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

S. KURIHARA, N. KUMANO, M. SANO, M. KASHIWAZAKI and S. MIYASHIRO
Medical Appliance Engineering Department, Tokyo Shibaura Electric Co., Ltd.

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;

(1) Multihole collimator

	Λ	B	C	
Nominal maximum gamma-raye nergy	0.20	0.36	0.41	MeV
Material	W	Pb	Pb	
Hole length	2.5	5.6	6.6	cm
Hole diameter	0.31	0.49	0.82	cm
Septum thickness	0.08	0.23	0.4	cm
Number of holes	4681	1573	559	
Λrea of view (in dia)	27	30	30	cm

(2) Fluorecent plate: zinc sulfate, 30 cm in dia
NaI (Tl) scintillator: 11″1/2 in dia, 1/2″ in thickness
(3) Objective optical lens: 4:40 mm F:0.95
(4) Multistage image tube: TOSHIBA M7064A
(5) Tandem lens: f:50 mm F:0.95 × 2
(6) TV camera: 1″ videcon with tandem lens
Video tape recorder and TV moniter are equiped.

Conclusion

1. Based on the ultrasensitive multistage image tube produced in the TOSHIBA Co., new sensitive gamma-camera was designed and evaluated.
2. This camera has its advantage in the freedom of design. Since original image is coupled optically on the onput surface of the image tube. Either sensitive crystal or inexpensive fluorescent plate can be used as the gamma-rays to light transfer material.
3. Phantom study revealed good resolution and sensitivity of this new vamera.
4. Animal and clinical application are reported.

Multistage Image Tube γ Camera Device and Radioisotope Angiography

H. Ueda, M. Iio, Y. Sasaki and Y. Sugishita
The Second Department of Medicine, University of Tokyo, Tokyo

A new and simple γ-ray camera employing a couple of multistage image tubes as the intensifier with external NaI (Tl) crystal as the detector was introduced in 1967 by authors.

The 11½-inch-diameter crystal was coupled optically to the specially developed ultrasensitive image intensifier tube, Toshiba multistage image tube M-7064-A. This tube was originally designed for use as a dark image intensifier which naked eye scarcely percepts. When a γ-ray interacts with the crystal, light is emitted and is projected on the input end of the tube through the optical lens system. This light in turn causes photo-electrons from each part of the photocathode corresponding to the brightness of the input image. After intensifications by four multiplying dinodes these electrons are focussed onto an output screen with the light flux gain of 10^4 to 10^5.

This multiplying process is repeated by the additional second tube with resultant gain factor of 10^8 to 10^{10}. Thus each γ-ray that interacts with the crystal produces several thousand photons at the output screen, which is recorded on videotape recorder for further analysis.