Effect of Transseptal Left Atrial Puncture upon Cardiac Output

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Left heart catheterization has been performed by a variety of technics over the years, most frequently by transbronchial left atrial puncture, posterior percutaneous left atrial puncture, retrograde left ventricular catheterization, percutaneous left ventricular puncture, and more recently transseptal left atrial puncture. Physiologic effects of the first two technics have been reported. The purpose of this paper is to describe the effect of percutaneous femoral vein transseptal left atrial puncture upon indicator-dilution cardiac output determinations.

Methods and Materials

One hundred fifty-seven comparisons of cardiac index, mean transit time, and "pulmonary" blood volume were made in subjects with predominantly rheumatic heart disease. A few studies were performed in patients with congenital heart disease (without shunts), or in individuals who were subsequently shown to be free from heart disease. Pulmonary artery catheterization was performed via the upper extremity in the usual fashion. The brachial or femoral artery served for systemic arterial cannulation. Left heart catheterization was performed by percutaneous femoral vein transseptal left atrial puncture, with Teflon radiopaque catheters. Systemic arterial indicator-dilution curves with indocyanine green were recorded via a Gilford densitometer with a Harvard constant infusion-withdrawal apparatus. Indicator-dilution curves were recorded on an 8-channel photographic recorder from a systemic artery after pulmonary artery dye injection just prior and subsequent to transseptal left atrial puncture. Cardiac index, mean transit time, and pulmonary artery to femoral artery blood volume were calculated from these curves. One hundred and five studies were made in patients with sinus rhythm; an additional 52 subjects with atrial fibrillation were examined.

Results

The data are presented separately for subjects with sinus rhythm and atrial fibrillation, respectively. In the former group of 105 subjects the mean cardiac index, transit time, and "pulmonary" blood volume are 2.71 L./min./M.², 14.5 sec., and 1,045 ml. before, and 2.79, 14.3, and 1,058 after left atrial puncture, respectively. These differences are of little or no physiologic import but the cardiac index difference is significant, 0.01 > p > 0.001. The differences in transit time and blood volume are not significant, 0.4 > p > 0.3 and 0.2 > p > 0.1, respectively. In the 52 patients with atrial fibrillation the mean cardiac index, transit time, and "pulmonary" blood volume are 2.01 L./min./M.², 21.2 sec., and 1,126 ml. before, and 2.03, 21.1, and 1,120 ml. after left atrial puncture, respectively. None of the differences in these means (0.5 > p > 0.4, 0.9 > p > 0.8, and 0.7 > p > 0.6, respectively) is significant. The distributions of the variations in these parameters demonstrated a random dispersion about the zero points. The detailed data have been omitted to conserve space, but are available on request.

Discussion

A previous report by Samet et al. demonstrated that a steady state may be achieved during combined right and left heart catheterization (the latter by the posterior percutaneous left atrial puncture technic) as compared to right heart catheterization both at rest and during exercise. Morrow et al. have presented comparable observations in the course of transbronchial left heart catheterization. Despite the widespread use of the transseptal left atrial puncture technic in recent
years, no data have been presented to determine whether the basal state is disturbed by atrial septal puncture. Since it is generally agreed that interpretation of the meaning of an atrioventricular valve diastolic or semilunar valve systolic pressure gradient depends in part upon the blood flow across the valve, the data in the present study bolster confidence in the validity of pressure and flow measurements obtained after transseptal left atrial puncture. Unlike the hemodynamic observations after posterior percutaneous left atrial puncture (which required a period of 30 to 40 minutes to permit achievement of a steady state), and unlike the measurements made after transbronchial left atrial puncture (which require removal of the bronchoscope to permit development of a steady state), steady state pressure and flow measurements may be made within 5 minutes after transseptal puncture. Various physiologic observations may therefore readily be performed after transseptal left heart catheterization.

Summary
Comparisons of cardiac index, mean transit time, and "pulmonary" blood volume were made with indocyanine green dilution curves before and after transseptal left atrial puncture in 105 patients in sinus rhythm and 52 with atrial fibrillation. The results demonstrated that the steady state was not disturbed by transseptal left heart catheterization.

References

Medicine—A Profession and a Social Institution
From the point of view of an individual, medicine is a profession—perhaps "his" profession. From the vantage point of society, medicine is a social institution performing a truly important function in our civilization. By going into medicine one commits himself to carry forward the function or commitment of the profession with respect to society. I say "carry forward" because medicine would not have been accepted generation after generation by a changing society if its central tradition were a static one. It has not only survived but grown in stature because its commitment is to change—to the untiring quest for more effective ways to preserve health by the elimination of disease, and for more humane and effective methods to care for the sick and the suffering. Only as the profession restlessly seeks to unburden society of the need for the very function it performs does medicine truly meet its commitment.—Introduction, Edward D. Churchill, M.D. Listen to Leaders in Medicine. Edited by Albert Love and James Saxon Childers. Atlanta, Tupper and Love, Inc., 1963, p. 3.
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