Xenon Inhalation Studies

Edward J. Beaulieu, Jr.

Cardinal Cushing General Hospital, Brockton, Massachusetts

We have developed a simple technique for performing xenon studies which we feel may be of value to other community hospitals.

The equipment used is all commercially available. Figure 1 shows our apparatus, which consists of:

1. disposable mouth pieces
2. flexible tubing with 3/4-in. inside diameter
3. xenon gun
4. gas inlet
5. stopcock
6. T-shape stopcock
7. Hans Rudolph valve
8. 15-liter equilibration bag
9. 4-in. flexible tubing connected to separate venting system to roof
10. nose clamp (not shown)
11. lead apron.

The lead apron is positioned around the rebreathing bag to cut down the radiation exposure to technical personnel performing the study. The 15-liter rebreathing bag is filled with approximately 10 liters of oxygen. We have found that a 5-liter bag does not contain enough oxygen for adequate equilibration. The patient is usually in a sitting position with both lungs within the field of view of a diverging collimator. The camera is then peaked for ^{133}Xe.

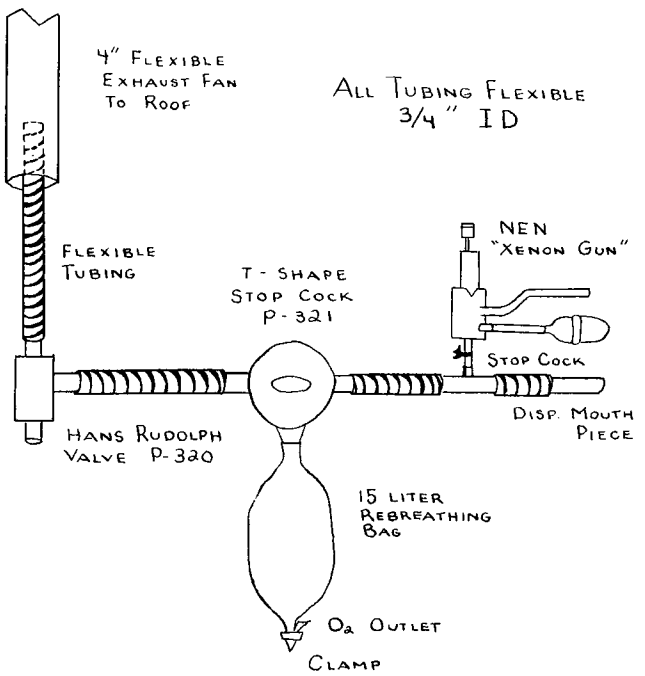

FIG. 1. System used for xenon inhalation studies.

After the patient's nose has been clamped so that he can breathe only through his mouth, he is instructed to breathe through the mouthpiece with the T-shape stopcock set to room air. Care must be taken to insure that there are no air leaks around the mouthpiece.

After the patient has been acclimated to breathing through the mouthpiece, the T-shaped stopcock is turned to oxygen. On a deep inspiration, the ^{133}Xe gas in the xenon gun is introduced into the gas inlet and the patient is instructed to hold his breath for 15 sec. At this point, the camera is started counting, and a 35-mm camera is started taking sequential 15-sec images. At the same time, the other scope of the camera is imaged with a Polaroid 3 lens camera. The first exposure is 15 sec and succeeding exposures are 1 min. After the 15-sec breath hold, the patient rebreathes the ^{133}Xe and oxygen mixture for 3 min. This has given us adequate equilibration. At the end of equilibration, the T-shaped stopcock is again turned to room air and the xenon gas is expelled through the venting system. The procedure is now in the washout phase, which normally requires 3 - 4 min to complete except for lung areas that trap gas. When the procedure is completed, the 15-liter rebreathing bag is vented through the venting system. This technique works well and is economically feasible when the number of inhalation studies performed is not overwhelming. With a higher patient load, the advisability of a crusher system using glass ampules with curie levels would have to be evaluated.

For reprints contact: Edward J. Beaulieu, Jr., 261 Spring Street, Brockton, Mass. 02401.