INTRODUCTION

Among the various radiopharmaceuticals which serve as a measure of "in vivo" metabolism, there exist two noble radioactive gases, Xe$^{133}$ and Kr$^{81m}$ which fulfil the most of the requirements to examine lung dysfunction. Of course, these two radionuclides can not entirely substitute the vital behaviour of the short lived positron emitters as O$^{15}$, N$^{13}$ and C$^{11}$. But Xe/Kr-ventilation examinations do not need sophisticated systems for radionuclide production such as cyclotrons sited close to the patient. Only a γ-camera, a spirometer and a suitable free programmable, interactive computer system are necessary.

By performing both Xe$^{133}$ and Kr$^{81m}$ ventilation scintigraphy in the same group of patients we observed different lung ventilation patterns. This is due to: 1. application technique and 2. the nature of lung diseases.

METHOD

The Xe$^{133}$ inhalation technique. This technique combined with the 3P-BIS (single breath (SB), equilibrium (E) and wash-out (WO)), is a technique which was developed in the Clinic of Nuclear Medicine of the Technical University of Munich (1). The patient breaths the Xe-activity at residual lung volume by bolus inhalation. It follows the equilibrium phase with activity distribution also to the hypoventilated departments of the lung. Two min after inhalation begins the well known wash-out phase (2). One of the benefits of the 3P-BIS lies in the registration of the SB-Phase in absence of background activity.
Fig. 1. 3P-BIS technique. 1st row: Restrictive ventilation abnormality accompanied by Xe-trapping. 2nd row: Xe-trapping by homogeneous activity distribution in SB and WO-phases. 3rd row: Overt inflation and Xe-trapping at same lung side. Homogeneous distribution in the AE-phase. 4th row: Normal lung ventilation in all three phases.

The $\text{Kr}^{81m}$ ventilation technique. Krypton is continuously delivered by the $\text{Rb}^{81}/\text{Kr}^{81m}$ generator. The method is the same as published by Fazio et al (3). A gas flow-rate of 250 ml per sec generates count rates of 100,000 c/min. This permits preparation of scans in 4 projections with an optimal signal-to-noise-ratio. Because of its very short half-life mobilizing volumes as VC can not be obtained by sequential or function scintigraphy.