

# Radiographic diagnosis of small metastatic lung cancer by synchrotron radiation pulmonary angiography

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## 1 Introduction

Metastatic lung cancer is rich in tumor vessels reflecting its potency to metastasis. One of the prominent features of tumor vessels is enhanced vascular permeability. It is known as “tumor stain” in tumor angiography in relation to penetration of contrast materials to tumor interstitium. We have developed synchrotron radiation pulmonary angiography (SRPA) in rat and minimum vascular diameter identified is around 50  $\mu\text{m}$  [1]. When HARP tube, which is a highly sensitive receiver developed by NHK, is applied to SRPA, a minute density change can be measured in small spot of lung field. If they show different density change from background area, it may be possible to identify as suspicious tumor nodule. The purpose of this study is to investigate whether our SRPA with HARP tube can identify minute density change in small spots of experimental metastatic lung cancer model in rat and whether these nodules are correspond to pathological tumor properties.

## 2 Experiment

### 1) Metastatic lung tumor model

Sprague Dawley (SD) rats were implanted glioblastoma cells ( $1.0 \times 10^6/\text{rat}$ ) through jugular vein. Two weeks after injection, rats were used for SPRA and their lungs were resected for pathological examination.

### 2) SPRA

Synchrotron radiation derived X-ray was obtained from magnet bending of 6.5 GeV electron beam. The SR was converted to monochromatic X-rays by reflecting at 13 degrees on a silicone crystal. The energy of the monochromatic X-rays was 33.3 KeV. After passing the subject, X-rays were converted into visible light by fluorescent screen made of cesium iodide and captured by HARP camera. 32% contrast material was injected at the rate of 2 ml/sec for one second. Images were captured at 30 images/sec continuously.

## 3 Results and Discussion

19 suspicious nodules were identified. These nodules were characterized as small nodules showing delayed clearance of contrast material compared with pulmonary vessels and pulmonary background, which was considered as pulmonary capillary area. These graphically identified nodules were corresponded to pathological tumor nodule. Average size of graphical nodules was  $621 \pm 193 \mu\text{m}$ . Vascular permeability factor (VEGF) was expressed intensively both tumor vessels and tumor interstitium using immunostaining.

## 4 Conclusion

SPRA with HARP receiver made it possible to identify small metastatic lung cancer around 500  $\mu\text{m}$  utilizing their enhanced permeability to contrast material [2].

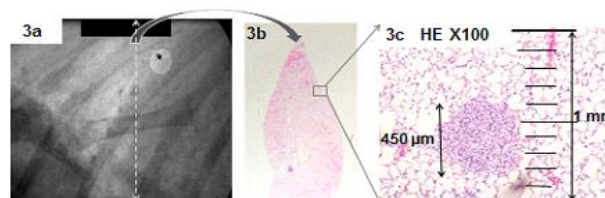


Fig. 1: A graphical suspicious nodule and its pathological correspondence.

## References

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