

Pneumologia

Pulmonary consolidations – differential diagnosis of respiratory infections and bronchopulmonary neoplasm – clinical case

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Abstract

English:

Bronchopneumonia is defined as an acute infection of the lung parenchyma involving the alveolar territory, associating an inflammation at the level of the bronchioles, most often grafting on a weakened area. The symptoms can be very variable, depending on the severity of the condition. Imaging, the chest X-ray shows multiple nodular or reticulonodular opacities that tend to be irregular and/or confluent. The distribution is often bilateral and asymmetric, predominantly involving the lung bases. The differential diagnosis of bronchopneumonia or the multiple pulmonary nodules described in the presented case is mainly made with pulmonary metastases, due to the increased frequency of diagnosis of pulmonary metastases in the case of multiple pulmonary nodules detected by chest CT; the lung being one of the main sites of metastasis of neoplasms.

Keywords

Pulmonary consolidations • respiratory infections • bronchopulmonary neoplasm • pulmonary metastases

Consolidări pulmonare – diagnostic diferențial al infecțiilor respiratorii și neoplasmelor bronhopulmonare – studiu de caz clinic

Rezumat

Romanian:

Bronhopneumonia este definită ca o infecție acută a parenchimului pulmonar care implică teritoriul alveolar, asociind o inflamație la nivelul bronhiolilor, cel mai adesea dezvoltându-se pe o zonă anterior afectată. Simptomele pot fi foarte variabile, în funcție de gravitatea afecțiunii. Imagistic, radiografia toracică arată multiple opacități nodulare sau reticulonodulare, care au tendința de a fi neregulate și/sau confluate. Distribuția este adesea bilaterală și asimetrică, afectând predominant bazele pulmonare. Diagnosticul diferențial al bronhopneumoniei sau al multiplelor noduli pulmonari descriși în cazul prezentat se face în principal cu metastazele pulmonare, datorită frecvenței crescute a diagnosticului de metastaze pulmonare în cazul multiplelor noduli pulmonari detectați prin CT toracic; plămânul fiind unul dintre principalele locuri de metastazare ale neoplasmelor.

Cuvinte-cheie

Consolidări pulmonare • infecții respiratorii • neoplasm bronhopulmonar • metastaze pulmonare

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1. Introduction

Bronchopneumonia is defined as an acute infection of the lung parenchyma involving the alveolar territory, associating an inflammation at the level of the bronchioles, most often grafting on a weakened area (bronchiectasis, malnutrition, diabetes) [1]. There is a variability of symptoms, depending on the severity of the condition, which may include cough accompanied by purulent expectoration, dyspnea, fever, chest pain, sweating. The most common cause of bronchopneumonia is bacterial pulmonary infection, and the most common germs incriminated are *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and enterobacteria. Viral and fungal lung infections can also be the cause of bronchopneumonia [1][2]. The objective examination reveals areas of submatity, accompanied by bronchial and fine crackle rales. Biologically, an intense acute inflammatory syndrome is taking shape, accompanied by leukocytosis with PMN. The sputum examination is used only in 40-50% of cases, <10 squamous epithelial cells, >25 PMN/field [1]. Chest X-ray shows multiple nodular or reticulonodular opacities that tend to be irregular and/or confluent. The distribution is often bilateral and asymmetric, predominantly involving the lung bases [3]. The differential diagnosis of bronchopneumonia or the multiple pulmonary nodules described in the presented case is mainly made with pulmonary metastases, due to the increased frequency of diagnosis of pulmonary metastases in the case of multiple pulmonary nodules detected by chest CT; the lung being one of the main sites of metastasis of neoplasms [4]. The diagnosis is usually established by corroborating clinical and paraclinical data, supported by imaging investigations (chest x-ray, computer tomograph) [1].

2. Clinical Problems, Differential Diagnosis

The presented clinical case refers to an 82 year old patient, known to have multiple cardiovascular, cerebral and metabolic comorbidities; vaccinated against SARS-COV-2, former heavy smoker (50 PA), with professional exposure (the patient worked in a toxic environment with paint and glue vapors); he presents himself to the emergency room complaining of a general condition affected in the last 48 hours, fever of approximately 39°C, weight loss (20 kg in the last 2 months), productive muco-purulent cough, dyspnea at low exertion, orthopnea, asthenia and marked fatigue.

The objective examination reveals decreased appetite, sweaty skin, poorly represented conjunctive-adipose tissue, the oxygen saturation being 88% in atmospheric air. Pulmonary auscultation reveals bronchial and fine crackle rales, dissemination on both lung fields. Biologically, the patient has leukocytosis accompanied by neutrophilia, normocytic

normochromic anemia, hyperuricemia, elevated C-reactive protein and procalcitonin. Spirometry detects moderate-severe obstructive ventilatory dysfunction.

The chest CT revealed a bronchiectasis exacerbation aspect, with the presence of consolidations along the pulmonary random bronchiectasis path, with the largest size of 25/31 mm, fine ground-glass and tree-in-bud outline.

Bacteriological examination for non-specific flora was collected, and then empirical parenteral treatment with double antibiotic therapy was started, until the bacteriological results came, where the presence of *Haemophilus influenzae* was detected. BK sputum was negative on direct microscopy.

The clinical evolution of the patient was favorable from both clinical and biological point of view. The chest CT was re-performed, which reveals compared to the previous investigation, the appearance in resolution of the condensations described, with the narrowing of the lesional extent.

Due to the increased frequency of diagnosis of lung metastases among nodules detected by imaging; of the symptomatology and risk factors, the most important differential diagnosis of the presented clinical case is pulmonary metastases, the lung being one of the main sites of metastasis of neoplasms. A range of 20-54% of patients with malignant extrathoracic tumors reveals pulmonary metastases [4]. The early diagnosis of lung metastases in patients with a known malignancy can be critical in planning an effective therapy. Computed tomography is accepted as the gold standard in detecting possible lung metastases. Among the cases of multiple nodules detected by CT, 73% were reported as pulmonary metastases [4].

Another differential diagnosis that was taken into account was secondary pulmonary tuberculosis, due to the symptoms of bacillary impregnation, but also the tree-in-bud sign detected by the radiological examination. This pattern describes multiple areas of centrilobular nodules with a linear branching pattern. Although it was initially described in patients with endobronchial tuberculosis, it is now recognized in a large number of conditions [5].

3. Results of clinical findings

The typical radiological features of a pulmonary metastasis include multiple round nodules of variable size, accompanied by diffuse thickening of the pulmonary interstitial [4]. Thus, from an imaging point of view, lung metastases usually appear as multiple peripheral nodules with soft tissue attenuation, rounded, well circumscribed, disseminated in both lung fields [6]. Chest CT is excellent for visualization of pulmonary

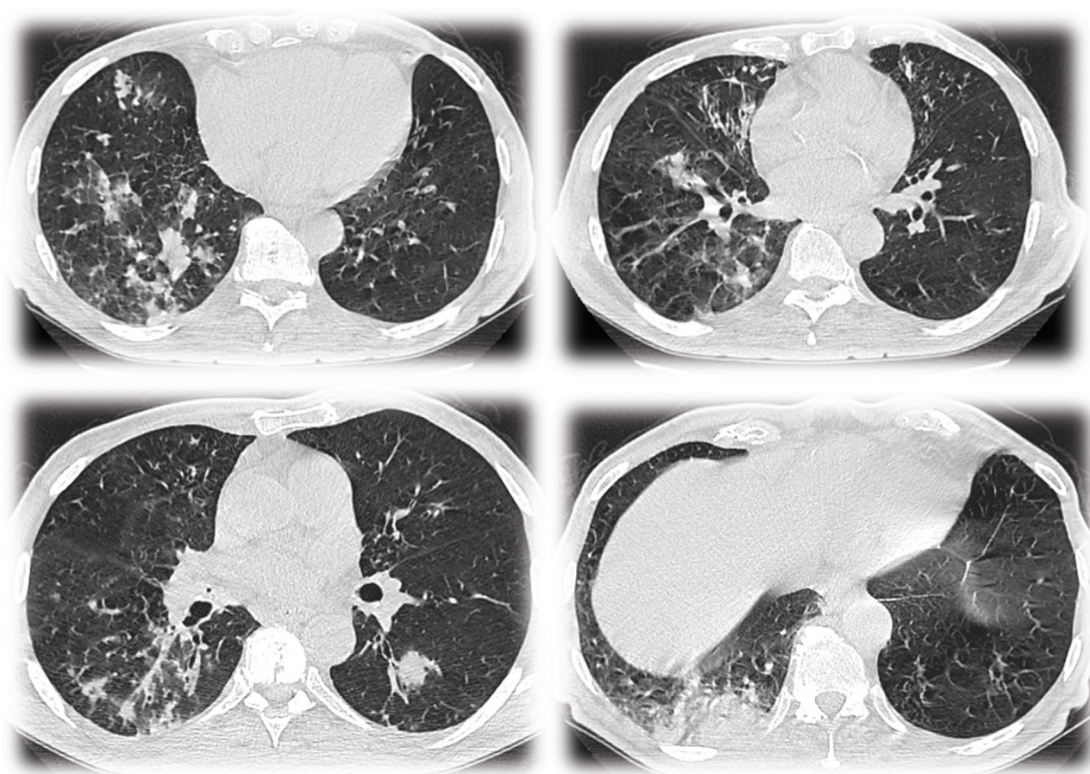


Figure 1. The computer tomography performed initially, before the antibiotic treatment.

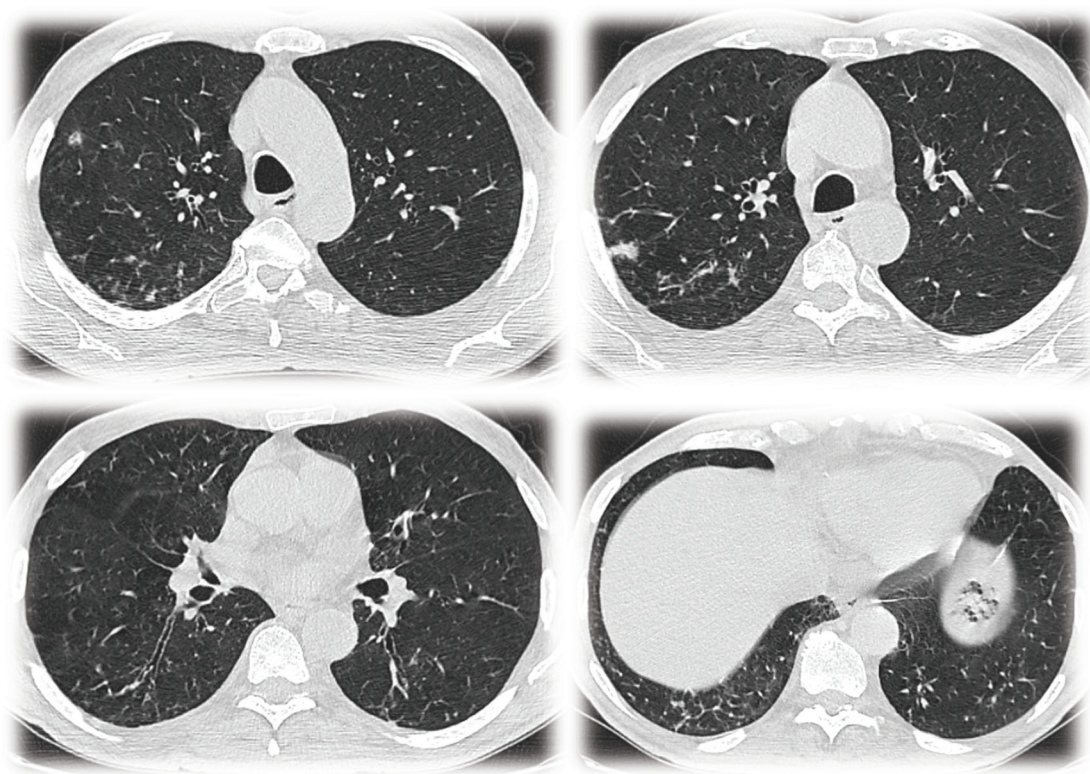


Figure 2. Computer tomography performed 3 weeks after the antibiotic treatment.

nodules. However, in clinical practice, atypical radiological features of lung metastases are frequently encountered, which make it difficult to differentiate from nonmalignant lung diseases. These features include consolidation, cavitation, cystic changes, calcifications, ossification, hemorrhage, and secondary pneumothorax [6].

A detailed knowledge of the atypical radiological features of a lung metastasis, with a good understanding of the histopathological background is essential for a correct diagnosis [4].

Squamous cell carcinoma is considered the most common cause of a cavity metastasis, but metastatic nodules from adenocarcinomas and sarcomas can occasionally develop pulmonary cavities. The frequency of the cavity detected on a radiograph is approximately 4%, in contrast to the 9% frequency of the cavity in primary bronchogenic carcinoma [4]. In the presented images (fig. 3), it is about a postmenopausal patient, the chest X-ray taken initially showing undefined lung densities. She denied any respiratory symptoms. The findings are extremely worrying for the hematogenous

spread of metastases in cases with unidentified primary neoplasm [7].

Calcification can appear in a metastatic sarcoma or adenocarcinoma, which makes it difficult to differentiate it from a benign granuloma or hamartoma. Pneumothorax occurs frequently in osteosarcoma metastases [4]. In the following images (fig. 4), we are talking about a young patient, aged 20, known to have amputated left humeral osteosarcoma and recurrence at the level of the adjacent left scapula. Multiple calcified lung metastases are observed in both lung areas, as well as left spontaneous hydropneumothorax, a frequent event in patients with osteosarcoma [8].

A common radiological aspect of an endobronchial metastasis is atelectasis [4]. Hemorrhagic pulmonary metastases are those that tend to be complicated by pulmonary hemorrhage within them. It is believed that the hemorrhage is due to the fragility of the neovascular tissue, which leads to the breaking of the vessel, thus resulting in characteristic radiological images rendered by a pulmonary nodule or mass, which is surrounded by a halo of ground-glass opacity [9].

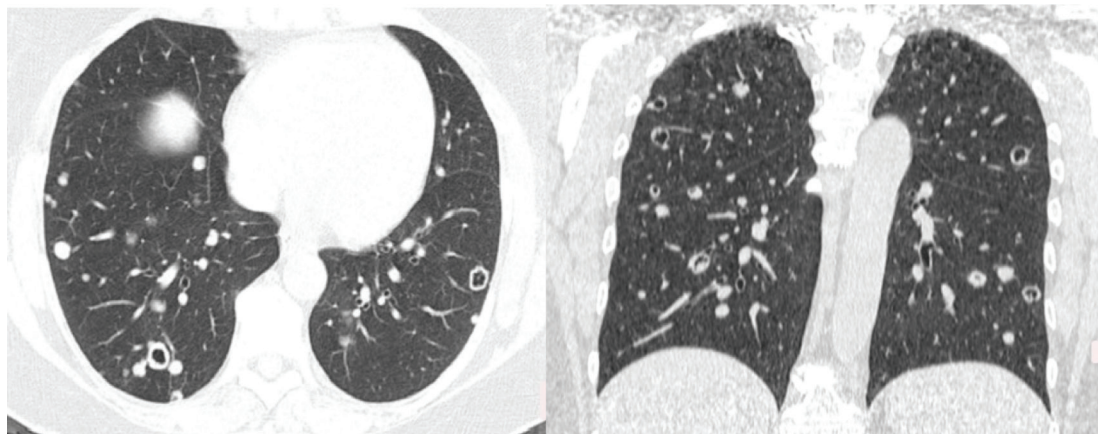


Figure 3. Examples of pulmonary cavity metastases [7].

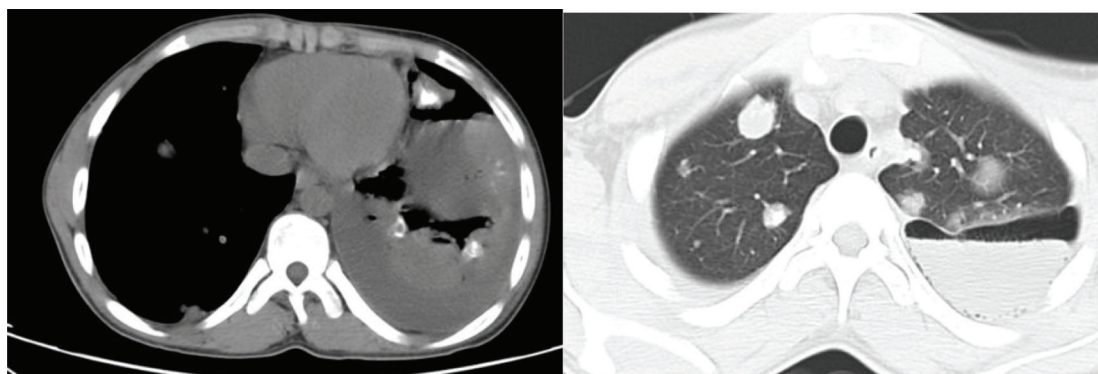


Figure 4. Patient with calcified lung metastases and hydropneumothorax, having as starting point an osteosarcoma [8].

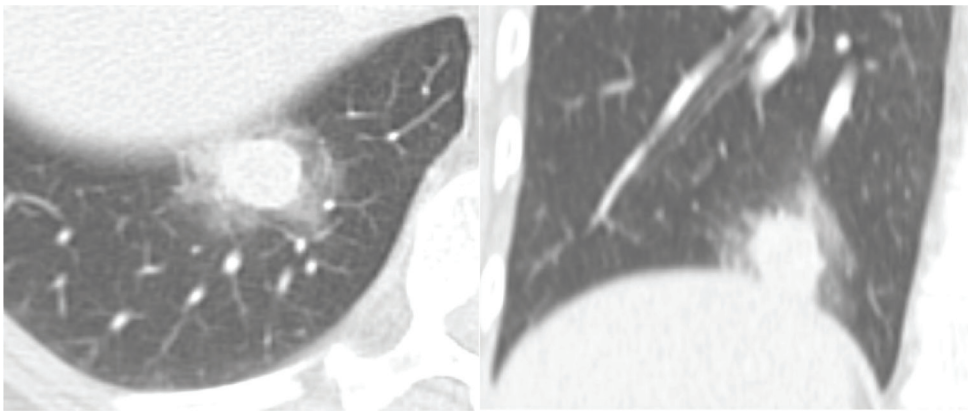


Figure 5. Examples of hemorrhagic pulmonary metastases [9].

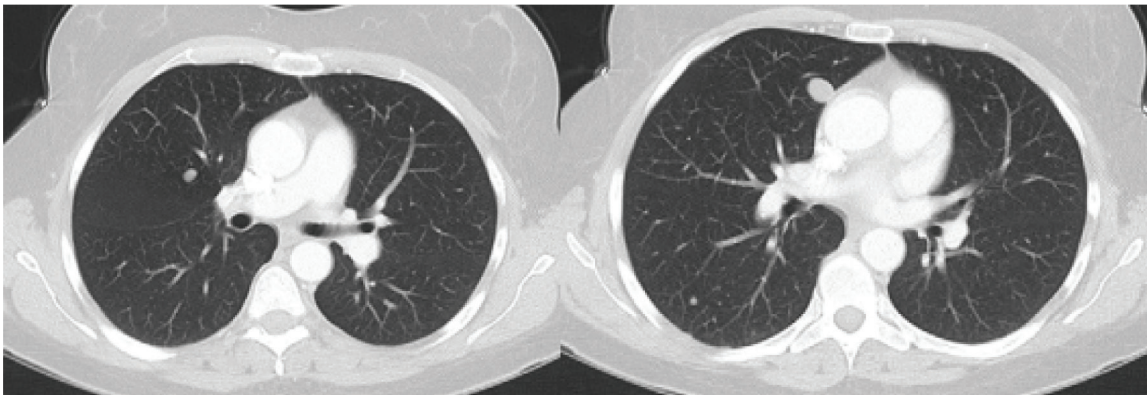


Figure 6. Benign lung metastases starting from a uterine leiomyoma [10].

Also, in cases of an endobronchial neoplasm or a solitary pulmonary metastasis, the differentiation between bronchogenic carcinoma and pulmonary metastasis is difficult. Dilated vascular structures inside a tumor mass can be observed in metastatic sarcomas [4].

Benign tumors, such as uterine leiomyomas and giant cell tumors of the bone, can rarely be the cause of lung metastases [4]. Benign metastatic leiomyoma is a rare cause of pulmonary nodules, which occurs when uterine leiomyomas metastasize to the lung. The management of this lesion varies from hormonal therapy to surgery. In the accompanying images (fig. 6), a case of a 45-year-old woman with multiple nodules in the right lung, identified during the preoperative hysterectomy imaging assessment, is presented [10].

4. Discussions

Pulmonary metastases are common. The incidence of synchronous lung metastases at the time of neoplasm diagnosis is approximately 18 per 100,000 cases, noting that this number does not include metachronous metastases,

which appear after the initial staging of cancers. Referring to the difference between the sexes, the incidence is higher among men, 20 per 100,000, versus women 16 per 100,000 cases. The specific epidemiology is reflected by the underlying malignant tumors [6].

As malignant diseases increase in incidence with increasing age, so will the incidence of synchronous lung metastases. Under the age of 40, the incidence is approximately 1 in 100,000 cases, while over the age of 40, the incidence is approximately 40 in 100,000 cases. The maximum incidence reaches 116 per 100,000 cases in the 80-84 age group [6].

The most common malignant diseases that develop lung metastases, which prevail from middle age to elderly adults, are: lung cancer, which is also the most common primary tumor that gives lung metastases; colorectal cancer, kidney cancer, pancreatic cancer and breast cancer.

Pulmonary metastases usually appear as multiple, peripheral nodules, disseminated in both lung fields. Chest X-rays are less sensitive, although they are often able to confirm the diagnosis from an imaging point of view, because lung metastases are often large and numerous. Instead, cases of single lung metastasis have been described. This is observed

more frequently in colorectal carcinoma, but it can also occur in the case of other primary tumors. Chest CT is excellent for visualizing pulmonary nodules. Although not routinely used, MRI can be as sensitive in detecting lung metastases as CT [6]. In general, lung metastases have a poor prognosis. However, the specific prognosis will depend on the primary tumor [6].

Case particularity

Contrary to the major clinical suspicion of neoplasm (marked involuntary weight loss, former heavy smoker, occupational exposure, advanced age), the imaging suspicion of pulmonary metastases and the high diagnostic of multiple pulmonary nodules detected by CT as metastases, the patient has an evolution favorable with the almost complete remission of pulmonary changes, the diagnosis of bronchopneumonia is made.

5. Conclusions

In daily practice, atypical radiological features of metastases are often encountered, which make it difficult to differentiate between metastases and nonmalignant lung diseases. The differential diagnosis of multiple pulmonary nodules is mainly made with pulmonary metastases, due to the increased frequency of diagnosis of pulmonary metastases in the case of multiple pulmonary nodules detected by chest CT; the lung being one of the main sites of metastasis of neoplasms. A detailed knowledge of the atypical radiological features of a lung metastasis, with an understanding of the histopathological background, is essential for a correct diagnosis [4].

Authors contributions

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Funding

None. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Informed consent was obtained from the subjects involved in the study.

Data Availability Statement

Data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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