G. Lung, Heart and Blood Flow

Scintiphotography of the Apex of the Chest (Apical Scintigraphy)

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Apical scintiphotography is applied to the examination of the apex of the chest in order to study the changes of the apex following irradiation for the post operative breast cancer.

Apical scintiphotogram is taken after injecting ^{99m}Tc-MAA of 3–5 mCi intravenously in the patient's sitting position with the scinti-camera angled 30° to the patient's back.

Apical scintiphotography is superior to the apicolordotic radiographic view of the apex of the chest in order to show the changes following irradiation. The usual scintiphotography in the frontal and bach views of the chest shows no apparent changes in the apex in the early stage after irradiation.

Physiological Implication of 133-Xenon Washout Delay from Lung

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Upon reviewing more than fifty cases with various pulmonary diseases studied with 133-xenon and scintillation camera, the image of 133-xenon washout delay from lung was appeared to be most sensitive in compared to the other images such as ventilation ($\dot{V}$) after single inhalation or perfusion ($\dot{Q}$). While regional washout delay from lung indicates regional ventilatory abnormalities anyhow, it is thought to be caused either from high resistive state especially at central airway or from loss of distensibility of lung according to the RC theory of Otis.

The case with high resistance at central airway was typically exemplified by the case with bronchial stenosis due to broncogenic cancer or spasmodic asthma where the prominent washout delay as well as hot spot formation at aerosol scanning was shown to be characteristic. According to the non-linear characteristics of the compliance curve, lowered distensibility of lung might be caused either at high lung volume, which is a state of overinflation, or at low lung volume due to

premature closure of small airway. The former was typically exemplified in the case with an emphysematous region of lung where washout delay with prominent hot spot was observed to be characteristic. This type of $\dot{V}$ abnormalities was liable to be less perfused resulting high $\dot{V}/\dot{Q}$ ratio. The latter was exemplified in the case with bronchitic region of lung where washout delay without hot spot formation was observed to be characteristic. The perfusion of this type was liable to be preserved well resulting low $\dot{V}/\dot{Q}$. This might be a reason why the bronchitis type of COPD often shows abnormal blood gas findings, whereas the emphysematous type does not.

The Diagnosis of Central Bronchial Carcinoma in Xenon-133 Lung Scintigraphy

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The purpose of this study is to evaluate regional perfusion and ventilation in bronchial carcinoma using serial Xenon-133 lung scintigraphy. Scintigraphic findings were compared with those of bronchography and pulmoangiography. It is well known that the Xenon-133 trapping phenomenon is seen in the lung area of bronchial stenosis.

The patient was studied in a sitting position with a scintillation camera to obtain a posterior view of the lung. The patient held in his breath in maximal inspiration during first 25 seconds after the injection of 4 m Ci of Xenon-133 solution. During this phase a perfusion pattern was observed.

Subsequently a washout phase and an inhlation phase of Xenon-133 were recorded. 19 cases of central bronchial carcinoma were studied, and 4 of them were negative chest X-rays.

Results: Xenon-133 trapping was seen in 15 cases of 19 patients with central bronchial carcinoma (79%). In 4 cases, while Xe-133 trapping was not seen in the scintiphotos of the lung, ventilatory dead space was observed, which would indicate a combined lesion of bronchial obstruction and arterial interruption. In 5 of the 15 cases, the Xenon-133 trapped lung area was located in the main lesion, and in 10 of them in the adjacent lesion. Thus, a decreased perfusion and/or a bronchial stenosis were observed in all Xenon-133 trapping cases.

The clinical significance of Xenon-133 serial scintigraphy in a case of central bronchial carcinoma is very high when Xenon 133 trapping or ventilatory dead space is recognized.