Radionuclide Angiography and Blood Pool Scan with In Vivo Labeled $^{99m}$Tc-Red Blood Cells

Koichi Asakura, Yoshimi Ono, Eiji Otake, Morimichi Ujiiie and Takeo Nozawa
Department of Radiology, Yokohama City University School of Medicine

Procedures for in vivo labeling of red blood cells with $^{99m}$TcO$_4^-$ were studies. The labeling was done with the separately intravenous injection, first of stannous pyrophosphate (Sn-PYP) and then of $^{99m}$Tc perteceinate. Experimentally, the suited dose of Sn-PYP was 0.20 mg/kg(PYP) and 30 µg/kg(SnCl$_2$). The best time interval between two injections was 30 min. There was no significant difference in the efficiency of RBC labeling obtained using variety of $^{99m}$TcO$_4^-$. Clinically, labeling efficiency of RBC was about 96%, and labeling remained up to 120 min later. High quality images of heart, great vessels and peripheral vessels were obtained.

Diagnostic Value of Radionuclide (RN) Angiography Using $^{99m}$Tc-Human Serum Albumin in Orthopedic Surgery

Tsuneo Watanabe, Shun-ichi Inoue, Hitoshi Miyasaka, Noboru Arimizu, Michikazu Sohara and Johji Nagase
Chiba University Hospital, School of Medicine, Chiba University

To determine the malignancy of bone and soft tissue tumors, and to detect vascular obliterations, the contrast angiography is usually very useful. Our study revealed that RN angiography is also useful to diagnose such cases. We performed the RN angiography in 10 cases of replanted fingers and 12 cases of bone or soft tissue tumors. To trace the vascular condition of the replanted fingers, 20 mCi $^{99m}$TcHSA was injected intravenously. The serial dynamic images with intervals of each 10 seconds after injection were taken for 240 seconds, and finally static images were observed. With aid of the computer (CDS), the functional curve was displayed and analyzed on the region of interest. In 9 cases of tumors, the radio-nuclide was injected intra arterially, and intravenously in other 3 cases. In 10 cases of tumors the static images were comparatively analysed with the contrast arteriographies.

The RN angiography does not provide a detailed anatomical display which can be seen with conventional arteriography but it is very suitable to quantify the changes of vascular beds in tumors, such as pooling, hypervascularity and other malignant changes. It is also useful for serial follow up study in replanted fingers because of its non-invasive character.

It may be assertable that RN angiography using $^{99m}$TcHSA has advantages such as ease, no morbidity and possibility to take bilateral arteriography simultaneously.

Red Blood Cell Labelling Positron-angiography after RI-gas Inhalation

Tomoyuki Rikitake*, Yukio Tateno*, Ren Iwata*, Tatsuo Ido*, Keijiro Kimura** and Shizuo Hasegawa**

*National Institute of Radiological Sciences 9-1, 4-chome, Anagawa, Chiba
****Respiratory Department, Tsukuba University, Ibaragi

RI-angiography will be used more often in the near future, because it is simpler and less painful than roentgenoangiography. To put this examination in practice, labelling of red blood cell is
needed, but it is not easy. We made this study for the purpose of an exploitation of an easy labelling method to put RI-angiography in general practice. In this study, we investigated red blood cell labelling with inhaled ¹¹CO gas for RI-angiography.

The Positron-camera coupling with on-line computer (TOSBAC 3400), was made up from a gamma camera (TOSHCBA GCA-202) and a focal detector. Our co-workers made ¹¹CO gas using the $^{14}$N ($p, \alpha$) $^{11}$C reaction. The radiochemical purity of this RI-gas proved to be over 98%. Fifteen mCi of ¹¹CO was injected with one litre of air into a gas box connected to a respiratory circuit. Five volunteers of the co-workers inhaled the gas mixture by a single-breath method. The activity of ¹¹CO in the lung was counted with the positron-camera and recorded into the computer. These records were fitted to an exponential equation of $Y=A \cdot e^{-\lambda t}$. The mean value of $\lambda$ was 0.0314 (sec$^{-1}$). The uptake into blood flow at $t=20$ sec., calculated from an equation of $Y=100 \cdot (1-\frac{1}{1-e^{-\lambda t}})$, was 45.7%. The erythrocyte labelling ratio with ¹¹CO after inhalation was calculated from radioactivities in the plasma and the whole blood. The labelling ratio of these five volunteers were all over 97.9%.

After the inhalation studies, RI-angiography with the positron-camera were taken. These scintigrams showed a good resolution. We could distinguish main sinus of the head and two arteries of the forearm.

We could found a rapid and easy labelling method for RI-angiography using ¹¹CO gas inhalation and we could get RI-angiograms with a good resolution using a positron-camera. This combination method is safe and comfortable for patients because it is entirely noninvasive.

Combined Detection for Pulmonary Embolism and Venous Thrombosis of Lower Extremity Using $^{99m}$Tc Labeled Capillary Blockage

D. HAMANAKA*, Y. ISHII*, T. SUZUKI*, Y. YONEKURA*, T. FUJITA*, K. TORIZUKA* and K. KUMADA**

*Department of Radiology and Nuclear Medicine, **Department of Surgery, Kyoto University Medical School

In western country, venous thrombosis of lower extremity has been important cause of pulmonary embolism and its incidence is quite high. On the other hand, the incidence of pulmonary embolism itself is thought to be quite low in our country. Using capillary blockage for radionuclide venography (RNV) as well as lung scintigraphy, we attempted to investigate the relation between venous thrombosis and pulmonary embolism.

Fourty patients with a symptom of swelling of the lower extremity were investigated. About 10mCi of diluted volume of $^{99m}$Tc MAA or microsphere was introduced into dorsal vein, and standard RNV were taken concerning deep and superficial vein with or without application of tourniquet to the proximal site of ankle. Early dynamic images and late static images were taken, respectively, followed by the standard lung scintigraphy. Additional inhalation scintigraphy was done later, if it was necessary to differentiate pulmonary embolism with other diseases with a perfusion defect.

The criteria for the presence of venous thrombosis was as follow; 1) the presence of stenosis or defect with collateral circulation at the early dynamic images, and 2) the presence of hot spot formation at the late static images. A sole finding of the hot spot formation was evaluated to be false positive and twelve of seventeen cases with the hot spot at calf revealed to be false positive. According to this criteria, thirty five cases of all revealed positive findings, which located mostly in pelvic region (55%) and in popliteocalf region (44%). Twelve of all cases revealed the pulmonary embolism, half of these have not any symptom suggestive of this disease, nine of these were with positive RNV findings and remainder of two were with false positive finding at calf region.

In conclusion 25% of cases with venous thrombosis resulted in pulmonary embolism, which was