THE COMPUTER SYSTEM IN NUCLEAR MEDICINE AND ITS CLINICAL APPLICATION.

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The purpose of this paper is to describe our computer system (COSNM-TMGH) improved for the past five years and its clinical application. The hardware system is consisted of NOVA computer with 32Kw memory, magnetic tape(MT), magnetic disk (DISK), graphic terminal(CRT), color TV and plotter We have two types of operating system, that is, RDOS (real time disk operating system) and BICOMS. Using RDOS and FORTRAN language mainly, clinical application programs were developed. Four kinds of clinical application were perfomed. Firstly, RI-angiographies are performed in brain, thyroid, heart, liver, and kidney. In all cases of brain scan, cerebral RI angiogram was obtained with one second time interval for 60sec. In cardiac RI angiography, 60 frames of images were acquisited at the time interval of 0.5sec. In the hepatobiliary study by Tc-HIDA, initial 15 frames of image were obtained with one minute time interval, following 10 frames with 2 minutes and the last 5 frames with 5 minutes. Such three step data acquisition method was done in the examination required long measuring such as study of hepatobiliary and cerebral blood flow by ^{133}Xe. Secondarily functional image was generated and displayed on the color TV. Regional function of various organs such as brain, liver and so on was depicted in the difference of color. The third application of our system is to evaluate left vetricular performance by a high temporal resolution multigated imaging method. Different from the former two application where data was acquisited by image mode, in this third application, data sampling was performed by list mode and time sequential images were reconstructed. A volume cuve of LV was generated from these images and cardiac functional parameters were calculated. The forth application is a moving image system which made possible to move a time sequential image

In conclusion, about 80% cases of all examination were diagnosed using the computer system of COSNM-TMGH on lined γ- camera. Four types of application were discussed in this report.

STUDY FOR THE IMPROVEMENT OF SCINTILLATION CAMERA

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The intrinsic special resolution is an important performance parameter of scintillation camera. Main purpose of our study was to improve it by using the resister matrix position computer.

The parameters that determine the resolution, lenearity, and uniformity of the image are

1) The thickness of NaI crystal
2) The thickness, shape and material of light guide (L.G)
3) The energy resolution of photomultipliers (PMTs)
4) The threshold level of PMT signals.

We used 9.5 mm thick NaI crystal for good sensitivity for Tc-99m gamma ray and 37 of 2-inch diameter PMT with good energy resolution.

To estimate the best thickness of L.G, we used computer analysis. The calculation was done about two parameters, the thickness of L.G and the threshold level. From the calculation, we know it is possible to use thinner L.G to improve the special resolution without the degradation of linearity. And the threshold level must be decided so that it enable both the resolution and the lenearity to be in the optimum state.

The detector system we constructed for study had L.G of 30 mm thick, and it's threshold level was 4%.

As the result of our study, both the intrinsic special resolution and the energy resolution were improved. The special resolution was 4.4mm FWHM and energy resolution was 12.6% FWHM for 140 keV gamma ray of Tc-99m. And good uniformity and linearity have been obtained.