

Evaluation of Performance of Focused Collimator Available by Japanese Manufacturers

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According to the scheme developed by G.J. Hine, IAEA, geometrical specifications of focussed collimators currently produced and used widely in Japan were evaluated.

Collimators examined were the products from the three companies, Shimadzu, Toshiba and Aloka. Four collimators from Shimadzu, 5 collimators from Aloka and 4 collimators from Toshiba, were examined and described by three parameters using two sets of line-source (^{131}I and ^{141}Ce) in the air.

The application of this method to the com-

mercially available focused collimators turned out to be of the general usefulness, because this project allowed a first direct comparison of Japanese collimators each other. Several collimators were found to have severe septum penetration for ^{131}I source. Probability of improper design of the lead shield as a cause of the severe septum penetration is now also being examined.

Presentation of the results were made as a part of the extensive survey operated by the Agency for the presently available collimators.

Clinical Application of Catheter-type Semiconductor Radiation Detector

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Since 1965 catheter-type semiconductor radiation detector (CASRAD) has been developed and applied for the medical use by the authors. The development of the detector and its application to circulation study in dogs were reported in this meeting previously. Recently the CASRAD probe has been further reduced in size so that it is able to be inserted into human heart through the cubital vein with ease and safety. Purpose of this paper is to present the application of CASRAD for the measurement of coronary blood flow in man and detection of gastric cancer.

1. Measurement of coronary blood flow

A CASRAD probe of which diameter is 2.7 mm (CASRAD TCK Type-2) was inserted into the coronary sinus through the cubital

vein. After the injection of ^{85}Kr saline solution in the left ventricle through cardiac catheter, radioactivity of ^{85}Kr washed out from the myocardium was detected by CASRAD probe. The clearance curve was analysed and myocardial blood flow per 100 g of myocardium was obtained. The validity of this method was examined *in vitro* using flow model before applied to clinical cases, in which good agreement between actual flow values and calculated flow values were shown when adsorption of ^{85}Kr by the detector surface was subtracted. Coronary blood flow measured in 4 control cases, twice in each case. The obtained coronary blood flows were 105 ml/1500g/min. (141 when repeated), 78(85), 128(117) and 85(75) which showed good reproducibility.

II. Detection of gastric cancer

A CASRAD probe of 2.5 mm diameter (CASRAD-G) was used in combination of a gastrofiberscope. The detector is inserted into a gastrofiberscope orifice designed for biopsy forceps.

About 20 hours after intravenous administration of ^{32}P sodium phosphate (300-400 μCi), the accumulation of ^{32}P in the tissue was measured by CASRAD probe. More than 50%

increase in counting rate over control area was regarded as positive, less than 20% increase as negative and 20 to 50% increase as indefinite.

Four out of 7 gastric cancers examined under direct vision were positive and other three were negative. However 7 out of 9 cases examined on resected specimen were positive. Some improvement in technique for the detection under direct vision is being performed.

A Variable Focus Zoom Collimator

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Collimators for isotope scanning now available have a fixed focus. This is to report on a zoom collimator having adjustable focus, made of layers of lead rings. The gap between each ring can be increased or decreased to extend or shorten the focal distance. The adjusting of focal distance is possible in the

practically available range, without the significant loss of efficiency or sharpness of image. Penetration of unnecessary gamma-rays can be prevented by using a suitable thickness of lead layers for the gamma-ray used as the ordinary collimator. One touch adjustment of the focus would save the time of interchange.

Radiometric Assay of Radioactivity Especially the Nuclide Obtained from Radioisotope Cow

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Since the use of daughter-nuclide obtained from radioisotope cow, radiometric assay of radioactivity became important and indispensable. For the assay, methods by absolute counting of radioactivity, by calculation based on the gamma-ray dose rate or by comparing with standard source are included. Of these, we recommend the method of calculating the radioactivity based on the specific gamma-ray constant or rhm value for the use in general hospital because of its simplicity and accuracy. In this calculation, rhm value of each nuclide as well as spectrum characteristic and reliability of dosimeter must be taken into consideration. For the calculation of rhm value (D) detailed knowledge of decay

scheme is needed. The rhm value can be calculated as $O = 19.4 (k_1\mu_1E_1 + k_2\mu_2E_2 + \dots)$ [mR/hr.mCi at 100 cm], provided E is γ -ray energy, k is emission ratio of γ -ray and μ is energy mass absorption factor. For the calculation it is necessary to consider internal conversion factor and K-electron capture, but X-ray less than 100 keV must be excluded for calculation of rhm value. The rhm values of $^{113\text{m}}\text{In}$ and $^{99\text{m}}\text{Tc}$ were calculated to be 0.15 mR/hr.mCi at 100 cm and 0.078 mR/hr.mCi at 100 cm and 0.078 mR/hr.mCi at 100 cm. Ionization type of surveymeter is most suitable as a dosimeter because of its good quality characteristic, but other types of surveymeter such as GM type or scintillation type are not