Medicine

PULMONARY NODULES – DIAGNOSIS CHALLENGE AND INTERDISCIPLINARY APPROACH

Mihai Iulian RADULESCU[1]
Dragos-Virgil DAVITOIU[2]
Ioan CORDOS[3]
Dan MISCHIANU[4]

ABSTRACT.
INTRODUCTION*: PATIENTS WITH A HISTORY OF NEOPLASIA REPRESENT A SPECIAL CATEGORY. THEY REQUIRE LONG AND MULTIDISCIPLINARY FOLLOW-UP BECAUSE OF THE RISK OF SECONDARY DETERMINATIONS, ESPECIALLY IN THE LUNG, WHICH IS A FILTER IN THE PATH OF HEMATOGENOUS DISSEMINATION. METASTASES APPEAR AS SOLITARY OR MULTIPLE PULMONARY NODULES. THE EXISTENCE OF A SOLITARY PULMONARY NODULE MAY REPRESENT A SYNCHRONOUS OR METACHRONOUS PULMONARY LESION, NOT A SECONDARY DETERMINATION.*
MATERIAL AND METHODS*: THE AUTHORS PRESENT A RETROSPECTIVE DESCRIPTIVE STUDY REGARDING PATIENTS WITH A HISTORY OF NEOPLASIA, THAT WERE HOSPITALIZED IN THE THORACIC SURGERY CLINIC IN 2014 FOR PULMONARY NODULES. INCLUDED IN THIS STUDY WERE PATIENTS WHO UNDERWENT CURATIVE TREATMENT FOR UROGENITAL OR DIGESTIVE TRACT NEOPLASIA.*
RESULTS*: FORTY-FOUR PATIENTS WITH PREVIOUS UROGENITAL CANCERS OR TUMORS OF THE DIGESTIVE TRACT UNDERWENT SURGICAL TREATMENT. THE HISTOLOGIC RESULTS CONFIRMED METASTASES IN 30 CASES (68%), PRIMARY LUNG CANCER IN 11 (25%) AND BENIGN PULMONARY LESIONS IN 3 (7%).*
DISCUSSIONS*: THE APPEARANCE OF A PULMONARY NODULE IN PATIENTS WITH A HISTORY OF NEOPLASIA IS SUSPICIOUS FOR METASTATIC DISEASE, BUT A PRIMARY CANCER CAN'T BE EXCLUDED. DIAGNOSIS AND EFFECTIVE TREATMENT REQUIRES AN INTERDISCIPLINARY COLLABORATION BETWEEN RADIOLOGIST, ONCOLOGIST, PULMONOLOGIST, THORACIC SURGEON AND PATHOLOGIST.*
CONCLUSIONS*: SOLITARY PULMONARY NODULES, IN A PATIENT WITH A PREVIOUS HISTORY OF NEOPLASIA, SHOULD RECEIVE HISTOPATHOLOGICAL CONFIRMATION FOR THE APPROPRIATE THERAPEUTIC APPROACH.*

KEYWORDS: PULMONARY NODULE, PULMONARY METASTASES, UROGENITAL CANCER

[1] Thoracic Surgery Department, Bucharest University Emergency Hospital
[2] Surgery Department, Bucharest University Emergency Hospital
[3] Thoracic Surgery Department, "Marius Nasta" National Institute of Pulmonology, Bucharest
[4] Urology Department, Central Military Emergency University Hospital "Dr. Carol Davila", Bucharest

INTRODUCTION

Patients with a history of neoplasia represent a special category. They require long and multidisciplinary follow-up because of the risk of secondary determinations, especially in the lung, which is a filter in the path of hematogenous dissemination.

Malignant disease's ability to metastasize remains one of the major obstacles when treating patients with cancer. The lungs are one of the most common organs in which cancer metastasizes, and approximately 30% of all cancer patients will develop lung metastases[5]. Metastases appear as a solitary or multiple pulmonary nodules. The symptomatology is almost nonexistent, so the diagnosis is made radioimagistic via radiography and CT-scan. For this reason a meticulous tracking of the metastases is a requirement for both patient and doctor.

The existence of a solitary pulmonary nodule may represent a synchronous or metachronous pulmonary lesion, not a secondary determination. However, a solitary pulmonary nodule in a patient with neoplasic history should be resected, because if it is proven to be a second determination the surgical treatment can prolong survival[6]

Typical radiologic findings of a pulmonary metastasis include multiple round variable-sized nodules. However, atypical radiologic features of metastases are often encountered, making distinction of metastases from other nonmalignant pulmonary diseases difficult. A detailed knowledge of the atypical radiologic features of a pulmonary metastasis with a good understanding of the histopathologic background is essential for correct diagnosis. Squamous cell carcinoma is regarded as the most common cell type of a cavitating metastasis, but metastatic nodules from adenocarcinomas and sarcomas also cavitate occasionally. Calcification can occur in a metastatic sarcoma or adenocarcinoma, which makes differentiation from a benign granuloma or hamartoma difficult. Peritumoral hemorrhage results in areas of nodular attenuation surrounded by a halo of ground-glass opacity[7]. Ultra-low-dose CT with iterative reconstruction has high sensitivity for lung nodule detection without significant difference in nodule size and volume measurement compared to low-dose CT[8]. Pulmonary nodules with a solid component, vascular convergence sign, and a larger diameter are highly suggestive of malignancy. The possibility of a neoplasm should also be considered in the case of nodules that show lobulation, spiculation, air cavity

[5] Davidson RS, Nwogu CE, Brentjens MJ, Anderson TM.The surgical management of pulmonary metastasis: current concepts. Surg Oncol 2001;10:35-42.

[6] Anraku M, Yokoi K, Nakagawa K, Fujisawa T, Nakajima J, Akiyama H, Nishimura Y, Kobayashi K; Metastatic Lung Tumor Study Group of Japan. Pulmonary metastases from uterine malignancies: results of surgical resection in 133 patients. J Thorac Cardiovasc Surg. 2004;127:1107-12; González Casaurrán G, Simón Adiego C, Peñalver Pascual R, Moreno Mata N, Lozano Barriuso MÁ, González Aragoneses F. Surgery of female genital tract tumor lung metastases. Arch Bronconeumol. 2011;47:134-7; Levenback C, Rubin SC, McCormack PM, Hoskins WJ, Atkinson EN, Lewis JL. Resection of pulmonary metastases from uterine sarcomas. Gynecol Oncol. 1992;45:202-5; Tellis CJ, Beechler CR. Pulmonary metastasis of carcinoma of the cervix: a retrospective study. Cancer. 1982;49:1705-9; Radulescu IM, Popescu R, Cirstoiu MM, Cordos I, Mischianu D, Cirstoiu CF. Surgical treatment for pulmonary metastases in urogenital cancers. J Med Life. 2014 Sep 15;7(3):358-62.

[7] Seo JB, Im JG, Goo JM, Chung MJ, Kim MY. Atypical pulmonary metastases: spectrum of radiologic findings. Radiographics. 2001 Mar-Apr;21(2):403-17; Yasaka K, Katsura M, Hanaoka S, Sato J, Ohtomo K. High-resolution CT with new model-based iterative reconstruction with resolution preference algorithm in evaluations of lung nodules: Comparison with conventional model-based iterative reconstruction and adaptive statistical iterative reconstruction. Eur J Radiol. 2016 Mar;85(3):599-606. doi: 10.1016/j.ejrad.2016.01.001.

[8] Sui X, Meinel FG, Song W, Xu X, Wang Z, Wang Y, Jin Z, Chen J, Vliegenthart R, Schoepf UJ. Detection and size measurements of pulmonary nodules in ultra-low-dose CT with iterative reconstruction compared to low dose CT. Eur J Radiol. 2016 Mar;85(3):564-70. doi: 10.1016/j.ejrad.2015.12.013.

densities, or pleural tags. To obtain a comprehensive and accurate analysis of the nodules, three-dimensional reconstruction is highly recommended[9].

MATERIAL AND METHOD

The authors present a retrospective descriptive study regarding patients with a history of neoplasia hospitalized in the Thoracic Surgery Clinic (Bucharest National Institute of Pulmonology) between 1.01.2014 – 31.12.2014 for pulmonary nodules. Included were patients who underwent curative treatment for urogenital or digestive tract neoplasia, considering surgical resection for the cancer and chemotherapy/radiotherapy. The surgical resection for the pulmonary nodule was performed and the histopathological result was registered.

RESULTS

Forty-four patients with previous urogenital cancers or tumors of the digestive tract underwent surgical treatment for pulmonary nodules. The mean age was 58 yo with a minimum of 27 and a maximum of 92. The gender distrubution of these patients is ilustrated in figure 4.

All af them were suspected of pulmonary metastases this changing the initial disease to stage IV malignancy. 30 of them received chemotherapy without having a histopathological proof of the pulmonary second determination. Patients with history of two or more neoplasias were sent for surgery first.

The histologic results confirmed (fig. 3):

- metastases in 30 cases (68%);
- primary lung cancer in 11 (25%) – fig. 2;
- benign pulmonary lesions in 3 (7%) – fig. 1.

For five patients out of eleven there was the third malignant disease found and operated. Those with primary lung cancer turned out to be early stage, so the surgical intervention was curative – pulmonar lobectomy and mediastinal limphadenectomy.

DISCUSSION

Management of solitary pulmonary nodule and micronodule is still debated. The first choice is to wait and do radiological follow-up, since the evaluation of temporal changes in a small mass may contribute to the differentiation of a malign from benign pathology[10]. In case of unchanged images not capable of orientating the diagnostician or no possible preoperative diagnosis by bronchoscopy and percutaneous needle biopsy, surgical treatment is necessary allowing the histological characterization of lesion and a good prognosis of disease[11]. Considering the risk of a pulmonary second determination in patients with history of neoplasia, we believe that having a histologic diagnostic of the nodule is mandatory.

The appearance of a pulmonary nodule in patients with a history of neoplasia is suspicious for metastatic disease. Starting chemotherapy without having a histological diagnostic received after surgical resection of the lesion is cheaper for the medical hospital management so these patients often receive treatment for a metastatic disease at first.

---

[9] Hu H, Wang Q, Tang H, Xiong L, Lin Q. Multi-slice computed tomography characteristics of solitary pulmonary ground-glass nodules: Differences between malignant and benign. Thorac Cancer. 2016 Jan;7(1):80-7. doi: 10.1111/1759-7714.12280.

[10] Divisi D, Imbriglio G, De Vico A, Crisci R. Lung nodule management: a new classification proposal. Minerva Chir. 2011 Jun;66(3):223-34.

[11] Divisi, Imbriglio, De Vico, Crisci, *Lung nodule management: a new classification proposal…*

As can be seen in our study primary cancer can't be excluded, despite the radiological aspect of the pulmonary lesion (fig. 2). If the nodule proves to be benign (fig. 1) no further treatment should be considered.

Diagnosis and effective treatment should require an interdisciplinary collaboration between radiologist, oncologist, pulmonologist, thoracic surgeon and pathologist – a multidisciplinary committee to reach the optimal solution for the patient – this being the main purpose of our study.

CONCLUSIONS

In some cases, despite neoplastic history pulmonary nodules are not secondary determinations. They can be primary lung cancer or benign lesions so the patient needs a different treatment.

Pulmonary nodules, in a patient with a previous history of neoplasia, should receive histopathological confirmation for the appropriate therapeutic approach.

Although surgical pulmonary resection implies important risks, the patient should receive a complete diagnostic before further treatment.

FIGURES

Figure 1: 55 yo, F, treated for endometrial adenocarcinoma. HP result: pulmonary hamortocondroma – benign.

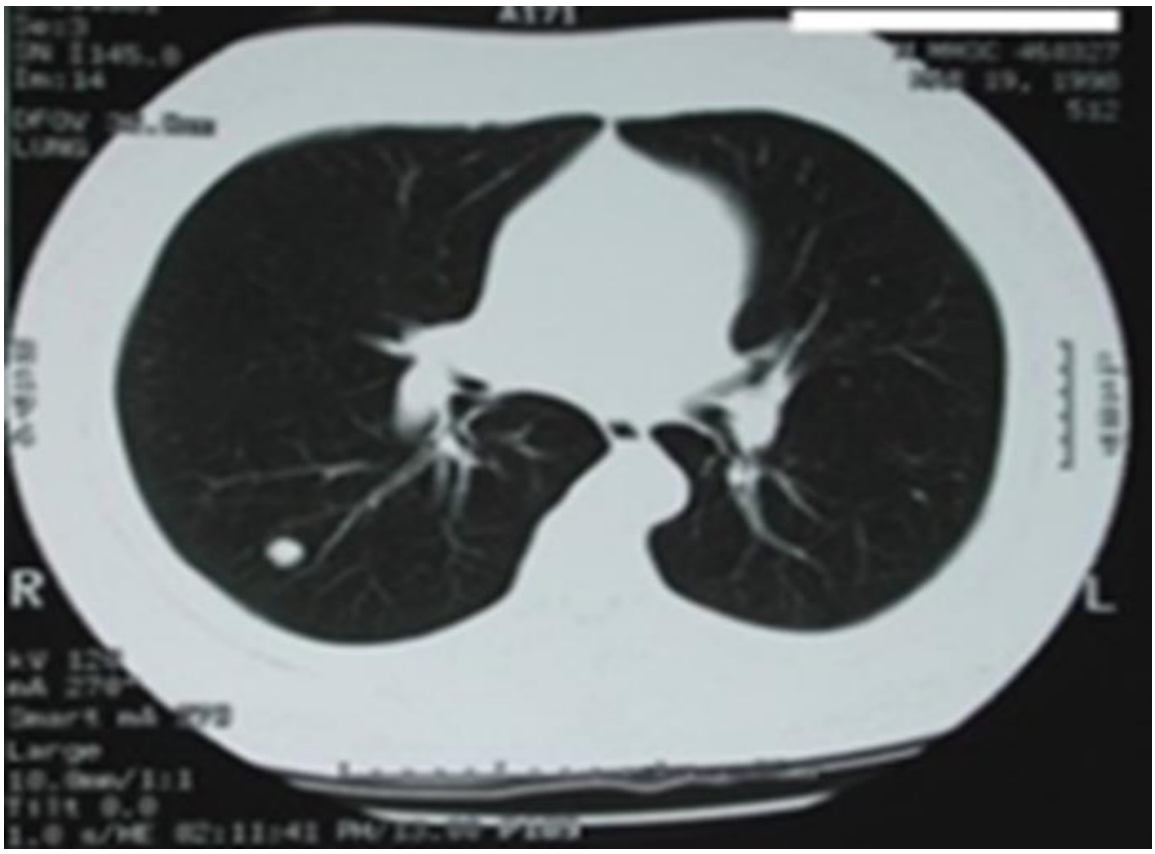


Figure 2: 64 yo, F, with right nephrectomy for urothelial carcinoma. HP result: squamous cell lung carcinoma – malign.

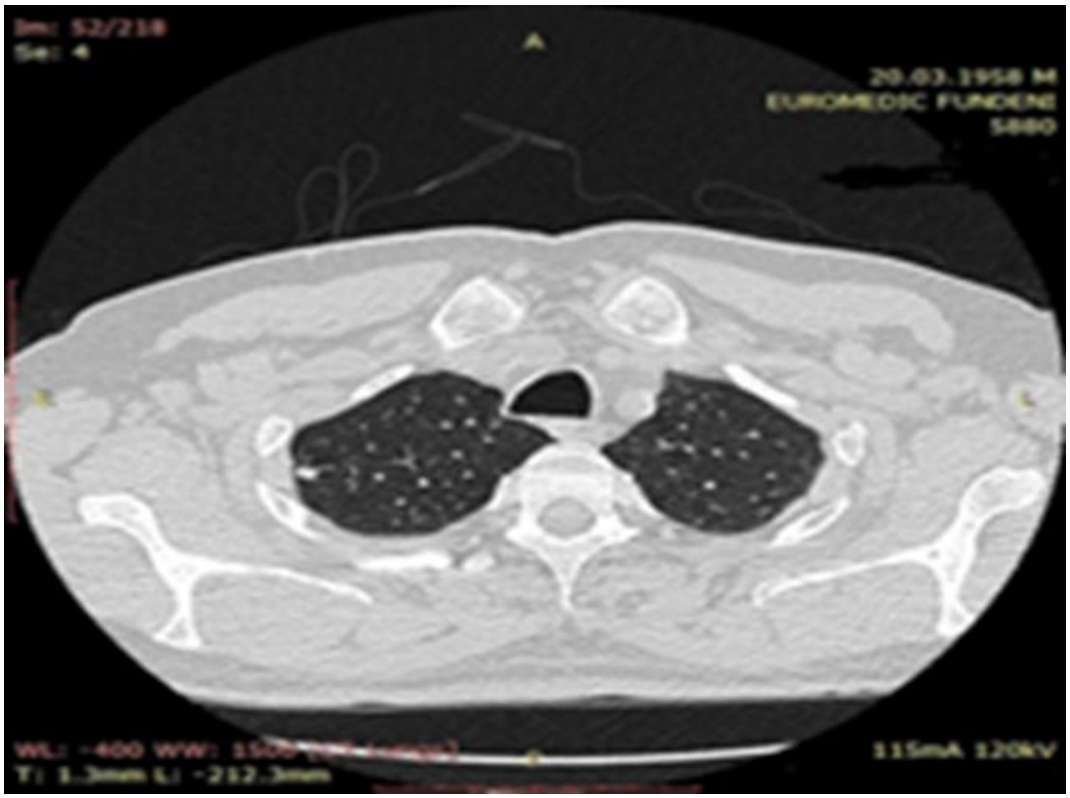


Figure 3. Histologic results of the resected pulmonary nodules in patients with history of neoplasia.

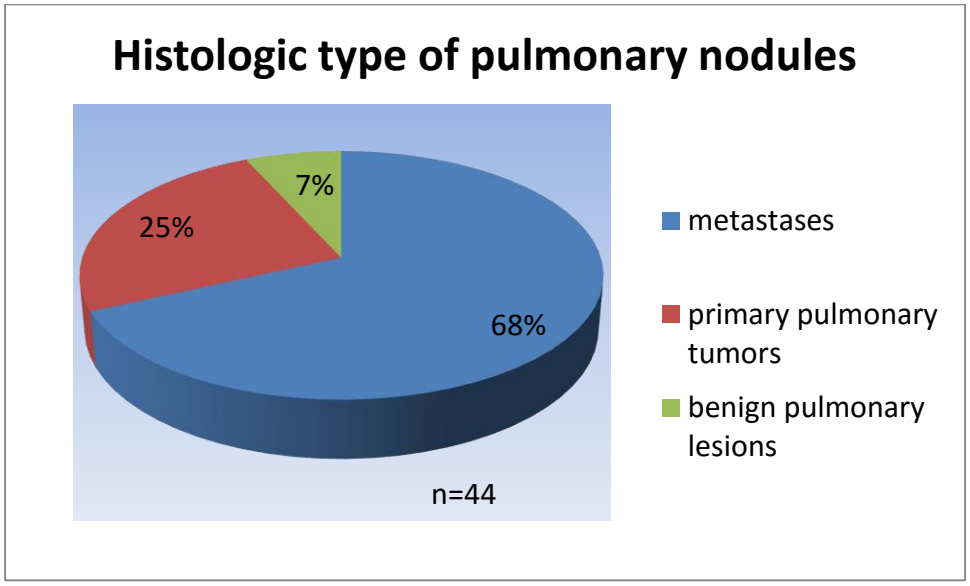
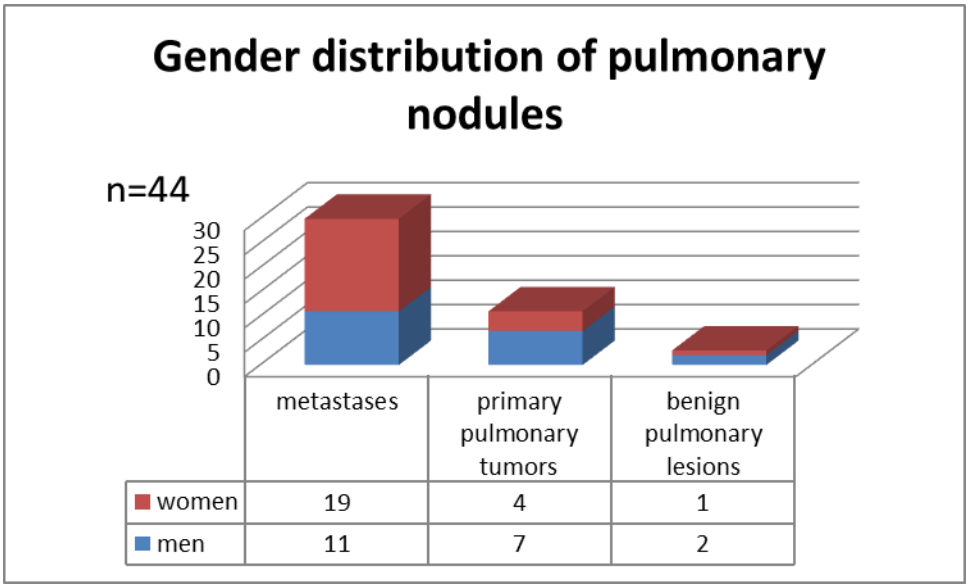


Figure 4. Gender distribution of patients with nodule resection.



REFERENCES

1. **Davidson RS, Nwogu CE, Brentjens MJ, Anderson TM**. The surgical management of pulmonary metastasis: current concepts. Surg Oncol 2001;10:35-42.
2. **Anraku M, Yokoi K, Nakagawa K, Fujisawa T, Nakajima J, Akiyama H, Nishimura Y, Kobayashi K;** Metastatic Lung Tumor Study Group of Japan. Pulmonary metastases from uterine malignancies: results of surgical resection in 133 patients. J Thorac Cardiovasc Surg. 2004;127:1107-12.
3. **González Casaurrán G, Simón Adiego C, Peñalver Pascual R, Moreno Mata N, Lozano Barriuso MÁ, González Aragoneses F**. Surgery of female genital tract tumor lung metastases. Arch Bronconeumol. 2011;47:134-7.
4. **Levenback C, Rubin SC, McCormack PM, Hoskins WJ, Atkinson EN, Lewis JL**. Resection of pulmonary metastases from uterine sarcomas. Gynecol Oncol. 1992;45:202-5.
5. **Tellis CJ, Beechler CR**. Pulmonary metastasis of carcinoma of the cervix: a retrospective study. Cancer. 1982;49:1705-9.
6. **Radulescu IM, Popescu R, Cirstoiu MM, Cordos I, Mischianu D, Cirstoiu CF**. Surgical treatment for pulmonary metastases in urogenital cancers. J Med Life. 2014 Sep 15;7(3):358-62.
7. **Seo JB, Im JG, Goo JM, Chung MJ, Kim MY**. Atypical pulmonary metastases: spectrum of radiologic findings. Radiographics. 2001 Mar-Apr;21(2):403-17.
8. **Yasaka K, Katsura M, Hanaoka S, Sato J, Ohtomo K**. High-resolution CT with new model-based iterative reconstruction with resolution preference algorithm in evaluations of lung nodules: Comparison with conventional model-based iterative reconstruction and adaptive statistical iterative reconstruction. Eur J Radiol. 2016 Mar;85(3):599-606. doi: 10.1016/j.ejrad.2016.01.001.
9. **Sui X, Meinel FG, Song W, Xu X, Wang Z, Wang Y, Jin Z, Chen J, Vliegenthart R, Schoepf UJ.** Detection and size measurements of pulmonary nodules in ultra-low-dose CT with iterative reconstruction compared to low dose CT. Eur J Radiol. 2016 Mar;85(3):564-70. doi: 10.1016/j.ejrad.2015.12.013.
10. **Hu H, Wang Q, Tang H, Xiong L, Lin Q**. Multi-slice computed tomography characteristics of solitary pulmonary ground-glass nodules: Differences between malignant and benign.Thorac Cancer. 2016 Jan;7(1):80-7. doi: 10.1111/1759-7714.12280.
11. **Divisi D, Imbriglio G, De Vico A, Crisci R**. Lung nodule management: a new classification proposal. Minerva Chir. 2011 Jun;66(3):223-34.