

Lung tumor discovered during the pre-employment medical check-up of a candidate for work abroad - case report

Tumor pluća otkriven prilikom prethodnog medicinskog pregleda kandidata za rad u inostranstvu - prikaz slučaja

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ABSTRACT

Lung cancer is one of the most common and deadliest forms of cancer with a high mortality rate. Regular health check-ups play a crucial role in the early detection of malignant diseases, especially among employed individuals. The aim of the paper is to present a case of a diagnosed lung tumor in a person who underwent pre-employment medical check-up in order to obtain a work visa for the purpose of employment abroad. This paper presents the case of a 47-year-old architect who was diagnosed with a lung tumor during a preventive medical check-up for obtaining a work visa. The patient was a smoker without any health complaints. A chest X-ray revealed a well-defined shadow in the middle field of the left lung. Further diagnostic procedures (CT scan and bronchoscopy) confirmed the presence of a typical, low grade neuroendocrine tumor, slow growing and less likely to spread - NET GR1. The tumor was successfully removed through surgery, and the patient received a positive opinion on work capability after a short rehabilitation period. This case underscores the importance of preventive medical exams for early detection of malignant diseases and timely intervention, improving treatment

APSTRAKT

Rak pluća je jedan od najčešćih i najsmrtonosnijih oblika raka sa visokom stopom smrtnosti. Redovni zdravstveni pregledi igraju ključnu ulogu u ranom otkrivanju malignih oboljenja, posebno kod zaposlenih osoba. Cilj rada je da prikaže slučaj dijagnostifikovanog tumora pluća kod osobe koja je bila na prethodnom medicinskom pregledu radi dobijanja radne vize u cilju zapošljavanja u inostranstvu. Ovaj rad prikazuje slučaj 47-godišnje arhitekte kojoj je tokom preventivnog zdravstvenog pregleda za dobijanje radne vize, otkriven tumor pluća. Pacijentkinja je bila pušač, bez zdravstvenih tegoba. Rendgenografija pluća i srca otkrila je jasno ograničenu senku u srednjem plućnom polju levog pluća. Dalje dijagnostičke procedure (CT snimanje i bronhoskopija) potvrdile su postojanje tipičnog sporo-rastućeg neuroendokrinog tumora male verovatnoće da će se širiti (engl.: neuroendocrine tumor, slow growing and less likely to spread -- NET GR1). Tumor je uspešno uklonjen hirurškom intervencijom, a pacijentkinja je nakon kratke rehabilitacije dobila pozitivno mišljenje o radnoj sposobnosti. Ovaj slučaj ističe važnost preventivnih pregleda koji omogućavaju rano otkrivanje malignih bolesti i pravovremenu intervenciju, što značajno poboljšava šanse za uspešno lečenje. Rano otkrivanje malignih oboljenja smanjuje potrebu za invazivnim tretmanima, smanjuje troškove lečenja i poboljšava kvalitet života pacijenata. Međutim, u praksi postoje i izazovi koji uključuju lažno pozitivne i negativne rezultate, što može dovesti do nepotrebnih intervencija ili lažne sigurnosti. Uloga medicine rada je ključna u ranoj detekciji, pružajući jedinstvenu priliku za

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outcomes and patients' quality of life. Early diagnosis reduces the need for invasive treatments, lowers costs, and increases survival rates. Occupational medicine plays a key role, offering unique opportunities for early detection during regular check-ups. Multidisciplinary collaboration is essential for effective treatment planning. Continuous education and public awareness are vital for promoting early lung cancer detection and reducing mortality. This case reminds healthcare professionals that every check-up is an opportunity to save a life.

Key words: lung neoplasms; carcinoid tumor; occupational medicine.

INTRODUCTION

Malignant diseases represent one of the leading causes of mortality worldwide, with more than 18 million new cases diagnosed annually and about 9.6 million deaths.¹ Lung cancer is of particular concern, as it is one of the most common and deadliest forms of cancer. Despite progress in diagnostics and therapy, many patients face late stages of the disease at the time of diagnosis, which significantly reduces the chances of successful treatment. Having this in mind, lung cancer is a significant public health problem, causing a large number of deaths globally. GLOBOCAN estimates of cancer incidence and mortality by the International Agency for Research on Cancer (IARC) show that lung cancer remains the leading cause of cancer death, with an estimated 1.8 million deaths in 2020. Early detection of malignant diseases, especially lung cancer, significantly increases the chances of successful treatment and survival. Screening programs, such as low-dose CT scans for at-risk groups, have been shown to be effective in reducing lung cancer mortality.² In the context of occupational medicine, regular preventive examinations provide a unique opportunity for early detection of malignant diseases in employed persons.

Statistical indicators regarding lung tumors vary from country to country. Thus, in the United States of America (USA), one person out of sixteen will be diagnosed with a lung tumor during their lifetime.³ More than 230,000 people in the US will be diagnosed with lung cancer each year, and a diagnosis of this disease will be made every 2.2 minutes. Researchers estimated that close to 65% of all new malignant tumors will be diagnosed in people who have never smoked or are ex-smokers, while 12% of newly diagnosed lung tumors will occur in people who have never consumed tobacco smoke.⁴

Statistics from the World Health Organization (WHO) indicate that lung cancer is the leading cause of cancer-related deaths worldwide. Smoking is still considered the main cause of lung cancer and is responsible for about 85% of all cases of this disease. Tobacco smoking (including cigarettes, cigars and pipes) is the main risk factor for lung cancer, but it can also affect non-smokers. Other risk factors include exposure

identifikaciju malignih oboljenja kroz redovne preglede. Multidisciplinarni pristup, a koji uključuje saradnju između onkologa, hirurga, radiologa i pulmologa, ključan je za optimalno planiranje i izvođenje lečenja, što doprinosi najboljim mogućim ishodima za pacijente. Zaključno, ovaj rad naglašava potrebu za kontinuiranim edukativnim programima i podizanjem svesti o značaju ranog otkrivanja raka pluća. Informisanje javnosti i implementacija preventivnih zdravstvenih programa može značajno smanjiti smrtnost od raka pluća. Ovaj slučaj služi kao podsetnik za sve zdravstvene radnike o važnosti pažljivog i temeljnog pristupa svakom pacijentu, jer svaki pregled može biti prilika za spašavanje života.

Ključne reči neoplazme pluća; karcinoidni tumor; medicina rada.

to secondhand smoke, occupational hazards (such as asbestos, radon, and certain chemicals), air pollution, and previous chronic lung disease. Symptoms of lung cancer include a persistent cough, chest pain, and shortness of breath. It is important to seek medical help in time to avoid serious health consequences. The most common types of lung cancer are non-small cell lung carcinoma (NSCLC) and small cell lung carcinoma (SCLC). NSCLC is more common and grows more slowly, while SCLC is less common but often grows quickly. Treatment depends on the medical history of the person and the stage of the disease. An additional problem with lung cancer is that the disease is often diagnosed in advanced stages when treatment options are limited. For the timely detection of the onset of this disease, screenings of high-risk individuals are recommended, which can enable early detection and significantly improve survival rates. As measures for the primary prevention of lung cancer and reducing the incidence of this disease in the world, WHO experts cite tobacco control measures and reducing exposure to risk factors from the environment (<https://www.who.int/news-room/fact-sheets/detail/lung-cancer>).⁵

On the other side, there are neuroendocrine tumors (NETs) which can be present in the lungs. They are a unique group of malignant growths, best known for their ability to secrete bioactive peptides, which may cause symptoms such as flushing and diarrhea. Because NETs are perceived to be uncommon and may be nonspecific in their presentation, delays in diagnosis are frequent. They are malignant growths that arise from neuroendocrine cells. They most commonly occur in the gastrointestinal tract (48%), lungs (25%) and pancreas (9%), but may also develop in many other organs, including the breast, prostate, thymus and skin.⁶ Neuroendocrine cells have the capability to produce hormones, such as serotonin, which can result in symptoms such as flushing and diarrhea, as well as other proteins (e.g., chromogranin A), which serve as biomarkers for NETs.⁷

There are three clinicopathologic features that drive the biological behaviour of NETs: grade, differentiation and stage.⁸ Currently, the term "neuroendocrine tumour" is preferred to describe grade 1 and 2 tumours, whereas the term "neuroen-

doocrine carcinoma” is used to describe grade 3 tumours. Differentiation refers to how closely the neoplastic cells resemble their nonneoplastic counterparts in the tissue from which they arose. Well-differentiated cancer cells closely resemble non-neoplastic cells, whereas poorly differentiated cancer cells do not. In general, low-grade tumours (grades 1 and 2) are well-differentiated and high-grade tumours (grade 3) are poorly differentiated. Stage refers to extent of tumor spread throughout the body and, as for other cancers, the Tumor Node Metastasis (TNM) system is used. NETs can be considered as either early stage (completely resectable) or advanced stage (either locally advanced and unresectable or metastatic).⁸

Occupational cancer means cancer caused by exposure to carcinogenic factors in the work environment, most often due to long-term exposure. Many cases of cancer occur several years after exposure, in some cases over 40 years. Between 2013 and 2021, a total of 33,712 cases of occupational cancer were officially recognized in the European Union (EU). However, the numbers for 2020 (3,093) and 2021 (3,258) were lower than the average for the period 2013-2019 (3,909 cases per year), due to the possible impact of the COVID-19 pandemic on public services and health systems and inadequate registration of cases.⁹

A more detailed analysis of the collected data reveals that the most common types of occupational cancer are lung cancer, pleural mesothelioma (primarily due to exposure to asbestos) and bladder cancer. Malignant neoplasms of the bronchi and lungs had the highest frequency, with a total of 13,944 cases in that period. A slightly lower frequency was seen in mesothelioma -- 13,530 cases. Thus, these two types of cancer account for approximately 80% of all newly reported cases of occupational cancer in that period. In third place, but still significant, was bladder cancer, with 2,416 new cases reported in the same period.⁹

The latest available data from GLOBOCAN (which is a project of the International Agency for Research on Cancer - IARC) provides estimates by cancer site and sex using the best available data in each country and several methods of estimation) from 2022 indicates that lung cancer was the leading cause of cancer death, with an estimated 1.8 million deaths (18.7%), followed by colorectal (9.3%), liver (7.8%), female breast (6.9%), and stomach (6.8%) cancers. The highest incidence rates are observed in the Eastern Asian region in men, followed by Micronesia/Polynesia, and Eastern Europe, with the highest national rate among men worldwide estimated in Turkey. Among women, lung cancer is the leading cause of cancer death in 23 countries, including China and the United States. By world region, elevated incidence rates are seen in Northern America, Eastern Asia, and Northern Europe, with the highest national rate estimated in Hungary. However, tobacco remains the principal cause of lung cancer, and the disease can largely be prevented through effective tobacco control policies and regulations. To assist in national implementation of effective interventions to reduce the demand for tobacco,

the World Health Organization (WHO) Framework Convention on Tobacco Control introduced the MPOWER package, consisting of six policy intervention strategies. Progress in the implementation of these interventions remains variable across countries. Five-year survival from lung cancer tends to be below 20% in most countries. A study of survival differences by stage, histologic subtype, and sex in high-income countries suggested that factors related to treatment, health care systems, and the extent of comorbidity likely play important roles.¹⁰

Occupational medicine focuses on the prevention, diagnosis and treatment of occupational diseases, as well as diseases related to work and the workplace. Regular health examinations organized by employers, especially for candidates for work abroad, enable the detection of various disorders or health conditions, including malignant diseases, in the early stages. These examinations include clinical examinations, laboratory tests, and imaging methods, which used together can help to identify risk factors and abnormalities that may indicate the presence of malignancy.¹¹ The importance of medical screening in the adult working population lies in its ability to identify early-stage diseases that may otherwise remain asymptomatic, particularly in high-risk occupational settings. Routine chest X-rays or further pulmonology consultations are typically indicated for workers exposed to respiratory hazards such as dust, chemicals, or fumes, to ensure timely detection and intervention for conditions like occupational lung diseases or malignancies.

Screening methods used in occupational medicine vary depending on the industry and the specific risks to which workers are exposed. Low-dose CT scans (LDCT) are particularly useful for detecting lung cancer in smokers and ex-smokers.¹² The US Preventive Services Task Force recommends yearly lung cancer screening with LDCT for people who: Have a 20 pack-year or more smoking history, and Smoke now or have quit within the past 15 years, and are between 50 and 80 years old. A pack-year is smoking an average of one pack of cigarettes per day for one year. For example, a person could have a 20 pack-year history by smoking one pack a day for 20 years or two packs a day for 10 years.¹³ Regular chest X-rays can also detect early changes that indicate potential lung cancer, especially in workers exposed to industrial pollutants or chemicals.¹⁴

The advantages of early detection of malignant diseases are numerous. In addition to an increased chance of survival, early detection enables less invasive treatments, reduction of treatment costs and improvement of patients' quality of life.¹⁵ However, there are also several challenges. Some of the most important include false positives, which can lead to unnecessary interventions and patient anxiety, as well as false negatives, which can provide false reassurance. Numerous studies have shown the importance of regular health examinations in the detection of malignant diseases.¹⁶ In one study Smith and Jones have found that regular examinations can reduce the risk of advanced stages of the disease by 30%.¹⁷ The other study conducted by Brown and Lee showed that workers who were

regularly screened, had significantly lower cancer mortality compared to those who were not regularly screened.¹⁸ Johnson with collaborator Nguyen emphasized the importance of optimizing screening methods in order to improve the efficiency of early detection of malignant diseases.¹⁹ Effective detection and treatment of malignant diseases requires an interdisciplinary approach that includes cooperation between occupational medicine and general practice doctors, specialists in surgery, oncology, nurses, laboratory technicians and other health workers. This cooperation is especially important in occupational medicine, where coordination between employers, health workers and workers can significantly contribute to the early detection and treatment of malignant diseases.²⁰ The aim of this paper is to present a case of diagnosed lung tumor in a person who had a previous medical examination in order to obtain a work visa for the purpose of employment abroad.

CASE REPORT

The woman (age 47) had a pre-employment medical check-up in order to apply for visa and permission to work in Saudi Arabia. She is an architect by profession. She denied smoking, consumption of alcoholic beverages, and reported no health complaints. She also denied the presence of chronic diseases, and taking therapy on a daily basis. She had a previous myomectomy, as well as nasal septum surgery after a fracture. The performed laboratory analyzes did not observe any abnormality of the biochemical parameters.

In addition to other medical examinations, in order to obtain a visa and work permission, it was indicated to perform an X-ray of the lungs and heart. A clearly limited circular shadow (nodule), measuring 17 mm x 25 mm, was observed in the middle field of the left lung. There were no other abnormalities on the chest X-ray. In order to better visualize the change, the lady was referred for a computed tomography scan with contrast. This examination confirmed the findings from previous diagnostics test and found a tumoral change in the left paracardial (lingual) region. There was no definite CT signs of infiltration of the surrounding lung parenchyma and blood vessels. The size of the tumor mass was 25mm x 18mm x 15mm. Tumoral changes are illustrated in Figures 1 and 2.

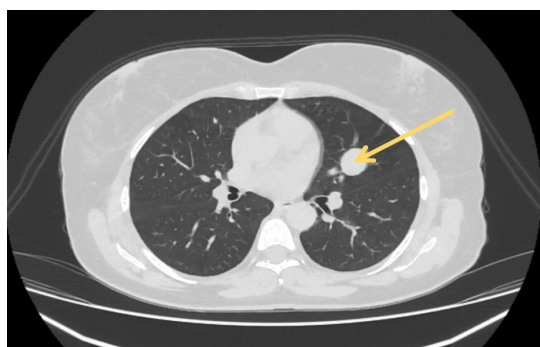


Figure 1. Evidence of a tumoral lesion in the left paracardial (lingual) region identified on a contrast-enhanced computed tomography (CT) scan.

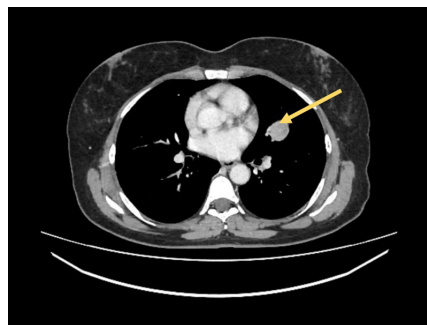


Figure 2. Evidence of a tumoral lesion in the left paracardial (lingual) region identified on a contrast-enhanced computed tomography (CT) scan.

Bronchoscopy was performed under short-term intravenous anesthesia. The sample was obtained by transbronchial biopsy, under X-ray control. The patient was referred to a thoracic surgeon. After reviewing all the elements obtained by "imaging" diagnostic procedures, a bronchoscopy was performed. Pathohistological analysis revealed typical low grade neuroendocrine tumor, slow growing and less likely to spread -- NET GR1 of the lung parenchyma. No infiltration of local lymph nodes was found. Since the lady was fit and without health complaints, surgical intervention was indicated. The tumor mass was removed by surgery. A video-assisted thoracoscopic surgery (VATS) left upper lobectomy was performed. A shorter period of pulmonary rehabilitation followed (including breathing exercises), during which a follow-up X-ray showed that the lungs were bilaterally expanded with completely normal findings. Upon completion of the recovery, a positive opinion was given regarding the lady's ability to work. She was advised to return for a follow-up examination in one year and to undergo an MSCT with contrast prior to the appointment.

DISCUSSION

This case report highlights the crucial role of preventive medical check-ups, especially in specific situations such as work abroad. During a routine medical examination, a lung tumor was discovered in the patient, which enabled timely diagnosis and intervention. This early detection was crucial for the positive outcome of her treatment. It is important to emphasize that the prognosis of pulmonary carcinoids depends on tumor size, grade, disease stage, and patient age. The 5-year survival rate is closely linked to the disease stage, with better outcomes seen in earlier diagnoses. Approximate 5-year survival rates for stages I to IV are 93%, 84%, 75%, and 57%, respectively.⁷

Early diagnosis of lung cancer is often challenging due to non-specific symptoms that do not appear until later stages of the disease. If lung cancer is found at an earlier stage, when it is small and before it has spread, it is more likely to be treated successfully.²¹ The prognosis of lung cancer patients with different clinical stages is significantly different. The 5-year survival of stage IA groups can exceed 90%, while patients with stage IV can be less than 10%. Therefore, early diagnosis is extremely important for lung cancer patients.^{22, 23}

In this case, without the mandatory medical examination, the tumor would probably remain undetected until the advanced stages, when treatment options are more limited and less effective. This case therefore highlights not only the importance of preventive examinations, but also the potential role of preventive medical examinations in saving lives. In the study conducted by Monica Zigman Suchsland and associates from USA and UK, it was concluded that efforts were needed to develop and test interventions that can be applied in ambulatory care settings to improve the detection of individuals with lung cancer.²⁴

The patient's surgical intervention was successful, resulting in her complete recovery. This success additionally emphasizes the importance of a multidisciplinary approach in the treatment of lung cancer. Efficient communication and coordination between various specialists enables optimal planning and execution of treatment, which is the key to achieving the best possible outcomes for patients.

After a successful recovery, the patient was given a positive opinion for work, which enabled her to continue her professional life. This is a significant aspect, because returning to the workplace contributes not only to financial stability, but also to the psychological well-being of patients. Work capacity and quality of life are important indicators of the success of treatment and recovery from serious diseases such as cancer.

This case also points to the need for continuous educational programs and raising awareness about the importance of early detection of lung cancer. Informing the public about symptoms, risk factors and the importance of regular health check-ups can contribute to earlier detection and a better prognosis of the disease. In addition, health screenings for specific populations, such as workers applying for visas, can serve as an additional opportunity to detect serious health conditions.

In the context of health policies, this case underscores the importance of investing in preventive health programs and the availability of diagnostic tools. Implementation of comprehensive health examinations and screening programs can significantly reduce mortality from lung cancer, which is one of the leading causes of cancer-related deaths worldwide.

Public health strategies aimed at reducing the incidence of tumors must be embraced by society as a whole, with a focus on primary prevention. Encouraging regular physical activity, promoting dietary modifications, ensuring adequate sleep, and encouraging sufficient hydration are all essential components of a proactive approach to cancer prevention. Such interventions not only promote general well-being but also significantly reduce risk factors associated with various types of cancer. Numerous studies have confirmed the efficacy of these preventive measures in lowering the incidence of cancer and other chronic diseases.

For example, research has shown that physical activity is associated with a reduced risk of several cancers, including breast and colon cancer.²⁵ Additionally, adopting a balanced diet rich in fruits and vegetables has been linked to a lower risk of cancer, as shown in a meta-analysis by World Cancer Research Fund, 2020.²⁶ Ensuring sufficient sleep is also vital, as evidence suggests that chronic sleep deprivation may increase cancer risk due to its impact on hormonal regulation.²⁷

Finally, this case report serves as a reminder for all health-care professionals about the importance of a careful and thorough approach to each patient, regardless of the reason for the visit. Every examination is an opportunity to potentially save a life, and therefore should be performed with the utmost care and expertise.

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