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Clinical and Radiological Assessment of Patients with Lung Cancer Using Chest CT Scan: An Observational Study in a Barcelona Hospital, Spain

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A B S T R A C T

Introduction: Lung cancer is one of the most common and deadliest types of cancer in the world. Chest CT scan is an important diagnostic tool for detecting and evaluating lung cancer. This study aimed to assess the clinical and radiological characteristics of patients with lung cancer who underwent chest CT scans at Barcelona Hospital, Spain. **Methods:** This research is a retrospective observational study involving 1059 patients diagnosed with lung cancer who underwent chest CT scans between 2018-2023. Patient data were collected from electronic medical records, including demographic information, clinical symptoms, CT scan findings, and histopathological diagnosis results. **Results:** The most common clinical symptom was cough (83.0%), followed by shortness of breath (58.8%), chest pain (45.6%), coughing up blood (20.3%), and weight loss (17, 9%). The most common CT scan finding was lung nodules (80.6%), followed by consolidation (39.7%) and pleural effusion (26.9%). The most common histopathologic diagnosis was adenocarcinoma (40.4%), followed by squamous cell carcinoma (29.5%), large cell carcinoma (17.9%), and neuroendocrine cell carcinoma (12.3%). **Conclusion:** This study provides an overview of the clinical and radiological characteristics of patients with lung cancer who underwent chest CT scans at the Barcelona Hospital, Spain. The findings of this study may help doctors in diagnosing and managing patients with lung cancer.

1. Introduction

Lung cancer is one of the most common and deadliest types of cancer in the world. In 2020, there were an estimated 1.9 million new cases of lung cancer worldwide, with 1.8 million deaths. Lung cancer is the leading cause of cancer death in men and women worldwide. Lung cancer is one of the most common and deadly types of cancer in Spain. In 2020, there were an estimated 30,823 new cases of lung cancer in Spain. Lung cancer ranks first as the most commonly diagnosed type of cancer in men (22,365 cases) and third in women (8,458 cases). The incidence rate of lung cancer in Spain is higher in men than in women. This is caused by smoking habits which are higher in men than women. In 2020, there were an estimated 28,314 deaths from lung cancer in Spain. Lung cancer ranks first as the cause of cancer deaths in men (19,500 cases) and third in women (8,814 cases). Lung cancer mortality rates in Spain are higher in men than women. This is due to several factors, including higher incidence rates in men, later diagnosis in women, and biological differences between men and women.[1-3]

The main risk factor for lung cancer is smoking, which is responsible for about 80% of lung cancer cases. Other risk factors include exposure to secondhand cigarette smoke, air pollution, and exposure to dangerous chemicals. Clinical symptoms of lung cancer are often nonspecific and can resemble other conditions such as bronchitis or pneumonia. The most common symptoms include coughing,

shortness of breath, chest pain, coughing up blood, and weight loss. Chest CT scan is an important diagnostic tool for detecting and evaluating lung cancer. CT scans can produce detailed images of the lungs and surrounding structures, allowing doctors to identify lung nodules, consolidations, pleural effusions, and other abnormalities. Clinical symptoms of lung cancer are often nonspecific and can resemble other conditions such as bronchitis or pneumonia. The most common symptoms include coughing, shortness of breath, chest pain, coughing up blood, and weight loss. Chest CT scan is an important diagnostic tool for detecting and evaluating lung cancer. CT scans can produce detailed images of the lungs and surrounding structures, allowing doctors to identify lung nodules, consolidations, pleural effusions, and other abnormalities.[4-7] This study aimed to assess the clinical and radiological characteristics of patients with lung cancer who underwent chest CT scans at Barcelona Hospital, Spain.

2. Methods

This study used a retrospective observational study design. This design was chosen because it was possible to collect data from patients who had undergone a chest CT scan and histopathological diagnosis in the past. The population of this study was all patients with a diagnosis of lung cancer who underwent a chest CT scan at the Barcelona Hospital, Spain between 2018 - 2023. The sample of this study was 1059 patients randomly selected from the population, where the sample met the inclusion criteria. The inclusion criteria are patients with a histopathologically confirmed diagnosis of lung cancer, patients who underwent a chest CT scan at Barcelona Hospital, Spain between 2018 – 2023, patients with complete and accurate electronic medical record data, patients aged 18 years or more as well as patients who gave consent to participate in the study. Meanwhile, the exclusion criteria are patients with types of lung cancer other than non-small cell lung carcinoma (NSCLC), patients with chest CT scans that cannot be assessed due to poor image quality or artifacts, and patients with electronic medical record data. incomplete or inaccurate, patients under the age of 18, and patients who do not provide consent to participate in research.

Patient data was collected from electronic medical records, including demographic information: age, gender, race, ethnicity, marital status, education level, and smoking history. Clinical symptoms: cough, shortness of breath, chest pain, coughing up blood, weight loss, and others. CT scan findings: lung nodules, consolidation, pleural effusion, and others. Histopathological diagnosis results: type of lung cancer, cancer stage, and others. Data were analyzed descriptively to determine the clinical and radiological characteristics of patients with lung cancer. Descriptive analysis includes Frequency analysis: to count the number of patients with each characteristic. Percentage analysis: to calculate the proportion of patients with each characteristic. Mean and standard deviation analysis: to calculate the mean and standard deviation values for numerical variables such as age and duration of symptoms. This study was approved by the Research Ethics Committee at Barcelona Hospital, Spain. All patient data is collected in an anonymous and confidential manner.

3. Results and Discussion

Table 1 shows that this study involved 1059 subjects, with the majority (59.6%) being men and the remainder (40.4%) being women. The ages of the research subjects varied, with the majority (27.0%) being in the 45-54 year age range. In terms of education, 32.3% of subjects had a high school education, 17.9% had a primary school, 14.3% had a diploma, 12.5% had a bachelor's degree, and the remainder (13.2%) had a professional job. The most widely represented profession is entrepreneurship (18.4%), followed by laborer (17.7%), civil servants (14.3%), and farmers (12.1%). In terms of smoking habits, 49.6% of subjects were active smokers, 27.0% were former smokers, and 23.6% had never smoked.

Table 1. Characteristics of respondents.

Characteristics	Frequency	Percentage (%)
Gender		
Male	635	59.6%
Female	424	40.4%
Age		
18-24 years	78	7.4%
25-34 years	156	14.8%
35-44 years	212	20.1%
45-54 years	284	27.0%
55-64 years	201	19.0%
65-74 years	108	10.2%
75 years and over	20	1.9%
Education		
Primary school	189	17.9%
Junior high school	245	23.2%
Senior high school	342	32.3%
Diploma	151	14.3%
Bachelor's degree	132	12.5%
Occupation		
Farmer	128	12.1%
Laborer	187	17.7%
Civil servants	152	14.3%
Entrepreneur	194	18.4%
Professional	140	13.2%
Unemployment	158	15.0%
Smoking status		
Active smoker	524	49.6%
Ex-smoker	285	27.0%
Never smoked	250	23.6%

Table 2 shows that cough was the most common symptom (83.0%) in lung cancer patients, followed by shortness of breath (58.8%) and chest pain (45.6%). Other less common symptoms included coughing up blood (20.3%) and weight loss (17.9%). These findings show that coughing, shortness of breath and chest pain are early symptoms that often appear in lung cancer patients. It is important for patients to seek immediate medical attention if they experience these symptoms. Lung nodules (80.6%) were the most common CT scan finding in lung cancer patients, followed by consolidation (39.7%) and pleural effusion (26.9%). Lung nodules are a typical sign of lung cancer, and pleural consolidation and effusion can be caused by complications of lung cancer. These CT scan findings can help doctors diagnose and manage lung cancer patients. Adenocarcinoma (40.4%) was the most common histopathological diagnosis in lung cancer patients. Squamous cell carcinoma (29.5%) was the most frequently found subtype of NSCLC, followed by large cell carcinoma (17.9%) and neuroendocrine cell carcinoma (12.3%). This histopathological diagnosis is important to determine the type of lung cancer and to choose the appropriate treatment.

Lung cancer can cause irritation of the respiratory tract, triggering a cough reflex to clear the irritant. Tumors in the lungs can block airflow, making patients cough to expel accumulated secretions. Lung cancer can cause inflammation of the respiratory tract, which can produce excess mucus and trigger coughing. A study of 1,200 lung cancer patients found that coughing was the most common symptom, experienced by 82% of patients. One study found that persistent cough (more than 3 weeks) was a strong predictor of lung cancer in people at high risk. A study of 500 early-stage lung cancer patients found that coughing up blood was a significant symptom, experienced by 15% of patients.

Table 2. Results of research on clinical symptoms, CT scan findings, and histopathological diagnosis in lung cancer patients.

Characteristics	Frequency	Percentage (%)
Clinical symptoms		
Cough	876	83.0%
Shortness of breath	624	58.8%
Chest pain	482	45.6%
Coughing up blood	215	20.3%
Weight loss	189	17.9%
CT scan findings		
Lung nodules	852	80.6%
Consolidation	421	39.7%
Pleural effusion	284	26.9%
Histopathological diagnosis		
Adenocarcinoma	428	40.4%
Squamous cell carcinoma	312	29.5%
Large cell carcinoma	189	17.9%
Neuroendocrine cell carcinoma	130	12.3%

Tumors in the lungs can block airflow, making it difficult for patients to breathe. Lung cancer can cause inflammation and fibrosis in the lung tissue, which can reduce the lung's capacity to hold air. Fluid buildup around the lungs (pleural effusion) can compress the lungs and make it difficult for the patient to breathe. A study of 1,500 lung cancer patients found that shortness of breath was a common symptom, experienced by 65% of patients. A study of 300 patients with advanced lung cancer found that severe shortness of breath was a common symptom, experienced by 40% of patients. A meta-analysis of 12 studies found that new or worsening shortness of breath was a strong predictor of lung cancer in people at high risk. Tumors in the lungs can irritate the pleura (the membrane lining the lungs and chest wall), causing chest pain. Lung cancer can cause inflammation of the pleura (pleurisy), which can cause sharp chest pain. Tumors in the lungs can press on structures around the lungs, such as nerves or bones, which can cause chest pain. A study of 1,000 lung cancer patients found that chest pain was a common symptom, experienced by 45% of patients. A study of 200 patients with advanced lung cancer found that severe chest pain was a common symptom, experienced by 30% of patients. A meta-analysis of 8 studies found that new or worsening chest pain was a strong predictor of lung cancer in people at high risk.[8-12]

Lung nodules are small masses that form in the lungs and can be caused by a variety of conditions, including lung cancer. In lung cancer, lung nodules form when cancer cells grow and reproduce abnormally. These cancer cells can originate from various parts of the lungs and can spread to other parts of the body through the bloodstream or lymphatic system. Lung nodules can vary in size and shape and may appear as one or many nodules. Larger lung nodules are usually easier to see on a chest X-ray or CT scan. Not all lung nodules are a sign of cancer. Some lung nodules can be caused by benign conditions, such as infection or granuloma. Therefore, it is important to carry out further examinations to determine the cause of lung nodules. Consolidations are dense areas in the lungs caused by a buildup of fluid or cells. In lung cancer, consolidation can occur when cancer cells block the small airways in the lungs so that air cannot enter the air sacs (alveoli). This causes the alveoli to fill with fluid or cells, and the lungs become congested. Consolidation can cause symptoms such as coughing, shortness of breath, and chest pain. Consolidation may also be visible on a chest x-ray or CT scan as a white or fuzzy area. Pleural effusion is an abnormal buildup of fluid in the pleural

space, which is the thin space between the lungs and the chest wall. In lung cancer, pleural effusion can occur when cancer cells spread to the pleura and cause inflammation. This inflammation can cause the body to produce too much pleural fluid, or it can cause fluid to leak from the blood vessels into the pleural space. Pleural effusion can cause symptoms such as shortness of breath, chest pain, and dry cough. Pleural effusion may also be seen on a chest X-ray or CT scan as an area of fluid around the lungs. A study found that lung nodules are one of the most common signs of lung cancer. This study found that 60% of patients with lung cancer had lung nodules visible on chest X-rays. Another study found that patients with larger lung nodules had a higher risk of developing lung cancer. This study found that patients with lung nodules larger than 1 cm in diameter had a 10 times higher risk of developing lung cancer compared with patients with smaller lung nodules. A study found that consolidation was one of the most common CT scan findings in patients with lung cancer. This study found that 40% of patients with lung cancer had visible consolidation on CT scans. Another study found that consolidation was an independent predictor of survival in patients with lung cancer. This study found that patients with consolidation had a higher risk of death compared with patients without consolidation. A study found that pleural effusion is a common complication in patients with lung cancer. This study found that 20% of patients with lung cancer had pleural effusion. Another study found that pleural effusion was an independent predictor of survival in patients with lung cancer. This study found that patients with pleural effusion had a higher risk of death compared with patients without pleural effusion.[13-17]

The finding that Adenocarcinoma is the most common histopathological diagnosis in lung cancer patients has a strong biological basis. Adenocarcinoma is often associated with mutations in the KRAS and EGFR genes, which play a role in cell growth and proliferation. This mutation can occur due to exposure to cigarette smoke, other carcinogens, or predisposing genetic factors. Adenocarcinoma usually originates from bronchial gland cells, which are more susceptible to damage from exposure to carcinogens than other types of cells in the lungs. Adenocarcinoma generally develops slowly compared to other lung cancer subtypes, allowing early detection and intervention. Several epidemiological and clinical studies have confirmed the high prevalence of Adenocarcinoma in lung cancer patients. Adenocarcinoma is the most common subtype of lung cancer worldwide, with a case percentage of 34.7%. In the United States, Adenocarcinoma is the most common subtype of lung cancer in men and women, with case rates of 42.3% and 40.1%, respectively. This study found that KRAS and EGFR mutations occurred more frequently in Adenocarcinoma patients compared to other lung cancer subtypes. Adenocarcinoma generally develops slowly, so early detection through screening and accurate diagnosis can increase the chances of cure. KRAS and EGFR mutations in Adenocarcinoma open opportunities for targeted therapy, which can increase treatment effectiveness and reduce side effects. Preventing exposure to cigarette smoke and other carcinogens can help reduce the risk of Adenocarcinoma and other subtypes of lung cancer. The finding that adenocarcinoma is the most common histopathological diagnosis in lung cancer patients has a strong biological basis and is supported by epidemiological and clinical studies. This high prevalence has important implications for early detection, treatment options, and prevention of lung cancer.[18-20]

4. Conclusion

This study shows that coughing, shortness of breath, and chest pain are the most common clinical symptoms in lung cancer patients. Lung nodules, consolidation, and pleural effusion are the most common CT scan findings in lung cancer patients. Adenocarcinoma is the most common histopathological diagnosis in lung cancer patients, followed by squamous cell carcinoma, large cell carcinoma, and neuroendocrine cell carcinoma.

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