LUNG CANCER: THE SQUAMOS CELL CARCINOMA – PARTICULARITIES OF MEDICAL IMAGING

Manuela Ursaru[1], Roxana Popescu[1], A.H. Nedelcu[2], A.G. Naum[2], Irina Jari[1], D. Negru[1]
"Gr.T. Popa" University of Medicine and Pharmacy, Iaşi
1. Department of Radiology
2. Department of Morphofunctional Science

LUNG CANCER: SQUAMOUS CELL CARCINOMA - PARTICULARITIES OF MEDICAL IMAGING (Abstract): Squamous cell carcinoma (SCC) is the most common histopathological form of lung cancer in Romania (45%). The purpose of the study was to identify the main imaging features of this type of neoplasia. Material and methods: In the period 2014-2015 were evaluated by chest radiography and thorax computer tomography, 52 patients with lung cancer, squamous cell carcinoma histopathological type. Results: Squamous cell carcinoma was the most frequently diagnosed in men (84.6%), older than 60 years (57.7%). The right lung was more frequently affected, the segments of upper lobes were most often concerned. The development in large bronchi with secondary atelectasis was more common beside the peripheral forms. The intratumoral necrosis and calcifications, pleural invasion and lysis of adjacent ribs have been better evaluated by CT scan than chest radiography. Secondary lesions were located in the liver, lung, bone, adrenal glands and brain. Conclusions: Atelectasis is a common manifestation of squamous cell carcinoma. Excavation, secondary necrosis are frequent radiological sign. The structure and invasive characters of the tumor are best evaluated by CT scan. **Key words**: SQUAMOUS CELL CARCINOMA, ATELECTASIS, NECROSIS

INTRODUCTION

In the past 25 years in Romania, lung cancer recorded a mortality of 59.29/100,000 inhabitants/year respectively in men and 12.4/100,000 population/year in women. In the specific cancer mortality, lung cancer won the first place in men and the third place in women (1).

The 5-year survival rate for all stages is 15%, we observed an increase from the 60s (8%), owing in particular progress in the prevention and treatment (2,3).

Squamous cell carcinoma (SCC) is the most common histopathological form of lung cancer in Romania (45%), unlike the West, where they represent about 1/3 of all lung neoplasms (4). With mostly central location, the tumor cause bronchial irritation (cough, hemoptysis) manifested frequently with secondary pneumonia or atelectasis. In most cases it invades the lung parenchyma, after it has been developed intrabronchially. The initial imaging evaluation consists in chest radiography, thorax CT with contrast for staging. Tumor lends itself to radical surgical treatment, becaude it has radio and chemoresistance (5-7).

The purpose of the study was showing the particularly of imaging (radiography and computer tomography) of this histopathological type of lung cancer.

MATERIAL AND METHOD

In the period 2014-2015, in the Regional Clinic of oncology, IRO Iasi, they were taking out 52 patients with lung cancer, squamous cell carcinoma histopathological type. Patients had previous admissions in various lung diseases clinics, where it was established clinical diagnosis of lung cancer, then confirmed by pathological examination (most commonly bronchoscopy).

All patients had initial performed chest radiographies (front and profile incidences), followed by CT scans with intravenous contrast, which got into the field to scan the liver and

TABLE I
Imaging features of SCC

	Radiography – n (%)	CT scan – n (%)
Central endobronchic lung cancer	30 (57,7%)	30 (57,7%)
Central exobronschic lung cancer	13 (25%)	11 (21,2%)
Lung cancer mixed form	2 (3,8%)	4 (7,7%)
Lung cancer peripheral	7 (13,5%)	7 (13,5%)
Homogeneous structure	48 (92,3%)	38 (73%)
Inhomogeneous structure	4 (7,7%)	14 (26,9%)
Pleurisy	12 (23%)	18 (34,6%)
Pleural invasion	–	8 (15,4%)
Intratumoral calcification	2 (3,8%)	4 (7,7%)
Bone invasion	1 (1,9%)	4 (7,7%)

adrenal glands to assess metastases at this level. In patients whose clinical and laboratory tests raised the suspicion of having different forms of secondary lesions were performed targeted CT exams (cranio-cerebral, bone, abdominal). The imaging exploring was performed in Radiological Clinic Hospital "St. Spiridon" Iasi, after the patients signed the informed consent.

RESULTS

Average age of patients at the time of diagnosis was 61 years, with limits ranging from 39-81 years 30 (57.7%) patients were diagnosed with SCC at an age greater than 60 years, and 22 (42.3%) patients at the age less than 60 years. Of the 52 patients included in the study, 44 (84.6%) were male and eight (15.4%) were women.

36 patients in the study group (69.2%) were smokers. The tumor was located in the right lung in 30 patients (57.7%) and in the left lung in 22 patients (42.3%) ; the most affected were the upper lobes : right upper lobe - 21 patients (40.4%), left upper lobe - 16 patients (30.8%).

All patients included in the study were investigated by chest radiography and thorax CT exams using also intravenous contrast and thus we can assess the tumor characteristics : the central developement : the endobronchial/exobronchial/mixed ; peripheral developement : homogeneous/ inhomogeneous structure, intratumoral calcifications, the pleural impairement or bone invasion (tab.I).

CT exam identified 26 patients (50%) with metastases at several locations : lung (10 patients -19.2%), liver (10 patients - 19.2%), bone (2 patients - 3.8%), cerebral (2 patients - 3.8%) and adrenal glands (2 patients - 3.8%).

DISCUTIONS

In the study group, SCC has been found more often in men aged over 60, according to various literature statistics (8).

This histopatholocal type is commonly associated with active smoking. Bronchial epithelial damage and chronic inflammation are pathological processes responsible for the appearance of squamous metaplasia which progresses to displasia, carcinoma in situ and invasive carcinoma finaly (9,10).

Regarding the localization of the tumor, the right lung was more frequently affected than the left, the upper lobes and segments were most often involved (11).

SCC's typical imaging manifestations are the result of partial or complete obstruction of the bronchi, secondary of endoluminal development wich is specific. Thus, in addition of postobstructive pneumonia occur atelectasis secondary to necrosis. Examination both radiographic and CT could be precisely central location (majority) or peripheral neoplasia (fig. 1-4). Regarding the central location, CT was more sensitive in assessing intrabronchial development of the tumor, the central mixed form (endo/exobronchic) was being undervalued in radiographic examination.

Using radiographic features, the tumor structure was difficult to assess, it was homogeneous in 92.3% of cases ; the inhomogeneous appearance (7.7%) was caused by calcification or necrosis of the tumor with excavation (on the radiography was revealed the neoplazic cavern) (fig. 5).

CT appreciated better the structure of tumor (inhomogeneous in 27% of cases) : identified calcifications in a greater number of patients

Fig. 1. Central endobronchial left lung cancer with total atelectasis (Rx thorax, incidence PA).

Fig. 2. Peripheral upper lobe left lung cancer with hilar lymphadenopathy (Rx thorax, incidence PA).

Fig. 3. Central endobronchial lung cancer with left upper lobe atelectasis. (CT thorax, axial).

Fig. 4. Peripheral right upper lobe cancer, with necrosis and calcification inside (CT thorax, axial).

than the radiographic exam ; necrosis was identified in the absence of tumor excavation using the densitometric measurements of the tumoral tissue (fig. 4, fig. 6).

The studies in the literature show an increased frequency of calcifications in squamous cell cancer (11), data was confirmed by this study group. Compared with conventional radiography, the computer tomography showed a higher sensitivity in highlighting these changes, the radiography reveals only calcifications greater than 3-4 mm.

The pleural damage consisted in pleural effusion or direct pleural invasion. While using radiographic features only the pleural effusions were identified, CT could appreciate the pleural invasion. Pleural effusions in small quantity were diagnosed in only amount CT scan, known the reduced sensitivity of radiographic examination in such situations.

Bone invasion was identified in 7.7% of cases, osteolysis of the ribs or thoracic vertebrae is best measured by CT scan (fig. 6) (11).

50% of the cases included in the study have shown metastases (fig. 7), the most common lesions being located in the lung and liver (19.2%) (12,13). Bone, brain and adrenal metastases were found less frequently (3.8%), associating them in varying proportions with extrathoracic lymphadenopathy (subclavicular, submaxillary, axillary, laterocervical). In the cases included in the study we noticed that

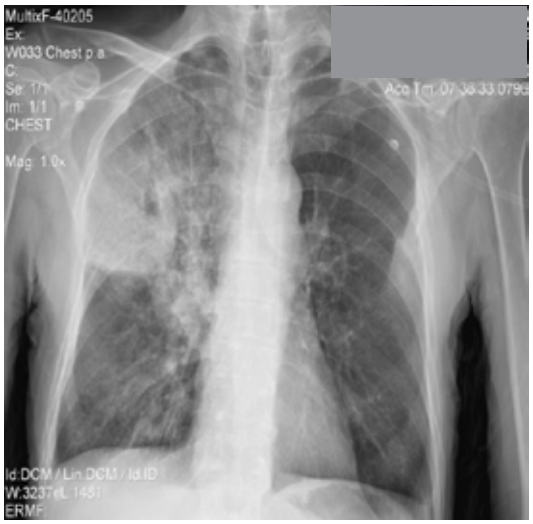

Fig. 5. Neoplazic cave of right upper lobe (Rx thorax, incidence PA).

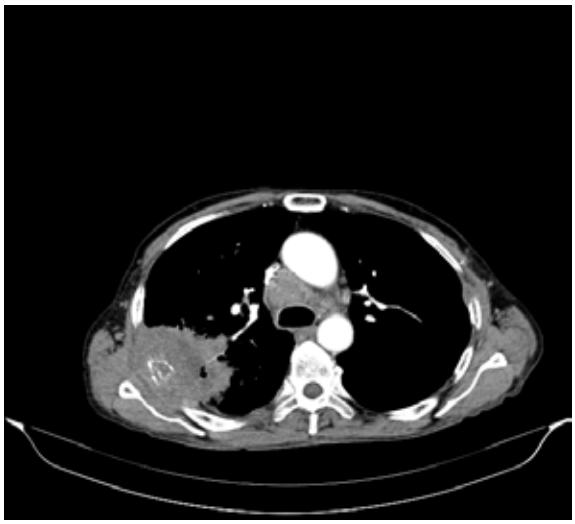

Fig. 6. Right lobe lung cancer with ribs lysis, necrosis and excavation (CT thorax, axial).

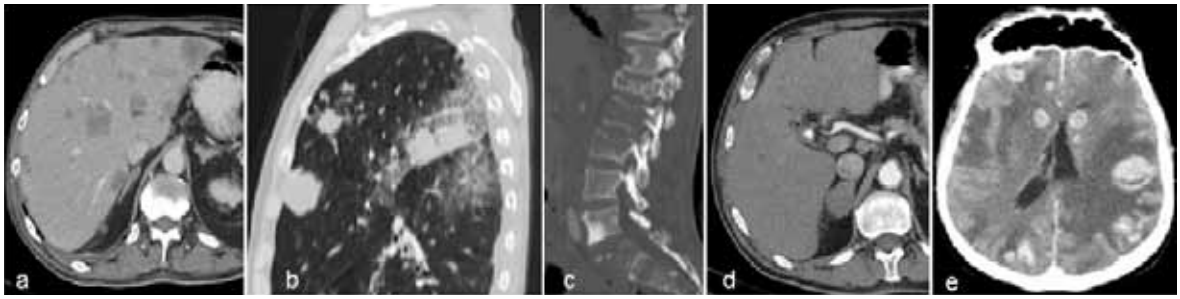

Fig. 7. Metastases of liver (a), lung (b), bone (c), the right adrenal gland (d), brain (e) - CT features.

metastases in the adrenal glands were correlated 100% with the extrathoracic location of the lymph nodes.

CONCLUSIONS

SCC preferential location is central, the tumor was occupying the lumen of large bronchi, atelectasis is the common manifestation. Excavation which occurs due to necrosis is a frequent radiologic sign in this type of carcinoma. The structure of the tumor, pleural or bone invasion are best evaluated by CT scan. This histopathological type of lung cancer causes lesions commonly located in the lung or liver.

BIBLIOGRAPHY

1. Alberg AJ, Ford JG, Samet JM. Epidemiology of lung cancer : ACCP evidence-based clinical practice guidelines. 2nd ed. *Chest*. 2007 ; 132(3) : 29-55.
2. Schrump DS, Altorki NK, Hensche CL, et al. Non-small cell lung cancer. In : DeVita VT Jr., Hellman S, Rosenberg SA, eds. *Cancer - principles & practice of oncology*. 7th ed. Philadelphia : Lippincott, Williams & Wilkins, 753-769, 2005.
3. Miron L. Cancerele toracelui : cancerul bronho-pulmonar. In : Miron L, Miron I, eds. *Chimioterapia cancerului : principii şi practică*. Iaşi : Kolos, 182-217, 2005.
4. Wahbah M, Boroumand N, Castro C, et al. Changing trends in the distribution of the histologic types of lung cancer : a review of 4,439 cases. *Ann Diagn Pathol*. 2007 ; 11 : 89-96.
5. Pfister DG, Johnson DH, Azzoli CG, et al. American Society of Clinical Oncology treatment of unresectable non–small-cell lung cancer guideline : update 2003. *J Clin Oncol*. 2004 ; 22 : 330-353.
6. Bruzzi JF, Komaki R, Walsh GL, et al. Imaging of non-small cell lung cancer of the superior sulcus : part 2 : initial staging and assessment of resectability and therapeutic response. *Radiographics*. 2008 ; 28 : 561-572.

7. Bruzzi JF, Komaki R, Walsh GL, et al. Imaging of non-small cell lung cancer of the superior sulcus : part 1 : anatomy, clinical manifestations, and management. *Radiographics*. 2008 ; 28 : 551-560.
8. Riihimäki M, Hemminki A, Fallah M, Thomsen H, Sundquist K, Sundquist J, Hemminki K. Metastatic sites and survival in lung cancer. *Lung Cancer* 2014 ; 86 : 78-84.
9. Satoh H, Kurishima K, Nakamura R. Lung cancer in patients aged 80 years and over. *Lung Cancer* 2009 ; 65 : 112-118.
10. Kobrinsky NL, Klug MG, Hokanson PJ. Impact of smoking on cancer stage at diagnosis. *J Clin Oncol*. 2003 ; 21 : 907-913.
11. Sharma CP, Bchera D, Aggarwal AN, Gupta D and Jindal SK : Radiographic Patterns in Lung Cancer. *The Indian Journal of Chest Dzseases & Allted Sciences* 2002 ; 44 : 25-301.
12. Hess KR, Varadhachary GR, Taylor SH, Wei W, Raber MN, Lenzi R, et al. Metastatic patterns in adenocarcinoma. *Cancer* 2006 ; 106 : 1624–1633.
13. Oikawa A, Takahashi H, Ishikawa H, Kurishima K, Kagohashi K, Satoh H. Application of conditional probability analysis to distant metastases from lung cancer. *Oncol Lett* 2012 ; 3 : 629–634.

Corresponding author

Alin Horaţiu Nedelcu
e-mail: alin_nedelcu@yahoo.com