myeloid metaplasia have revealed very bizarre individual variations suggesting marked variations in this syndrome.

Discussion. Direct study of carbohydrate metabolism of human platelets through fractionation of glycolytic intermediates revealed important differences as between fresh normal platelets, stored normal platelets, and the platelets of individuals with certain hematologic disorders (Fig. 7). (Individual variations have occurred and may be explained by variation in differences in hematologic syndromes.)

Comparison of carbohydrate intermediates from fresh normal and stored normal platelets revealed that storage resulted in a decrease in total amount of extractable esters. This suggested a leakage of phosphorous from platelets to plasma. The simultaneous increase in ADP with its marked increase in specific activity as compared with MHP suggested that stored platelets had undergone a qualitative metabolic change. Changes in specific activity of the various fractions indicated a qualitative change in this cycle. The striking qualitative and quantitative variations from normal values in platelets of chronic granulocytic leukemia suggested the possibility of an abnormal carbohydrate metabolism. Of particular interest was the increase of inorganic phosphorous and the presence of several unidentified fractions.

Summary. Presence of active degree of carbohydrate metabolism and identification and separation of some intermediates of this system has been directly demonstrated in human platelets. The use of radioactive phosphorous to determine specific activity of some fractions has yielded important additional data. Preliminary studies have indicated quantitative and qualitative alterations in carbohydrate metabolism during storage of normal platelets and particularly in platelets obtained from certain hematologic disorders, notably chronic granulocytic leukemia.

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Dye-Dilution Curves from Left Heart and Aorta for Localization of Left-to-Right Shunts and Detection of Valvular Insufficiency. (22994)

EUGENE BRAUNWALD, HERBERT L. TANENBAUM AND ANDREW G. MORROW
(Introduced by Robert W. Berliner)
National Heart Institute, Bethesda, Md.

The precise localization of left-to-right shunts whether intra- or extracardiac, may sometimes be difficult or even impossible with conventional diagnostic technics. A similar problem is presented in the detection of mitral or aortic valvular insufficiency. Dilution curves recorded from a peripheral artery following injection of indicator into a peripheral vein, the right heart, or pulmonary artery are helpful in establishing the presence of a left-to-right shunt(1). They are of relatively little value, however, in determining its precise location(2).

The technics for catheterization of the left side of heart(3,4,5) and of the central aorta (6) have made possible the injection of an indicator into the left atrium, left ventricle, and various sites in the aorta. Dilution curves obtained from these injection sites have been recorded in patients with various types of left-to-right shunts or valvular insufficiency.

Methods. Left heart catheterization was usually performed by the transbronchial route(5). In several patients the catheter was passed into the left heart retrograde from

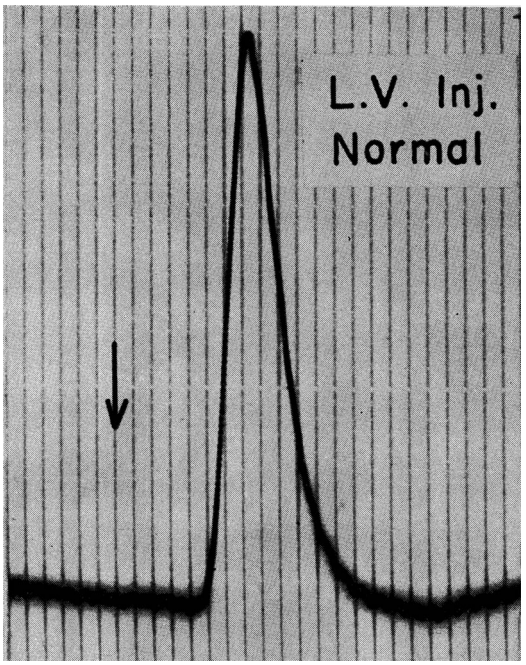

FIG. 1. Dye dilution curve following inj. of Indigo Carmine into ascending aorta of patient with aortic stenosis but without either aortic regurgitation or a left-to-right shunt. Arrow indicates instant of inj. Time lines equal 1 sec.

a peripheral artery. In patients with interatrial communications the catheter was passed via the saphenous vein, through the defect and into the left heart. Central aortic catheterization was performed through a No. 12 thin-walled needle introduced percutaneously into the femoral artery, or via the surgically exposed right ulnar artery. The indicator used was either Evans Blue or Indigo Carmine(7). A cuvette densitometer* was employed in conjunction with a photographic cathode-ray recorder for continuous recording of dye concentrations from femoral artery.

Results. In the absence of any left-to-right shunt, or of valvular regurgitation on left side of heart, the rapid injection of an indicator into the left atrium, left ventricle or thoracic aorta yielded a primary curve with a sharp rapid ascent and a slightly slower descent (Fig. 1). When the injection was made proximal to the site of a left-to-right shunt, that fraction of the indicator which passed through the pulmonary circulation distinctly interrupted the smooth, rapidly descending limb of the primary curve with an abrupt decline in rate of fall in concentration. However, when the indicator was injected distal to site of shunt a normal curve was obtained (Fig. 2). Thus, by selectively injecting the indicator into various sites the location of the left-to-right shunt could be

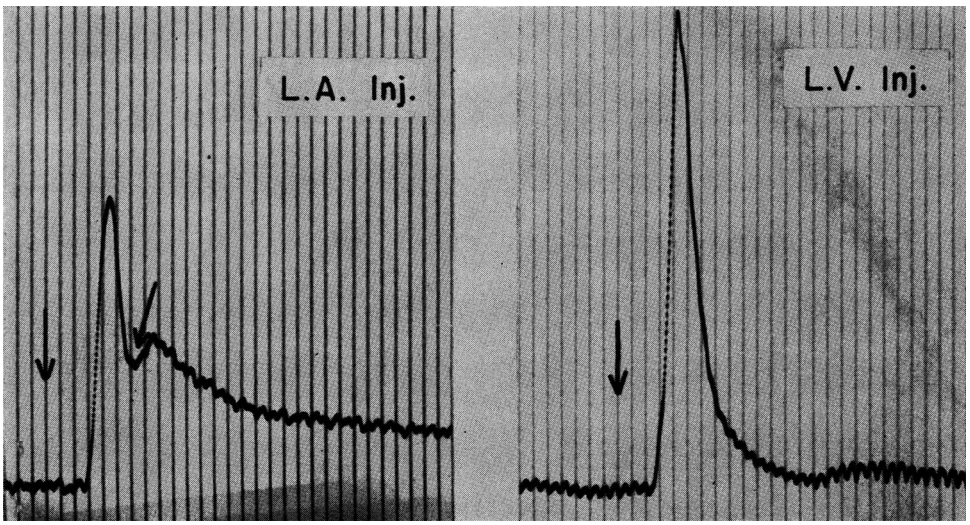

FIG. 2. Dye dilution curves in patient with uncomplicated interatrial septal defect. Curve on the left resulted from left atrial inj. and shows presence of a left-to-right shunt (oblique arrow). Curve on the right was into the left ventricle and is normal.

* Colson Corp., Elyria, O.

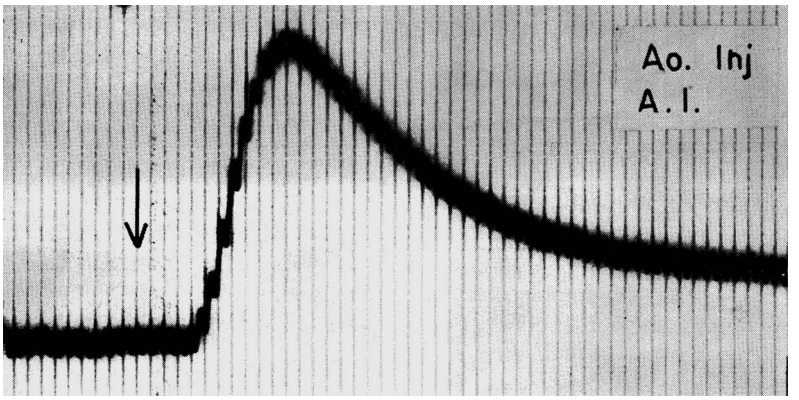

FIG. 3. Dye dilution curve following inj. into the ascending aorta of patient with aortic regurgitation.

precisely determined.

When the injection was made immediately distal to an insufficient valve, a portion of indicator washed back and forth. This resulted in a dilution curve with rapid ascent but a distinctly prolonged, generally smooth uninterrupted descent (Fig. 3).

Thirty-three patients have been studied to date. No complications have resulted from the left heart or arterial catheterizations. The technic has proved particularly useful in distinguishing between: 1) interventricular septal defect and aortic septal defect; 2) aortic septal defect and patent ductus arteriosus; 3) aortic valvular disease and ruptured aneurysm of sinus of Valsalva; and, 4) aortic insufficiency and pulmonic insufficiency. Another application has been in the determination of the presence or absence of an interventricular septal defect or of mitral insufficiency in patients with known interatrial septal defects, *i.e.*, establishment or exclusion of the diagnosis of a common atrioventricular canal. In patients with anomalous pulmonary venous drainage the presence or absence of an interatrial septal defect has been determined.

Summary. A technic is described which makes possible the precise localization of left-to-right intra- or extracardiac shunts and the detection of aortic and mitral valvular insufficiency. An indicator dye is rapidly injected into chambers of the left heart or aorta and a dilution curve is recorded from a peripheral artery. The method has been applied in 33 patients and has proven of diagnostic value.

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