despite tissue infiltration and a gradual loss of vital capacity, the lungs exhibit remarkable functional compensatory capacity. Tumors are characterized by nonspecific symptoms associated with malignant disease, such as loss of appetite, weight loss, cachexia, weakness, fatigue, and increased temperature. The spread of tumors to surrounding tissues can result in Pancoast-Tobias syndrome [7], marked by severe shoulder pain affecting C8, T1, and T2 nerve trunks, symptoms of the Horner triad [8], and atrophy of intrinsic hand muscles. The most common type of Pancoast tumors is nonsmall cell carcinomas (more than 95%), with squamous cell carcinoma be-

ing the most commonly represented [9]. Roughly 3-quarters of Pancoast tumors are stage III tumors with involvement of the parietal pleura. Nearly one-quarter of diagnosed Pancoast tumors are advanced stage IIB or advanced stage IV tumors with involvement of the brachial plexus, mediastinum, great vessels and heart, esophagus, trachea, vertebral bodies, recurrent laryngeal nerve, they may produce distant metastases [10].

A Pancoast tumor, situated at the lung apex, can induce pain radiating to the shoulder, arm, and even the lateral epicondyle region, known as referred pain. This occurs due to the involvement of adjacent structures and nerves, with the mechanism implicating the tumor's impact on the brachial plexus and sympathetic nerves in the thoracic region. The patient was initially misdiagnosed with epicondylitis and nearly underwent orthopedic surgery based on an inaccurate assessment of her overall clinical condition. The infiltration of the brachial plexus by the tumor became more likely when new pain affecting multiple nerves—ulnar, median, and partially radial nerves in the right upper limb and hand—developed. This example underscores the frequently documented challenge of late Pancoast tumor diagnosis and emphasizes the associated poor prognosis. It is crucial to recognize that symptoms of a Pancoast tumor, including pain radiating to the arm and shoulder, can be nonspecific and may overlap with various conditions, such as musculoskeletal disorders like lateral epicondylitis.

Diagnosis of the tumor is based on clinical manifestations and chest X-ray. CT scan of the chest provides precise information about the extent of the tumor, involvement of regional lymph nodes, mediastinal adenopathy, and overgrowth into bony structures of the chest, vertebrae, and ribs. However, CT scanning is limited to assess the extent of tumor invasion into soft structures such as the brachial plexus, and subclavian vessels, therefore it is appropriate to complement magnetic resonance imaging.

Biopsy is necessary to initiate targeted therapy. The patient in our case study was not biopsied because of the high perioperative risk due to the extent of tumor invasion into the surrounding tissues. Detection of the tumor could have been performed by bronchoscopic examination, but the patient refused any further diagnostic modality. Adequate treatment in previously published cases of neck with reported shoulder pain [11,12], or multiple joint pain [13] was applied depending on the biopsies performed, which made treatment impossible in our case.

Resectable sulcus superior NSCLC tumors (according to classification of malignant tumors (TNM) where T responds to the size of primary tumor and its invasion of nearby tissue, and N responds to regional lymph nodes involvement; T3 invasion, N0-1) are best treated with trimodal therapy involving systemic chemotherapy, radiation therapy, and surgical resection [14]. Patients with nonresectable sulcus superior NSCLC tumors (T4 extension, N0-1) receive full-dose systemic chemotherapy concurrent with radiation. These tumors can be re-evaluated with CT or FDG-PET/CT scans after treatments for resectability. If the lesion remains nonresectable, these patients may benefit from consolidation therapy with durvalumab, which is a monoclonal antibody against PD-L1 (Programmed Death Ligand 1), after completion of chemoradiation [10]. As with most other malignancies, patients with

early-stage disease have a better prognosis. The curability of Pancoast tumors depends on the stage of the tumor and the presence of metastases. For tumors that are resectable, the 5-year survival rate is estimated to be 44%-54% [14]. Advanced stages of disease with severe clinical symptoms are an indicator of poor outcomes with short survival times.

The emergence of pain, attributed to nociceptive innervation concentration, is not immediate and becomes evident only upon nerve infiltration. Despite comprehensive analgesic pharmacotherapy, progressive disease associated with infiltration of the tumor surroundings intensified the intensity and character of pain. Interventional techniques would be also options for pain management. Currently, spinal lysis and cordotomy are at the forefront of interventional techniques. The performance of these procedures is preferred in patients with difficult pharmacologically manageable pain with a short expected survival time [15]. Spinal neurolysis is a palliative, pain-relieving procedure for patients with advanced cancer resistant to complex pain pharmacotherapy. Intrathecal neurolysis block is a very valuable therapeutic tool in the management of intense pain. The principle is to chemically disrupt the conduction of nerve impulses through sensory fibers, while the function of motor fibers is preserved to a high degree. Accordingly, the procedure can be performed in the cervical, thoracic, or lumbar spine. The procedure is performed under aseptic conditions under X-ray control under local anesthesia or light sedation. The patient is conscious and communicates with the doctor during the procedure [16].

Cordotomy is an intervention that plays a crucial role in managing chronic and intractable pain when other treatment modalities have proven ineffective for individuals with limited life expectancy, usually less than 1 year. This intervention focuses on selectively disrupting the spinothalamic tract, typically in the cervical region. Thoracic and lumbar chordotomy is also possible, although very rarely used in clinical practice. Common diagnoses include pain arising from advanced cancer causing somatic pain below dermatome C4, or inoperable tumors compressing spinal nerves on one side. Visceral pain, especially abdominal pain is not an indication. Cordotomy is applied at cervical level, between C1 and C2, where the fibers of the lateral spinothalamic tract run close together in the anterolateral quadrant. The fibers are somatotopic, with the most cervical fibers in the most anterior position and the most sacral fibers in most posterior position. The treatment is applied on the contralateral side of the pain. The most commonly used technique is radiofrequency ablation. Most common are motor loss in specific body regions, bladder dysfunction, respiratory depression, dysesthesia, and pain in the head and neck. The risk of complications varies based on the extent of the lesion and the individual patient's anatomy [17]. Considering this, cordotomy can be a very effective method of pain control, but must be reserved for those, where the benefits of pain relief are expected to outweigh the potential complications.

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## Conclusions

The delayed diagnosis of Pancoast tumors often translates into a bleak prognosis due to their malignant nature. Thus, a



comprehensive medical assessment, encompassing imaging studies and potentially a biopsy, is indispensable for an accurate diagnosis and appropriate therapeutic planning.

Our case study illuminates not only the challenges in initiating targeted treatment but also underscores the crucial role of implementing effective analgesic interventions. Neuropathic pain, with its escalating nature, significantly adds to the patient's distress. Advanced interventional spinal procedures, such as spinal lysis and cordotomy could be appropriate options.

In the presented case, the patient was offered spinal lysis. However, her decision to decline, mirroring previous choices in diagnostic and therapeutic interventions, unfortunately impeded palliative management. This underscores the pivotal importance of patient collaboration in decision-making, impacting not only the efficacy of interventions but also the patient's resulting quality of life.

## Patient consent

Written informed consent was obtained from the patient's daughter.

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