A Portable Scanner

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A easily removable, small sized and less weighed rectilinear scanner has been constructed. Generalized use of the new scanning agents, short lived lower energy gamma emitter, allows us to make a scanner smaller and simpler than ever.

Two inch thick, 2 inch diameter sodium iodide crystal with thin lead shielding gives lighted detector assembly. Three kinds of thin septal collimaters were home-made by the Harris' method. Resolutions and sensitivities of three home-made and a ready-made collimators were compared with each other by using the point and extended sources of several kinds of gamma energies. Tested KeV), ^{203}Hg (279 KeV), ^{131}I (364 KeV), and nuclides are ^{125}I (27, 35 KeV), ^{57}Co (122 ^{198}Au (412 KeV). Organ phantom scans suggested how to choose the collimator specifically for each case.

Several patients who were not able to transport to the scanner room were scanned. The myocardial scan with ^{131}Cs and the thyroid scan with ^{131}I were proved to be as good as the conventional scan. Though the liver and the kidney scan with ^{198}Au and ^{203}Hg respctively were not so good as the conventional scan, they were useful enough for the urgent purpose.

SCINTILLATION CAMERA

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After the 6 years experience on domestic 5″ crystal scintillation camera, we had a conclusion that this apparatuses will not be utilized clinically mainly by for its small crystal size. Recently another scintillation camera with 11.5″ crystal was set and used for clinical purpose. Some experience on this scintillation camera will be reported here.

SENSITIVITY:—The characteristics of this apparatus is its high sensitivity that lead to get dynamic scintigrams using mCi order of ^{99m}Tc.

On heart dynamics, the valuable scintigrams will be received serially with one second intervals on right side cavity of the heart and with 2—5 seconds intervals on left side. The right to left shunt is easily detectable, but the dynamics in left side is rather difficult to diagnose because its long bolus.

Renal dynamics will be detected by 3—5 second interval serial scintigram, they show aortic and renal patterns of ^{99m}Tc dynamics. On these organs the ^{131}I-hippuric acid scintigrams are also valuable to detect the focal function. In these organs, conventional scanner and renogram studies are also valuable.

It is difficult to detect brain dynamics by ^{99m}Tc but stational scintigrams of brain are clearly detectable within one minute exposure. Therefore multidirectional scintigrams are easily detected without patient loads. The details of scintigram by camera are sometimes more valuable than scanner's.

RESOLUTION:—Resolution by multihole collimater shows less accuracy compared with that of conventional scanner, but pinhole collimater's in short distance shows better results. Therefore thyroid scintigram is suggested by this apparatus.

Some large organs just as liver and lung are not adapted for camera usually, but on limited purposes these organs are also suggested to use camera. Sometimes we examine lungs by camera because the purpose of lung scintigram is gross distribution of radioisotopes in lung and not proposing small area.

Here we report on our experience of scintillation camera and we suggest that this apparatus must be popularity used on clinical purposes.

Scintillation Image Camera

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As the mechanical rectilinear scanners and scintigrams thus obtained become the more routine means of diagnosis, the more quick visualisation of the spatial distribution of radioisotope in human organs is requested widely by many specialists in the field of nuclear medicine. For the purpose of this, many types of gamma-cameras are being developed and some of them are now already used conventionally.

The new device of gamma-camera to be reported is based on the new ultrasensitive image intensifier, TOSHIBA multistage image tube M7064A, which is originally produced to see the objects in almost total darkness that naked eye scarcely percepts. The tube is a cylindrical electron tube, containing an input photosensitive suface and an output phospher screen at the onside of both ends, and is divided in five stages by four multoplying dynode films. Optical omage is focussed onto the photocathode and photoelectrons are liberated from each part of the photocathode in number corresponding to the brightness of the input image. The photoelectrons are accelerated up and focussed on the first multoplying dynode film. Whi na high energy primary electron enters the dynode film, many secondary electrons which are called transmission secondary electrons are emitted from the other side, and the multiplying factor of a single dynode of this tube is very excellent, as much as 8 to 10 times or more. After multiplication by four dynode films, an intensified final image electron stream strikes the phospher screen, thus producing a very bright output picture. The light flux gain factor of this tube ranges from 10^4 to 10^5. The resolution of image is quite excellent, more than 18 pairs of black and white bars per one millimeter width in an input surface can be resolved.

In our new gamma-camera, gamma-rays from the subject pass through a heavy metal collimator into the fluorescent plate or scintillator and make an image of the distribution of gamma-ray emitter in the subject. Through an optical lens system, the image is focussed on the input surface of the tube, and the final image that are multiplyed in the tube can be recorded with a polaroid camera or a 35 mm camera.

The final image, however, is bright enough to be taken in the photograph, but in the case that the distribution of gamma-ray emitter chages so quickly or TV camera is employed instead of photographic camera, the image is too dark to be recorded.

In order to make up for the darkness, one more image tube is coupled with a tandem lens system. And the significant intensification of 10^7 to 10^8 has been obtained, and made it possible that very quick changings of RI distribution are recorded on the video tape recorder.

The outline of specifications is as follows;