Position Averaging Circuit for Toshiba Gammacamera

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PURPOSE

In measuring patients with Gammacamera, it is very important and troublesome to set the detector view field to the desired portion of a patient.

Usually the relationship between the portion and marks is taken using point sources such as ^{57}Co.

But the image of the point source is always accompanied with blur, and sometimes unable to be recognized as a mark among the image of organs.

Then with a idea that the position signals which indicate a point source have statistical fructuction, the distinct marks are recorded after averaging the position signals of a certain number of scintillations.

CIRCUIT

Position signals of X and Y axes sent from Gammacamera detector are made into deflection signals on CRT through integrators respectively.

After brightness signals are counted by a certain number of scintillations, a new brightness signal is sent to CRT.

These three kinds of signals indicate a mark with the averaged position which coincides with the position of a point source.

RESULTS

POSITION AVERAGING CIRCUIT has been developed as a adaptor of TOSHIBA GAMMACAMERA which is able to indicate a distinct mark of a point source without blur.

Isosensitive Scintigram Based on Subtraction Tecknique Using Two Radionuclides

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It is important for analyzing and processing scintigram data that distribution of radioactivity in the body is detected quantitatively, but the quantitative detection is difficult ordinarily because γ-ray is absorbed by the tissue and is attenuated by the distance. In the case of isosensitive-scanning where opposed two detector's scanner is used, distribution of radioactivity is detected independent of depth of activity. But in the case of scintiphotography with sciticamera, isosensitive image can not be obtained. It was aimed by authors to take isosensitive scintigram with scinticamera by the method where two radionuclides were used and subtraction between two nuclide images was performed so that attenuation due to distance and absorption by tissue could be corrected.

If two nuclides emitting γ-ray of different energies (or a nuclide radiating two γ-rays or more of different energies) concentrate in one organ, the relation of $N_{XH} - KN_{XL} =$ constant was found independent of depth of tissue, where N_{XH} is counting rate at arbitrary depth (X cm) of body, K is constant that depends on γ-ray energy as well as concentration ratio of two radio-nuclide activities in the organ. Thus subtraction technique using two radio nuclides is able to obtain isosensitive-scintigram.

The theoretical consideration was attempted based on the experiment performed with phantom, scinticamera (PHO/GAMMA III) and CLINICAL DATA SYSTEM ACCESSORY (CDS-4096). As tow radionuclides ^{99m}Tc and ^{198}Au were selected and infused into the phantom. When counting rate of ^{99m}Tc and ^{198}Au are equal, value of K is 0.8–0.9. The experiment results were demonstrated that isosensitive scintigram could be obtain by this method.

Minification of the Scanning Image and its Application on the High Speed Scanning of the Organ and Whole Body

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In order to improve the ability of conventional scanner minification of the photo image was added.

Shimadzu Scanner (SCC-130S) was modified to reduce the size 1:5 in length (1:25 in area).

Phantom study and many clinical application showed the following advantages.

1) When compared with conventional photo-recording (1:1), minification of the photorecorder did not spoil the resolution of the image. Because of the smoothing effect and increased statistics minified image could be read more easily with increased resolution.

2) By minifying 1:5 practically 20 times gain was able to be used for the increase in scanning of speed decrease in the radiopharmaceuticals or increase in statistitics of the image.

3) Conventional scanner was able to be used for the whole body scanning with high speed.

When compared with γ camera minified scanning technique showed following advantages or the static image and slow dynamic study.

1) Area covered by the conventional scanner with minified imaging (43 cm $\times$ 43 cm $=$ 1849 cm^2) is 3 times more than the field of view of the γ camera with parallel collimator.

2) This area (1848 cm^2) can be scanned in 7.5 min with 4 m/min speed and 6 mm spacing without spoiling the image with the dose of radioisotope such as 3 mCi$\sim$^{99m}Tc. In other words same area with γ camera can be visualized in 2.5 min.

3) Better resolution with focusing effect is obtained.

4) No distortion of the image is present.

5) No nonuniformity of the sensitivity is present.

6) Taking 3–4 full size images whole body image can be obtained with ease.

Data are presented to show the advantages of minification.