BASIC AND CLINICAL EVALUATION OF MOTION CORRECTOR, AND ITS APPLICATION TO LIVER IMAGING.

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Phantom Studies: Liver slice phantom containing 2 mCi of ^{99m}Tc was moved on the whole body scanning table simulating the respiratory motion in order to evaluate the effectiveness of the motion corrector (MC). Regardless of the collimator used, motion blurring of the phantom images could be clearly reduced with MC unless the objects moved within the field of view.

Clinical Evaluation: Two hundred ninety-one ^{99m}Tc-Sn colloid or -phytate liver imagings were recorded on X-ray films (291 cases), and Polaroid films (175 cases) using large-field-of-view gammacamera and MC. Motion corrected (MC(+)), and uncerrected (MC(-)) liver imagings were compared and analysed blindly. The effectiveness of MC was graded as follows; Grade 0 (not effective), Grade 1 (slightly effective), Grade 2 (clearly effective), Grade 3 (markedly effective). The most of the liver imagings showed no remarkable changes in liver size and shape, even when motion corrected. However, the sharpness of liver contour, and of defects and/or indentations became sharper and clearer. Small defects which were invisible on MC(-) imaging were detected with MC.

Forty percent of 175 MC(+) liver imagings on Polaroid films were Grade 2 and Grade 3, showed sharper and clearer images.

About 20 percent of 295 MC(+) imagings on X-ray films were Grade 2 and Grade 3. X-ray film imaging showed less effective motion correction than Polaroid film imaging.

The advantages of MC are ; 1) Require same imaging time as MC(-) imaging, 2) Simple to operate, 3) Economical, and compact device without an aid of computer, 4) usual i.v. dose is adequate for imagings.

The disadvantage of MC is that bone marrow images may be blurred in some cases of liver cirrhosis.

Conclusion: MC is quite useful in liver imagings.

COMPUTER PROCESSING OF IMAGES BASED ON DUAL-ISOTOPE TECHNIQUE

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A method of computer aided subtraction technique with simultaneous use of different radiopharmaceuticals labeled with two radionuclides was evaluated. Three sets of paired radionuclides were studied; 1) ^{99m}Tc and ^{75}Se for the subtraction image of pancreas, 2) ^{99m}Tc and ^{67}Ga for tumor imaging in the liver and 3) ^{99m}Tc and ^{131}I for simultaneous measurement of glomerular and tubular function of the kidney.

Simple glass phantom and organ phantoms are used for the evaluation of optimal setting of subtraction constant. Clinical usefulness of the method was also studied. LFOV gamma camera(Searl) and Scintipac 200 (Shimadzu) were used for imaging and subsequent data analysis.

The optimal window levels were set for each γ-ray spectrum to be measured. When maximum count rate in a single matrix in two different window setting was used for the calculation of subtraction constant(K) for each pair of radionuclides, the resultant images were distored or partially disappeared due to over-subtraction.

The alternative method was to set a ROI on the region where two radionuclides were present without overlapping on the other organ or phantom containing one of the radionuclides. For example, a ROI was set on a upper part of the liver where the pancreas may not overlap. The subtraction constant can be calculated by measuring count rate of the ROI in each window setting. The images obtained after subtraction using the K-value thus calculated revealed expected phantom images in each pair of radionuclides.

In clinical studies subtraction of ^{99m}Tc liver image from ^{75}Se pancreas image revealed clear visualization of the pancreas. The subtraction of ^{99m}Tc liver image from abdominal ^{67}Ga scan gave a evident delineation of metastatic tumor in the liver.

Organ scintigram based on optimal subtracting conditions with simultaneous use of two radioparmaceuticals should prove useful for the correct interpretation of the images.