

Relationship between cancer cell proliferation and thallium-201 uptake in lung cancer

Masatoshi ISHIBASHI,* Teruhiko FUJII,** Hideaki YAMANA,** Kiminori FUJIMOTO,* Toru RIKIMARU,**
Akihiro HAYASHI,** Seiji KURATA* and Naofumi HAYABUCHI*

**Division of Nuclear Medicine and Department of Radiology,
Department of Surgery, and *First Department of Internal Medicine and Respiratory Unit,
Kurume University School of Medicine*

Although thallium-201 (^{201}Tl) uptake is related to perfusion in many normal tissues, the biologic rationale for ^{201}Tl uptake in tumors is uncertain. To determine if tumor uptake is related to cell proliferation, we correlated the relative retention of ^{201}Tl in lung tumors with expression of Ki-67, an indicator of cell proliferation. **Methods:** Sixty patients with lung tumors, included small cell carcinoma ($n = 8$) and non-small cell carcinoma ($n = 52$), underwent ^{201}Tl single photon emission computed tomography (SPECT) imaging. The ^{201}Tl lesion uptake was determined on early and delayed images and the radiotracer retention index (RI) was calculated. Tumor specimens were obtained at surgery or bronchoscopy. The cell proliferation ratio was estimated with MIB-1, a monoclonal antibody that recognized the nuclear antigen Ki-67. **Results:** The average ^{201}Tl index was 2.13 ± 0.61 (early) and 2.46 ± 0.83 (delayed). The average RI was 17.44 ± 35.01 . Overall, the ^{201}Tl index (delayed) and the cancer cell proliferation were correlated ($r = 0.70$, $p < 0.0001$). Of interest, there was a significant correlation ($r = 0.872$, $p < 0.0005$) between the ^{201}Tl index on delayed images and the cell proliferation ratio in patients with small cell but not non-small cell lung carcinoma. The ^{201}Tl index (delayed) was significantly higher ($p < 0.0001$) in patients with small cell lung carcinoma than in patients with non-small cell lung carcinoma. **Conclusion:** ^{201}Tl imaging appears to be useful for evaluating patients with small cell lung carcinoma but not non-small lung carcinoma, and is correlated with the monoclonal antibody MIB-1, a marker of cell proliferation.

Key words: lung neoplasm, ^{201}Tl , cell cycle, monoclonal antibody MIB-1, cancer cell proliferation