

²⁰¹Tl Myocardial Scan:

(I) Evaluation of Scanning Condition and Early Organ Accumulation

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²⁰¹Tl enables myocardial scan by incorporation into normal myocardium as same physiological behavior as potassium ion. ²⁰¹Tl has suitable energies for gamma camera and half life for clinical investigation, and is thought to be most promising myocardial scanning agent. We investigated ²⁰¹Tl scanning condition in the viewpoint of collimators, energies and windows with liver slice phantom. In twenty-one patients (7 myocardial infarction, 9 IHD without infarction and 5 cardiac patients other than IHD and normal volunteers), early organ accumulation up to 10 minutes after I.V. injection, and early (immediately after 10 minutes of flow study) and delayed (45–60 minutes postinjection) organ accumulation changes were evaluated with GCA 401 gamma camera-computer system.

The phantom study showed best results in 80 KeV photopeak with 20% window width in low energy collimator. In clinical study, each organ showed little change after 3–4 minutes postinjection. Kidney showed highest activity, and next to kidney were following order as normal myocardium, spleen, liver, infarcted myocardium and

lung. Early infarcted /normal myocardial (MI/NM) accumulation ratios were around 0.8. Delayed / early ratio in normal myocardium was 1.03 (mean) and in infarcted myocardium was 0.90 (mean). This was well correlated with change of NI/NM ratio from 0.78 (early) to 0.74 (delayed). Organ/normal myocardial accumulation ratio in lung, liver and spleen decreased according to time resulting better contrast in delayed scan.

Blood disappearance of ²⁰¹Tl was two exponential: 2.5 minutes (rapid phase) and 54.7 minutes (slow phase). Effective half life of ²⁰¹Tl in whole body measured by linear scan was 2.22 ± 0.46 days, and whole body radiation dose was estimated to be about 160 mrad/mCi.

²⁰¹Tl myocardial scan taken from 5 minutes after I.V. injection delineated normal myocardium as O and/or U shaped uniform activity and infarcted myocardium as a clear area of decreased activity. Mediastinal activity always showed lowest activity, resulting good contrast myocardial scans.

²⁰¹Tl Myocardial Scan:

(II) Usefulness of Six View Images and Its Diagnostic Criteria

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Recently there appeared many reports according to usefulness of ²⁰¹Tl myocardial scan. However, scanning views and techniques were still variable from laboratory to laboratory. We made it a rule to take 6 view images to evaluate localization of area of abnormally decreased activity and its nature in rest ²⁰¹Tl myocardial scan. Six view images included anterior, LAO30°, LAO60° left

lateral, RAO30° and delayed LAO30° views. These were taken from 5 minutes postinjection in order as above mentioned. Delayed LAO30° views was usually taken from 45 minutes to 60 minutes postinjection. Forty patients were included in the study (14 patients with myocardial infarction, 6 patients with angina and those suspected of having infarction, 11 patients with IHD other than above

mentioned, 4 patients with congenital heart disease, 3 patients of postcardiac surgery, 2 normal volunteers). Both early and delayed LAO30° views were used to evaluate changes in focal ^{201}Tl accumulation according to time in rest.

Twelve out of 40 patients showed right ventricular wall delineation, and nine out of 40 patients showed change in focal activity (usually area of decreased activity) between early and delayed LAO30° views. All patients other than infarction who showed area of decreased activity included apex. This was thought to be due to the fact that apex was periphery in coronary circulation. In 12 patients of right ventricular wall delineation, 10

had congestive heart failure, and in 30 patients without CHF 28 did not show right ventricular wall. Overall acuity of right ventricular wall delineation was 95%. In 6 patients who showed increased focal activity in delayed scan, 5 showed no organic change, and in 3 patients who showed decreased focal activity, 2 showed presence of organic change. Overall acuity in terms of organic change was 78%. With 6 view images all parts of myocardium was able to delineate tangentially and localization of any abnormal myocardial areas were possible. No acute adverse reaction due to toxicity of ^{201}Tl was detected in any of 40 patients.

Tl-201 Scintigraphy for Myocardial Imaging

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Tl-201 scintigraphy was performed in several disorders. Starting 10 minutes after intravenous injection of 2.0 mci of Tl-201, scintiphotos were obtained in five different views (anterior, left lateral, 30, 45 and 60 degree left anterior oblique). Images were obtained with a Toshiba gamma-camera GCA-202. The energy spectrum used was 75 keV \pm 30%.

Studies were performed in 14 patients with acute or myocardia infarction, 6 with angina pectoris, 5 with cardiomyopathy, 7 with congenital heart disease, 6 with mitral stenosis and 5 with other disease.

Scintiphotos showed a defect in 6 of 8 patients with acute myocardial infarction and in 5 of 6 patients with old myocardial infarction. There was

a good agreement between electrocardiographic and scintigraphic location of the infarction. Scintiphotos showed no defects in patients with angina pectoris at rest.

Scintigraphy was also performed in patients with pressure or volume overload of the right ventricle such as ASD, PS and Tetralogy of Fallot. The right ventricle was fairly well visualized in those cases. Since with Tl-201 the normal right ventricle is barely or not visualized, good visualization of the right ventricle per se may indicate the presence of the pressure or volume overload of the right ventricle. Also, in patients with heart failure or cardiomyopathy, scintigraphy will provide objective criteria of hypertrophy and/or dilatation of the right ventricle.

Myocardial Imaging in Idiopathic Cardiomyopathy Using Thallium-201

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The purpose of this presentation is to evaluate the clinical validity of myocardial imaging using i.v. injection of Thallium-201 (^{201}Tl) in patient

with idiopathic cardiomyopathy.

23 cases of idiopathic cardiomyopathy (ICM), including 8 cases of hypertrophic obstructive type