

# Differential Diagnosis Value of $^{18}\text{F}$ -FDG Imaging in Lung Histoplasmosis and Lung Cancer

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**Abstract:** In order to confirm the accuracy of ECT (emission computed tomography) scanning imaging in the diagnosis of lung histoplasmosis is higher than CT (computed tomography) scan. We retrospect a lung histoplasmosis patient, he was examined by the CT scan and ECT scanning, respectively. Results showed that lung cancer for CT diagnosis and large benign lesions for  $^{18}\text{F}$ -FDG ( $^{18}\text{F}$ -fluorodeoxyglucose) ECT diagnosis. This indicated that the ECT diagnosis for benign lesions in the lung maybe have higher accuracy than CT scan.

**Key words:** Computed tomography,  $^{18}\text{F}$ -FDG; X-ray, lung cancer, lung histoplasmosis.

## 1. Introduction

The development of imaging technology, is important significant for the clinical diagnosis and treatment. But, for some lung disease, CT (computed tomography) diagnostic accuracy is not satisfied.

CT relies on the different penetration ability of X-ray in different organizations, to form a diagnosis image. Its characteristics is easy operation, high resolution, and can diagnosis correctly for the intracranial tumor, hematoma, abscess, brain injury, cerebral infarction, cerebral hemorrhage, spinal canal tumor and slipped disc disease, etc [1]. But, there are some limits in pathological qualitative diagnosis of diseases.

At this moment, ECT (emission computed tomography) can make up for these disadvantages. Simply, ECT is the sum of CT and nuclear medicine. In another word, it is relying on the different distribution and metabolism of radioactive drugs in the normal and abnormal tissues, to form the image and diagnose the disease. Therefore, ECT not only can get anatomical images of human organs, meantime can obtain the physiological and metabolic variation

characteristics, to achieve early diagnosis [2]. And ECT is widely used in thyroid cancer, bone tumors, especially in the detection of bone metastatic tumors.

But CT and ECT, which diagnosis is more accurate for lung histoplasmosis disease? To illustrate this problem, this article uses the specific case to illustrate.

## 2. Case Report

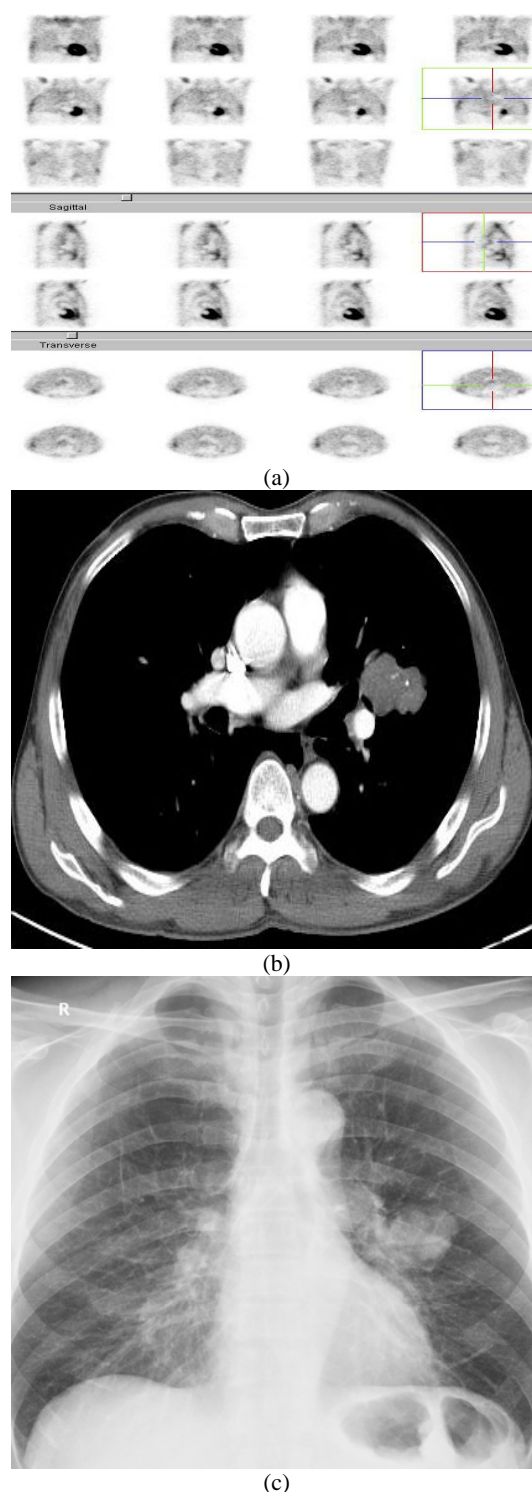
Patients, male, 50 years old, because physical examination found that "the left lung exclusive Shadow week," and treatment. Outpatient X-ray showed: two markings rough mess, 4th left lung hilum see front rib with a diameter of about 5cm mass shadow, lung see scattered in patches cable video. Unenhanced CT diagnosis: a cancer on the left lung lobe; 2 two emphysema associated with multiple bullae. Admitted to hospital for further examination and treatment, physical examination: a 0.5cm palpable neck lymph nodes, the quality, the movable, lower lung breath sounds rough, confidants (-). History of hypertension for many years, oral ZJ control. There are 10-year history of psoriasis. Admission diagnosis "1. left lung differences Movies: Lung cancer may; 2. secondary infection of the lungs; 3. hypertension" In order to clarify the nature of the lesion, lung  $^{18}\text{F}$ -FDG ( $^{18}\text{F}$ -deoxyglucose) ECT inspection and enhanced CT.

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ECT slice CT images and results are experienced by the two departments above the intermediate level corresponding physician read the piece [3, 4].  $^{18}\text{F}$ -FDG ECT imaging Methods: Siemens Ecam dual probe ECT, with high-energy collimator.  $^{18}\text{F}$ -FDG is provided by Huashan Hospital PET/CT center, radiochemical purity > 95%. Check the patient before fasting 6h, blood sugar within the normal range; intravenous 185 MBq (5 mCi) 60 min after the start Imaging; coincidence imaging matrix  $128 \times 128$ , about  $6^\circ/\text{frames}$ , 25 s/frame, were collected 64. Image reconstruction using iterative reconstruction method, attenuation correction obtain attenuation correction chart, including the cross-section, coronal and sagittal images. ECT showed: left lung hilum radioactive sparse, consider the possibility of large benign lesions (see Fig. 1A). 64-enhanced CT scan criteria: sternoclavicular joint as the baseline to the bottom of the lungs, the inspiratory phase scanning, thickness 1mm, pitch 1mm, reconstruction thickness of 5-10mm, layer spacing 5-10mm, intravenous injection of iodinated contrast media 100ml. Enhanced CT imaging findings: lungs through the brightness increase, see multiple translucent zone, within which no markings. Ye see mass in the left lung, about the size of about  $3.5 \times 4$  cm, see leaf, see the edge burr, door left lung lymph nodes (see Figs. 1B and 1C). Enhanced CT diagnosis: a left upper lobe lung cancer may, with the door left lung lymph nodes; 2 two emphysema associated with multiple bullae. Right cervical lymph node biopsy: See proliferative lymphocytes. Bronchoscopy brush biopsy and bronchoalveolar lavage: not found malignant cells; sputum cytology: The cancer was not found; tuberculosis smear (-); cytomegalovirus antibody IgG (+); complement C-3: 0.74 (normal value is 0.9 ~ 1.8 g/L); RF (rheumatoid factor): 35 IU/ml (normal < 25 IU/ml); tumor markers: (-); fungal culture: (+); PAS (+). Thoracoscopic Surgical pathology examination revealed: cancer is not found, see multiple calcified granulomas with extensive necrosis, yeast fungi.

Fluconazole therapy after discharge. Discharge diagnosis: a pulmonary histoplasmosis; 2 hypertension.



**Fig. 1** The chest images. (A) the ( $^{18}\text{F}$ -FDG)-ECT image; (B) the CT image; (C) the X-ray image.

### 3. Discussion

Lung histoplasmosis is histoplasma capsulatum infection caused by a type of fungal disease, the bacteria present in the soil is mainly a bird or bat droppings or dust contaminated, is a bipolar fungi within the organization and 37 °C medium was yeast type, showing hyphae at room temperature and soil type, the size of the spores [5-7]. Fungal spores inhaled into the lungs after the macrophages and other phagosome swallowed, by converting to a yeast form and avoid being cleared. Yeast cells remaining in the phagolysosomes vesicles, defects in cell-mediated immunity (immunosuppressive therapy in patients infected with human immunodeficiency virus or HIV, etc.), the yeast can continue to proliferate and spread to spread into the reticuloendothelial system Organ and rapid progress, and deadly, high fever, difficulty breathing, hepatosplenomegaly, lymphadenopathy, jaundice, anemia [8, 9]. If the cell-mediated immune normal form of Histoplasma capsulatum certain immunity, granuloma and intracellular yeast will eventually be cleared and self-healing. So pulmonary histoplasmosis clinical manifestations often associated with inhalation of spores of quantity and host immune related. Chest radiology common manifestation is flaky or nodular infiltrates area, opacities or mediastinal lymph nodes, around may have inflammatory infiltration, occurs mainly in the upper lobe lesions, may have fibrosis and calcification, the leaves shrink, to tuberculosis, lung cancer, sarcoidosis, etc. were identified. A small number of patients with progressive disseminated two lungs X-ray showed miliary shadows or scattered nodular lesions, similar to miliary tuberculosis [10-12]. With the progress of time, with caseous necrosis granuloma generation region, can develop into a huge circular scar tissue calcification or calcified tissue becomes plasma cell tumors. A form of emphysema or COPD and other chronic lung diseases, but also occur in lung tissue plasma cell tumors [13]. When lung tissue plasmacytoma in the X-ray, showing nodule or mass

in CT scan, found that in order to distinguish between benign and malignant, then often require thoracoscopy or open lung biopsy to make an accurate diagnosis [14].

The patients because of physical examination and found abnormal lung mass shadow, subclinical, below the original hair acute pulmonary histoplasmosis, when a clear diagnosis of lesions also encountered some difficulties, mainly because of the patient no obvious clinical symptoms, and radiologic findings in vitro and mistaken for malignancy. X-ray, CT imaging principle is based on the density of different organs of the body, the radiation-absorbing capacity through the different, and in vitro imaging and 18F-FDG ECT imaging is based on the intensity of the metabolism of different tissues and organs, glucose Different degree of uptake in vivo imaging to determine the patient two imaging results may be different. Most inflammatory cells (not including granulation tissue, etc.) 18F-FDG uptake is lower than the cancer cells, and cancer are more concentrated, so 18F-FDG ECT diagnosis of the disease has a large advantage, often used in the diagnosis and it is seen as a more accurate diagnosis. Sometimes identify patients with pulmonary histoplasmosis infection, but whether lesions accompanied by malignant tumors, can still give the diagnosis difficult, because granulomatous disease and malignant lesions 18F-FDG uptake after substantial overlap will reduce the efficiency of diagnosis, this When feasible antifungal therapy was observed before and after treatment changes in lesion size, but eventually should rely fungal culture, pathological or immunohistochemical examinations to confirm the diagnosis [15].

### 4. Conclusion

In the diagnosis of lung tissue cytoplasm disease, ECT diagnosis may be more accurate than CT diagnosis.

### References

- [1] Kingston, M. J., Perriman, D. M., Neeman, T., Smith, P.

- N., and Webb, A. L. 2016. "Contrast Agent Comparison for Three-Dimensional Micro-CT Angiography: A Cadaveric Study." *Contrast Media Mol Imaging* doi: 10.1002/cmml.1695.
- [2] Argyris, P. P., Bilodeau, E. A., Yancoskie, A. E., Trochesset, D., Pambuccian, S. E., Wetzel, S. L., Shah, S. S., Edelman, M., Freedman, P., Dolan, M., and Koutlas, I. G. 2016. "A Subset of Ectomesenchymal Chondromyxoid Tumors of the Tongue shows EWSR1 Rearrangements and is Genetically Linked to Soft Tissue Myoepithelial Neoplasms: A Study of 11 Cases." *Histopathology* doi: 10.1111/his.12973.
- [3] Spugnini, E. P., Melillo, A., Quagliuolo, L., Boccellino, M., Vincenzi, B., Pasquali, P., and Baldi, A. 2014. "Definition of Novel Electrochemotherapy Parameters and Validation of Their *in vitro* and *in vivo* Effectiveness." *J. Cell Physiol.* 229 (9): 1177-81.
- [4] Lv, G. M., Hu, M., Chen, R. Z., Zhu, L. L., Tao, Ch. J., Xia, X. D., Gong, Y. L., Li, P., and Wan, H J. 2014. "Treatment of Advanced Breast Cancer with Chinese Medicinal Herbs of Fei Decoction: A Case Report." *Curr. Pharm. Biotechnol.* 14 (13): 1088-92.
- [5] Gorocica, P., Taylor, M. L., Alvarado-Vásquez, N. et al. 2009. "The Interaction between Histoplasma Capsulatum Cell Wall Carbohydrates and Host Components: Relevance in the Immunomodulatory Role of Histoplasmosis." *Mem Inst. Oswaldo Cruz.* 104 (3): 492-6.
- [6] Duncan, S. J., and Kalaria, D. 2015. "A Woman with a Lung Mass and Multiple Pulmonary Nodules." *Am. J. Case. Rep.* 16: 367-70.
- [7] Han, P., Yan, W., Luo, Y., Tu, W., He, J. Y., Liu, J. M., Gong, J., Wang, Y. W., Li, M. K., Tian, D. A., and Huang, H. J. 2014. "Chronic Bronchitis with Fungal Infection Presenting with Marked Elevation of Serum Carbohydrate Antigen 19-9: A Case Report." *Int. J. Clin. Exp. Pathol.* 7 (9): 6307-12.
- [8] Thomas, J., Sharpton, J. E., Stajich, S. D., Rounsley, et al. 2009. "Comparative Genomic Analyses of the Human Fungal Pathogens *Coccidioides* and Their Relatives." *Genome Res.* 19 (10): 1722-31.
- [9] Khaled, F. S., Daniel, B., and Thomas, V. B. 2006. "Growing PET Positive Nodule in a Patient with Histoplasmosis: Case Report." *Journal of Cardiothoracic Surgery* 1 (23): 1-4.
- [10] Peng, S. K., April, C. R., Kumar, V. V. et al. 2010. "Concurrent Amoebic and Histoplasma Colitis: A Rare Cause of Massive Lower Gastrointestinal Bleeding." *World J. Gastroenterol.* 16 (10): 1296-8.
- [11] Kendal, G. C., Robert, Z., and Jon, P. W. 2009. "Histoplasma Capsulatum Encodes a Dipeptidyl Peptidase Active against the Mammalian Immunoregulatory Peptide, Substance P." *PLoS ONE* 4 (4): 1-6.
- [12] Medeiros, A. I., Secatto, A., Bélanger, C., Sorgi, C. A., Borgeat, P., Marleau, S., and Faccioli, L. H. 2009. "Impairment of Neutrophil Migration to Remote Inflammatory Site during Lung Histoplasmosis." *Biomed. Res. Int.* doi: 10.1155/2015/409309.
- [13] Saheki, M. N., Schubach, Ade. O., Salgueiro, M. M. et al. 2008. "Primary Cutaneous Histoplasmosis: Case Report on an Immunocompetent Patient and Review of the Literature." *Rev. Soc. Bras. Med. Trop.* 41 (6): 680-2.
- [14] Ye, C., Zhang, G., Wang, J., and Chai, Y. 2015. "Histoplasmosis Presenting with Solitary Pulmonary Nodule: Two Cases Mimicking Pulmonary Metastases." *Niger J. Clin. Pract.* 18 (2): 304-6.
- [15] Allan, J. Guimarães, S. F., Francisco, J. G. et al. 2009. "Monoclonal Antibodies to Heat Shock Protein 60 Alter the Pathogenesis of *Histoplasma capsulatum*." *Infect. Immun.* 77 (4): 1357-67.