Le faisceau est finement collimaté; la détection du rayonnement diffusé est effectuée à 90° grâce à un collimateur focalisé sur la ligne d'irradiation aux énergies de 195 à 244 keV. Le plan tomographique est construit par le déplacement synchrone du détecteur et du pinceau d'irradiation au niveau d'un plan déterminé chez le patient par le positionnement de l'ensemble.

Après des essais sur fantômes, l'application clinique fut réalisée chez 40 patients présentant des affections pulmonaires diverses.

RESULTATS

La résolution spatiale est de 6 mm (largeur à mi-hauteur) pour des coupes de 10 mm d'épaisseur moyenne et la résolution en densité est de 2%. Les images tomographiques obtenues permettent une bonne analyse de la distribution des densités pulmonaires normale et pathologique, même en l'absence de compensation des phénomènes d'atténuation.

GAMMA-GAMMA-COINCIDENCE SCINTIGRAPHY: TOMOGRAPHY WITHOUT COMPUTERIZED IMAGE RECONSTRUCTION

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Radionuclides emitting two or more gamma rays per decay such as ^{43}K, ^{48}Cr, ^{73}Se, ^{75}Se, ^{178}Ta, ^{192}Ir, ^{196}Au and ^{202}Tl allow direct three-dimensional scintigraphy by gamma-gamma-coincidence measurements without computerized image reconstruction. Two systems based on this method were designed.

A scintillation camera was coupled to two horizontal detectors in opposite arrangements. The latter consist of two 15X15X5 cm^3 NaI(Tl) crystals, each with a focusing tungsten slit collimator at a distance of 24 cm. The collimator parameters were optimized by computer programs. At the horizontal centre of the system, the FWHM of the point spread function in vertical Z-direction amounts to 2.5 and 3.2 cm in water, with and without energy discrimination

respectively. A maximum coincidence count rate of 4.4% was obtained, compared with the normal camera mode, for a ^{75}Se point source in the centre of a 30X17X15 cm^3 water phantom.

In order to compensate for the reduction of efficiency in this system, the use of pinhole collimators for the camera will be indicated.

The applicability of the camera system may be limited for imaging large organs because the distance between the two horizontal detectors is too large. Therefore a 3-D scanner was developed to overcome these limitations.

Seven 12.7 cm Φ X 5 cm NaI(Tl) detectors are coupled to long focusing hole collimators and inclined towards each other so that they focus on a common point. Using every combination of two of these seven detectors in coincidence ($\binom{7}{2}$ pairs), a coincidence count rate of 4.8% was reached, compared with the normal scanner mode, for a ^{75}Se point source in 6.5 cm water. In addition to the vertical depth discrimination (FWHM of the point spread function 2.0 cm in water) there is a resolution improvement in horizontal direction (FWHM of the point spread function in water 1.2 cm instead of 1.7 cm).

Several phantom studies were undertaken with both systems.

THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF 3-D IMAGING WITH COMPLEX CODED APERTURES*

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The feasibility and performance of imaging gamma-emitting extended objects by means of coded apertures have been investigated both theoretically and experimentally [1–3]. This imaging technique offers the following advantages:

1. Formation of 3-D images.
2. No correlation between geometric efficiency and spatial resolution.

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