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From Regulation increases pressed (CAO, higher range severe (mm (40%)
PAP

patients were measured before and after 6 months of continuous low-flow oxygen therapy in 6 patients. There was a significant decrease (P < 0.05) in PAP (40 ± 5 to 30 ± 3 mm Hg) and pulmonary arterial resistance index (900 ± 134 to 651 ± 65 dynes.cm⁻²), and a significant increase (P < 0.05) in RVEF (35.7 ± 9.0 to 57.7 ± 11.4) after oxygen.

For correlation of RVEF with PAP, 35 patients with severe CAO were studied. In 14 normal men, radio-nuclide-determined RVEF averaged 57% with a normal range (25D) of 51 to 64%, and systolic PAP averaged 17 mm Hg (12 to 22 mm Hg). In patients with severe CAO, RVEF did not correlate with systolic or mean PAP (r = 0.44 and 0.32 respectively). Fourteen patients (40%) had depressed RVEF (27 ± 28), and the systolic PAP in this group (51 ± 4 mm Hg) was significantly higher (P < 0.001) than the systolic PAP (40 ± 2 mm Hg) in those with normal RVEF (58 ± 18).

Results suggest that in severe CAO, RVEF is depressed in most patients with a history of DCP and RVEF is normal without a history of DCP. Ousain fails to alter significantly RV performance even when RVEF is depressed, whereas chronic low-flow oxygen therapy increases RVEF probably by decreasing RV afterload. RVEF does not correlate with PAP.

Radioisotope Scintigraphy for the Study of Dynamics of Amine Regulation by the Human Lung


Although it is well established from animal perfusion studies that the lung can remove and deactivate circulating vasoactive amines, the significance of this possible regulatory function and its relationship to lung disease, drug therapy and anesthesia has been difficult to determine in humans largely due to the lack of a safe, noninvasive technique for such an evaluation. We have sought to use suitable tracer molecules labeled with radioactive nuclides which decay by the emission of radiation which can be detected outside the body barrier as a probe for this aspect of lung metabolism both in animals and humans.

MATERIALS AND METHODS

Exploratory studies were carried out using tryptamine-HCl-

1C-5-HT (14C-OA) synthesized as previously detailed and 5-

hydroxytryptamine-HCl (erythamine-14C) respectively.

Carbon-11 is a short-lived (t1/2 = 20.4 min) isotope of carbon which decays by positron emission resulting in the production of two 511-kev annihilation photons. The in vivo distribution of radioactivity following the injection of a carbon-11 labeled tracer can be imaged and the relative change in radioactivity determined by using a scintillation camera as these photons traverse the body barrier. The safe use of such tracers in humans is possible because the short half-life and exceedingly high specific activity (ca 2000 Ci/mmol) of the labeled amines results in a very low radiation dose and eliminates "drug" induced alterations in metabolism.

All of New Zealand rabbits of either sex (4-6 kg), anesthetized with thiopental (Nurital) (1.1 mg/kg) were injected in a marginal ear vein and female mongrel dogs (18-25 kg), anesthetized with sodium pentobarbital (35 mg/kg), were injected in a leg vein with 2-8 mCi of either 14C-OA or 14C-

5-HT dissolved in 0.9% saline solution while positioned under a gamma camera fitted with a pinhole collimator. Data were collected from the time of injection to 20-40 minutes post-injection. Regions of interest assigned for dynamic studies included lung areas, liver, kidneys, whole chest or whole body. The percentage of the injected radioactivity which was sequestered by the lung was determined by assigning the activity in the entire field of view as the bolus moved through the chest area as a percent of the injected dose and calculating the percent of uptake at 30 seconds in the lung and other organs based on this value. Numerical data from all dynamic studies were corrected for isotopic decay.

Human studies were initiated utilizing 14C-OA in normal healthy volunteers injected IV with 3-4 mCi while positioned under the gamma camera such that the entire upper torso was in the field of the camera. Blood samples were withdrawn and 14C measured continuously and a urine sample taken at the end of the 30-minute study.

RESULTS AND DISCUSSION

Both 14C-OA and 14C-5-HT show a very high lung uptake (ca 50% or more of injected dose) after IV injection in both rabbits and dogs. With both of these amines, the initial lung removal appears to be mainly dependent upon pulmonary blood flow. With 14C-OA, the clearance of activity from the lung results in a subsequent accumulation of activity in the liver and excretion as 14CO₂ (resulting from initial deamination by monoamine oxidase (MAO) followed by CO₂ oxidation) while 14C-5-HT metabolites are excreted through the kidney into the urine. Attempts are in progress to determine the effects of inhibitors of MAO such as pargyline and clorgyline on the overall rate of clearance of radioactivity from the lung. Preliminary results indicate a decrease rate of clearance of 14C-OA from lungs in dogs treated with pargyline (25 mg/kg) and these

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Figure 1. Sequential images of the upper torso of a human volunteer (control patient) after the injection of 3.5 mCi of $^{14}$COA. An external standard (lower right) is visible in some of the frames.

Figure 2. Distribution of radioactivity as a function of time measured dynamically after the injection of 3.5 mCi of $^{14}$COA.

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Radiographic, Hemodynamic and Clinical Comparison of Pulmonary Venous Hypertension Complicating Acute Respiratory Failure in Severe Chronic Airway Obstruction

Roger C. Bone, M.D., F.C.C.P.; John R. Goheen, M.D.; and William E. Ruth, M.D., F.C.C.P.

A difficult problem in clinical medicine is detection of left ventricular failure in the presence of significant obstructive lung disease. Usual clinical findings and roentgenographic criteria of heart failure may be altered by the presence of severe underlying pulmonary disease. A variable incidence of left ventricular failure in patients with chronic airway obstruction has been reported by several authors, but most reported measurements were done in stable or ambulatory patients. The most relevant clinical situation is the acutely ill patient who presents in respiratory failure. In this particular setting, the detection of any element of left ventricular failure as a contributing factor to hypoxemia is especially important. The present investigation compared radiographic and clinical findings of pulmonary venous hypertension with actual hemodynamic measurements in patients with severe chronic airway obstruction and acute respiratory failure to determine whether there were radiographic or physical findings which could be used to evaluate left ventricular failure. Although there may be some theoretic objections to the use of pulmonary capillary wedge pressure (PCWP) greater than 15 mm Hg as the index of left ventricular dysfunction (or failure), in patients with significant change in lung architecture, it remains the only readily available clinical tool for establishing the occurrence of left ventricular failure (LVF). Patients with PCWP < 15 mm Hg were considered to have adequate left ventricular function. Also, one may obtain an inaccurate PCWP when intra-thoracic pressure changes are large. These patients were excluded from analysis.

Table I—Hemodynamic Measurements in Patients with Acute Respiratory Failure Complicating Severe Chronic Airway Obstruction

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<tr>
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<th>Group 1 (15 patients)</th>
<th>Group 2 (7 patients)</th>
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<tbody>
<tr>
<td>Pulmonary artery pressure* (mm Hg)</td>
<td>23 ± 8</td>
<td>40 ± 9</td>
</tr>
<tr>
<td>Pulmonary capillary wedge pressure (mm Hg)</td>
<td>8 ± 2</td>
<td>18 ± 3</td>
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*Mean value ± standard deviation

**From the Department of Internal Medicine, University of Kansas Medical Center, Kansas City. Supported in part by grant No. 173701 from the National Institutes of Health and Hospital Research Grant No. 71227.

Reprint requests: Dr. Bone, Division of Pulmonary Disease, University of Kansas Medical Center, Kansas City, Kansas 66103