

Diffraction enhanced imaging of lung cancer

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Introduction

Radiological examinations at present can find lesions of lungs in centimeters, but cannot distinguish malignancies from benignancies. If these lesions are too small for biopsy, they are usually clinically diagnosed with experience as malignancies or pneumonitis or tuberculosis, if the diagnosis is malignancy, the patient is treated with surgical operation, radiotherapy, and/or chemotherapy. Clinical studies show that 80% pathologically diagnosed lung cancers are in mid and late stage. They have lost a precious opportunity to have early pertinent treatment. Since squamous cell carcinomas are the most common lung cancers, this study aims to discuss the potential of DEI that distinguishes squamous cell carcinoma from benignancies of lungs.

Material and Method

Human pulmonary normal tissues, benign consolidations, and samples of squamous cell carcinoma were fixed, prepared into $1 \times 1 \times 0.2 \text{ cm}^3$ pieces. The tissues were imaged at PF BL14B beam lines by diffraction enhanced imaging (DEI) with the resolution-tunable double-crystal analyzer using 35keV x-ray. X-ray CCD and X-ray films were used to record data.

Result

The normal tissues, benign consolidations, and samples of squamous cell carcinoma showed their own structure-specific images respectively.

Conclusion

DEI imaging possesses the potential of distinguishing malignancies from benignancies of lungs.

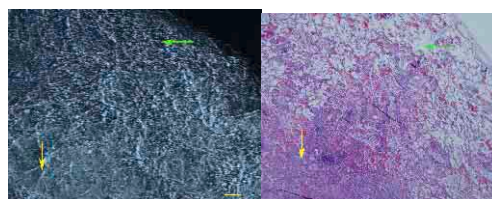


Fig1

Fig2

Fig 1. DEI. superposition of alveoli images can be seen in normal regions (green arrow), the thickness of alveolar wall was $20\text{-}30\mu\text{m}$, benign consolidation area (yellow arrow) showed homogeneous consolidation. (scale 0.5mm).

Fig2. Microscopic photograph. Alveoli can be seen in normal region (green arrow), the thickness of alveolar wall was $20\text{-}30\mu\text{m}$, The benign consolidation area ((yellow arrow) was deeply stained with lymphocytes. (scale 0.5mm).

infiltration, part of the alveolar cavities disappeared.

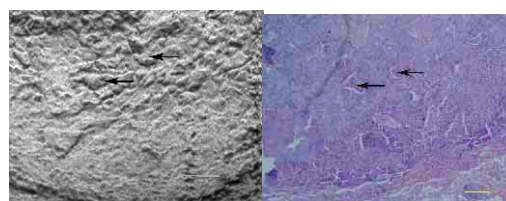


Fig3

Fig4

Fig3. DEI, squamous lung cell carcinoma sample. Alveoli disappeared or consolidated. Cancer nest structures (arrows) can be seen, the minimum diameter of the cancer nest was $100\mu\text{m}$.

Fig4. Microscopic photograph. The structure of mid-differentiated squamous cell carcinoma nest (arrows). (scale 0.5mm).

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